A STUDY TO DETERMINE THE IMPACT OF THE WASHINGTON PUBLIC WORKS BROADBAND PROGRAM ON UNSERVED.

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Abstract

This capstone aims to examine the Public Works Board (PWB) Broadband financing program that has tried to correct the unserved and rural internet divide by implementing Grant/Loan programs. Data from four sources were analyzed to test the program's outcomes as they pertained to their goal of providing infrastructure funding to unserved communities throughout Washington state to close the broadband gap. Results indicated no significant relationship exists between unserved areas and the location of broadband project sites provided public funding.

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The digital divide has come into focus, with COVID-19 knocking at the rural doors of those without broadband internet access. Rural broadband takes its place in history alongside the rural electricity divide. The internet era is no longer in its infancy as a cool fad or only accessible to computer experts; the internet is now a highway, a marketplace, a classroom, and even one's lawyer's office. This divide has been catapulted into the spotlight today as school children are video conferencing on laptops with difficulty for those, especially in rural and unserved communities (Boerngen, 2021).

Broadband access affects educational equity, economic potential, and racial disparities in unserved/rural areas in the United States (U.S.). Washington, New York, Indiana, and almost every other state and/or country (Briglauer, 2021) in the world has some grant and/or rural broadband financing program to attempt to correct the inequities that uneven rural broadband access has on these communities. No grant or broadband program is perfect, but they all try to address the concern with varying success. Identifying the similarities of programs and their pitfalls in states such as New York and Indiana, which have studies and literature concerning their programs access, is essential to understanding the aspects of the Washington broadband financing program.

Federal and state grants are essential to support rural agricultural communities and economies. The USDA "found that enhancing digital agriculture technologies already in use today - and increasing producers' usage to full-scale [with Broadband internet] - could create at least $47 billion yearly in additional gross benefit for the US economy." (*Broadband*, 2022) Federal and state funding to bring broadband into unserved communities could have a significant

positive economic impact in those unserved areas. State and Federal grants and funding can level the playing field for these communities to add back equity.

The lack of broadband access also creates an educational divide between unserved/rural areas and those with abundant broadband access. The USDA states, "[Rural students should be] able to do their homework at home, rather than drive miles and miles to a Wi-Fi hotspot in town. Likewise, students should be able to download the same educational videos as urban and suburban students quickly and easily. Adult learners require modern connectivity to engage in university, community college, trade, and technical school degree and professional certification programs" (*Broadband*, 2022). Today, students download software, PDFs, and other standard classroom practices that offer online materials. These practices inadvertently dichotomize the classroom since the barrier to broadband internet predominantly affects unserved and rural area students.

Limited access to broadband in rural America doesn't discriminate against educational and economic access alone; it also has racial biases that come into play; "In rural America, broadband availability is 16 percentage points higher in majority-white counties compared to majority-African American counties and is 45 percentage points higher in majority-white counties compared to majority-Native American counties" (*The racial equality and economic opportunity case for expanding broadband – third way*, 2022). Along with inequitable access to other community resources such as well-funded schools, health care, and jobs, limited broadband access is another factor that further exacerbates racial disparities within the U.S.

Historically rural areas in the US have been left out of access to other utilities. The Rural Electrification Act of 1936 (Celebrating the 80th Anniversary of the Rural Electrification Administration, n.d.) was created in response to rural areas being left out of the modern

electrification in urban and city locations. The act was meant to modernize with electricity the US landscape regardless of population density/cost. In 1936, 90% ("Rural Electrification Act (1936)," n.d.) of rural farms and areas lacked electricity because it was too costly to be provided to low-density areas. The act provided electricity to become a public good and incorporated these areas into modern society.

1936 has come and gone, but we now have a public need where private entities will not or cannot support these unserved areas with broadband internet access. Washington state has large swaths of rural communities unserved by this utility. Washington state has access to capital funds that can support these communities. The WA PWB Broadband financing program comes from a need to provide broadband access to the unserved/rural communities that state and federal governments are willing to invest in. More specifically, the WA Public Works broadband (PWB) program is for broadband projects in "unserved" areas, which are defined as those without access to internet speeds of at least twenty-five megabits per second (Mbps) for downloads and 3 Mbps for uploads, or 25/3 Mbps. The FCC definition of broadband internet access is 25/3 Mbps, equal to or more significant. To illustrate, the capacity of 25/3 MBps is sufficient for light or moderate use in households with three or fewer users/devices. Still, it does not meet the demands of modern-day usage. (Household Broadband Guide, n.d.)

Washington state PWB Broadband financing program understood that severely distressed areas have lower opportunities and need greater access to funds at a cheaper rate to add equity to the PWB Broadband program. The program guidelines have stipulated what constitutes a severely distressed, distressed, and standard county—a 2019 and 2020 study conducted by WA dept. Of Commerce identified the rural internet divide and what a distressed county was in Washington (Brown et al., 2020). WA state Definition of Distressed Area: RCW 43.168.020

"Distressed area" means (a) a rural county; (b) a county that has an unemployment rate of twenty percent above the state average for the immediate three years; and (c) a county with a median household income that is less than seventy-five percent of the state median household income for the last three years. (Box, n.d.)

Table 1A illustrates the funding tiers and interest rates if awarded a loan under the PWB Broadband program depending on county status. "Standard county" has the highest interest rates and lowest award potential, "distressed county" with middle-interest rates and the same award cap as standard, and severely distressed with the lowest interest rates and highest award cap of $5 million. If severely distressed counties have a higher loan cap and the lowest interest rate, we would think that these counties might receive more funds. At the very least, severely distressed would have a higher rate of being provided broadband awards with all the equity of the program's financing being addressed in the guidance. Three out of fifteen pages, or 20% of the PWB BB guidelines that Commerce provided for the program, are dedicated to defining and explaining the distressed and severely distressed counties. (Box, n.d.)

When discussing broadband grants, we must include public utilities since the public utilities in WA already provide utility services in these "unserved" areas. Public utilities would be more likely to receive funds due to the population they are covering, and some already offer telecommunications services. The grant allocation would seem the best fit for counties with public utilities. A recent study suggests "a positive and significant impact of state-level funding programs on general (and fiber) broadband availability, and a negative impact of municipal/cooperative restrictions." (Whitacre & Gallardo, 2020) The study suggested that the more restrictions on public utilities or lack of utility cooperatives, the less likely someone is to have more than 25/3 Mbps of broadband access. Public utilities offer a better chance for

community members who are a part of these areas to access broadband internet. The corollary is that those unserved areas without public utilities are less likely to have broadband access.

Broadband grants often need infrastructure development and continued financial support to keep services operational (e.g., maintenance, etc.). Local governments, like counties in rural areas through Utility co-ops or public utilities, can offer broadband services. In Washington state, these co-ops are called Public Utility districts. A Public Utility District is a community-owned, locally regulated utility created by a vote of the people under Washington RCW 54 (About Puds, n.d.). A study in Indiana elaborated on the benefits of utility Co-ops offering broadband, "the anticipated [broadband] revenue from customers would not be adequate to cover the total system costs, so some external assistance [grants] would be needed to incentivize the investments." (Grant et al., 2018) The study was focused on the "areas served by Rural Electric Member Cooperatives (REMC) in the state of Indiana." These are like Washington's Public utilities as they are non-for-profit utility providers. In the study, they surmised that investment specifically in Public/cooperative utility-run areas would have a net benefit far exceeding the cost of implementing the infrastructure necessary to reach these rural areas. Infrastructure broadband grants are essential but not the entire story for public utilities. The Public utilities are more apt to offer broadband to these unserved areas. They are more likely to receive grants as they already meet qualifications that these grants stipulate, such as being publicly owned and can support the infrastructure for the duration of the performance periods established in these grants. (Grant et al., 2018)

In New York, when it comes to cooperatives, it is not apples to apples with the WA broadband program. Still, it does offer valuable insight that one type of program is not enough to truly address the rural broadband divide for these unserved communities, as the PWB programs

are for one-time infrastructure projects. The NY study focused on the operational costs far exceeding the need for a one-time influx of infrastructure funds to provide broadband to unserved areas. The study describes for public co-ops to be successful, “service prices need to increase 75%–131%, depending on grant restrictions, relative to existing market prices for new broadband cooperatives to become financially feasible.” Articulating these findings to decide how best to allocate funding needs to be considered as operational costs are where the user gets service calls and repairs for their broadband when it goes down or needs repairs. “Cooperative would not cash flow at market prices unless there were at least fourteen potential subscribers per mile…financial infeasibility has little to do with construction costs than the annual operational and maintenance costs needed to sustain the system.” (Schmit & Severson, 2021) Infrastructure investment alone is not the long-term answer for unserved areas attaining broadband. It is not enough to have infrastructure investment alone; providing the necessary cash flow to maintain the broadband infrastructure in these unserved areas is also critical.

A study evaluating the efficacy of broadband subsidy programs assessed that they often provide duplicative access, do not reach unserved areas and reinforce regions that already have programs or funds. “Prior investigations have shown that RUS’ broadband subsidy programs were not cost-effective and often funded duplicative coverage in areas already served by existing providers. This study analyzes three large projects subsidized by the ARRA-created Broadband Initiatives Program (BIP). These projects received $231.7 million in Federal support (including subsidized loans and grants), or about seven percent of total RUS subsidy obligations. The evidence indicates that RUS’s history of funding duplicative services has continued under BIP. The current program is not a cost-effective means of achieving universal broadband availability.” (Eisenach & Caves, 2011) Broadband programs that are duplicative or fail to meet the needs of

unserved areas defeat programs' intentions. Broadband programs that overlap or areas of low need receiving funds over areas of high demand not receiving funds do not effectively allocate public funding and waste program dollars better served in a more targeted manner.

Programs like the WA PWB BB program are forecasted to provide positive economic activity through implementation. A study evaluated programs like the WA PWB program can break even and expand economic activity that was not previously there before. "By comparing the actual amounts of state aid support to the estimated impact on GDP growth, we find it highly cost-efficient, as the programs break even after three years on average." (Briglauer & Grajek, 2021). If funds from the PWB support economic growth and opportunity, then that can mean massive changes to these communities that benefit from the funds.

Opponents to providing funds for expanding broadband access to all households make two main points. First, it will take $24 billion to connect all households; second, the last 250,000 homes will cost $14 billion. "The FCC's National Broadband Plan estimated that it would cost $24 billion to connect all households in the country. It is also estimated that connecting the last 250,000 homes would cost $14 billion (of the $24 billion), or $56,000 per household. The document's implicit message was clear: Should that much money be spent on connecting a few homes?" (LaRose et al., 2007) The second part is the continued care that these programs fail to recognize as the grant/loan programs do not see how they will need to offer increasingly subsidized programs to keep these communities connected due to their high operating costs, as found out in a NY study. The final argument is the lack of computers and computer education to make a rational case for providing these unserved areas with broadband access. The other aspect: are there computers in these homes? Even if so, broadband access is ineffective if subscribers

need basic computer literacy training or special accommodations to use the service. (Rosston & Wallsten, 2014)

Current Study

This study investigates the relationship between county-level factors and PWB BB financing. Specifically, I explore whether WA PWB broadband financing is achieving its goal. Are the grading criteria used in PWB predictive that a distressed county receives funds? A study is critical to know if funds are getting to those communities. Are the communities that need broadband still left out due to the loans' current grading criteria? An evaluation of where the funds are going needs to be analyzed to understand the program's effectiveness. The state has delineated target populations by allocating higher funds and cheaper rates for severely distressed counties. Are these communities benefiting from these criteria? Are funds going to these unserved areas of Washington as the public survey provides the data to the Dept. of Commerce Broadband office? The WA state PWB program utilizes the following statistics on county demographics for grading criteria: Median Household income (MHI), Unemployment rate (UI), and Rural designated counties. WA PWB BB program determined to use the three criteria listed above to prioritize and scale available funds and rates of loans based on levels of distress as categorized in the program. The dependent variable is the comparative analysis of counties that receive grants and those that do not. While Commerce does not specify that they will only make grants for these counties, they have been identified as being in such need that they require higher financing at a lower Return on Investment (ROI), incentivizing the funds to go to these hardest-hit counties. To elaborate further, severely distressed counties with a higher loan cap and the lowest interest rate would make us believe these counties might receive more funds. At the very

least, severely distressed would have a higher rate of being provided broadband awards with all the equity of the program's financing being addressed in the guidance.

Methods

Data Source.

I utilize four data sources for the capstone project. The first data source I utilized is the American Community Survey (ACS), an annual survey that provides vital information about the US and its people. ACS Information generates data that helps determine how more than $675 billion in federal and state funds are distributed each year. ACS data are collected primarily by mail using "paper and pencil" questionnaires, with telephone and personal visit collection used as a follow-up to mail nonresponse. The second data source is the Washington State Department of Commerce Broadband Access and Speed Survey. A survey of 31,793 households with speed test and/or a questionnaire survey of current broadband access was conducted via a Commerce website. The survey aggregated geo-location data and asked them six questions about their internet access and whether they had broadband access at all or tested their download/upload speeds if they had broadband internet. The data was collected through an online survey on the Dept. of Commerce website. The third data source is the FCC (Federal Communications Commission) which holds a database of all the internet service providers (ISPs) for a given area. The fourth data source is the Washington State Employment Security Department, with county-wide statistics for employment rates and demographic make-up.

The Washington Department of Commerce has offered a broadband speed test survey. The survey name and subtitle: "State Broadband Access and Speed Survey: Help us identify low or no high-speed internet service areas in Washington state." It has been open for two years, and

nearly 40,000 surveys have been aggregated. It is a simple speed test with five questions to start before taking the speed test:

1. Do you know if your Internet Service Provider offers a faster service for an additional cost than what you are paying for now? (Yes/No/Do not know)

2. Is the device you are testing your speed with, connected via wireline or Wi-Fi? (Wireline/Wi-Fi/Do not know)

3. How many people in your household are using the internet right now? (1-2/3-4/4+/Don't know)

4. What is the most important factor in deciding which home internet subscription you buy? (Cost/Performance/Lack of other choices/Don't know)

5. Are you satisfied with your internet speeds? (Completely satisfied/Somewhat satisfied/Neutral/Somewhat dissatisfied/Completely dissatisfied)

After those five questions, it states: "From this website, we can collect data about your broadband speed and create a map for your community that will help your community in efforts to get grants and other support to improve broadband for your community. Select below the action you wish to take."

After which, you perform a speed test, or you provide an answer to "Why do you not have service here?" (check all that apply) (Too Expensive/Not available in my community/area/I do not have a computer/I do not know how to use a computer/I do not know how to get internet service/I do not need it/not interested in it/Have physical limitations (i.e., eyesight/disability)/Worried about others getting my personal information/I do not need more than public internet (library, restaurant, etc.)/Other) and one last question after that, "How much would you pay for internet per month?"

I have utilized the survey to identify the areas of unserved or no service areas in Washington state and the locations of the known PWB BB financing projects (see heat Map Figure 1). The non-identified participants are fully aware they are trying to change their internet service/access when participating in the survey. The survey provided insight that limited access to broadband affects thirty-nine out of thirty-nine counties; no county in WA state has not had a participant in the broadband survey where internet speed/access was not a concern for the participant.

Measures.

The ACS survey provided three independent variables for analyses: % of counties' racial and population demographic make-up, median household income, and no internet survey. Washington Employment Security Department provided two independent variables: county unemployment rate and rural county designation. Washington Dept. of Commerce provided: counties with public utility districts (PUD) and survey data. The survey from WA commerce on household broadband access includes the dollar amount and location of each project for each county received from the PWB BB program, which is used as the dependent variable in analyses.

Analysis Strategy

The study utilized IBM's SPSS statistical analysis software to evaluate research questions. I used Spearman's Correlation on all variables to examine variable relationships (see Correlation table). Second, logistic regression examined the relationship between the independent and dependent variables – county receipt of grant funds. Specifically, a stepwise binary logistic regression first assesses the county's independent variables with an unemployment rate greater than 120% of the state average, counties with 75% of WA Median household income, & rural/tribal county designation (Model 1). I then added the variables:

counties that received PWB funds, a public utility provider, and the percent white population in the county to the model (Model 2). A Multilinear Regression on the added variables was run to determine their potential relationship with one another (Model 3).

Results

To investigate the research question, 'Are Public Works Broadband funds being allocated to severely distressed counties?' I examined the relationship between severely distressed counties' independent variables and the PWB funds allocated to counties' dependent variables. Results revealed from a Logistic nominal regression that counties designated as severely distressed were zero times as likely to receive PWB funds than those counties that were not severely distressed but were not statistically significant findings. (OR=0, p-value .999).

The results offer little insight into how the funding was allocated. The results provide little in asserting that severely distressed counties were a priority. It is not clear that any of their elements in their prioritization were factors in determining the allocation of funding.

Discussion

The program that WA PWB has put a lot of time and effort into producing a way to address inequities in broadband focused on addressing unserved and distressed communities. Currently, the PWB BB program fails to address the need in WA state by providing for distressed counties or unserved communities. The study showed how much the program does not address the unserved areas according to the survey that the WA Dept of Commerce office of broadband provides to assess the current make-up of Washingtonian access to broadband. It also has no significant probabilistic likelihood nor correlation with the severely distressed identified counties in WA. The WA Dept. of Commerce has valuable survey data, showing them where a possible location or implementation of broadband grants funds need to be

allocated to achieve either goal or with that survey, Washington can more accurately target fund allocations based on that data set

The study brings into light the findings in New York and Indiana. In NY, it asks us to question what happens after a county receives these infrastructure-focused funds but cannot continue operations due to the prohibitive cost of maintenance in these rural, low, density areas. Indiana had an answer to this by focusing on their study of the net benefit of public utilities being the better option for receiving funds. They discovered every dollar invested resulted in a return greater than their original investment. Understanding that the PWB program was an attempt to allocate areas with broadband infrastructure and expand access to these unserved areas, it would seem that if the unserved areas in Washington did receive these broadband funds, it would not be the end of the story, but one step in the direction of assisting these communities to catch up. PWB funds that are not allocated to areas of distress or unserved areas make the road to broadband access even further. The continued operation of broadband depends on ensuring that the funds not only address the infrastructure challenges but also need to be further subsidized by the operational costs associated with these projects.

Other studies raised the question of the effectiveness of providing internet to these areas due to cost or fear of inefficiency. Rosston's study (Rosston & Wallsten, 2014) claims it would cost $14 billion to provide broadband for 250,000 homes. The argument evades the responsibility/purpose for which these government grants/funds are intended. The economic unsoundness of rural broadband is precisely the reason for the government to supply a good that otherwise would not be provided without a high cost to the consumer. The aspect of a public good affords people in unserved areas the opportunity to have an equal playing feel in education and economy, among a myriad of other elements that come with a utility of this nature. Broadband is such a unique and essential utility for households. It is hard to see 250,000 households, seemingly small in perspective, would be left out of our national community due to the cost

of providing. We do not argue that National security is too costly to provide for these same homes, yet we are using dollars to make that distinction.

The final aspect is despite having included all the possible variables that might explain where a PWB BB loan/grant was allocated, none of the factors that one would think attributed to where a PWB project was greenlighted. PUD, race, income, unemployment, previously given a feasibility grant, and severely distressed county, the model was not predictive nor statistically significant that any of those or the combination would provide insight to how the PWB broadband program funds would be allocated.

Conclusion

It saddens me to report that while the PWB program is noble in its objective, it lacks the focus or parameters for achieving its stated goals. If we were to throw darts at aboard, we might have a higher likelihood of achieving a goal of unserved committed than the current system of applications and loan disbursement. The suggested remedy is to recreate a program where the survey data is used as a guide or emphasize applications and grants to be easier to attain and/or further outreach to these communities. The PWB BB program needs to reweight its scoring rubric to underscore the need to focus on severely distressed counties according to its guidelines and articulate to counties and corollary counties that need to share with PWB what is required to achieve greater Broadband access. The story cannot be so simple as to suggest a PWB grant alone can accomplish the goal, and maybe that is why we do not see these rural areas applying or receiving funds. The corrective action in the short term would be to see where their current projects are located and associate that with the geo-location of the aggregate number of areas that have the highest density of unserved in these rural areas, a misnomer of sorts considering density is partially the reason for them not having broadband in the first place. In the PWB long run needs to see its goal not as just trying to address underserved areas but to see that

democratization vs. concentration of the internet is what needs addressing. In a democratic reality is that the survey is the voting tool for which one could follow where to place the most energy and resources to alleviate the rural internet divide rather than rely on a theory of concentrating the resources based on a series of parameters that may not focus in areas of need/unserved.

I suggest coordination with local Co-op/Public utility companies to see how best to implement a broadband grid to serve unserved communities that can be maintained cost-effectively. To rectify the program's shortcomings, a targeted approach utilizing the survey data to allocate funding based on the location of those surveyed and economic factors already included in the distressed county status as primary targets for awards. Further elaborating on suggested actions would be to promote these programs solely in the distressed counties with a high quantity of reported unserved survey respondents.

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Tables

TABLE A1: Comparison of Standard, Distressed, and Severely Distressed Award Criteria

Financial Status and Hardship Criteria	**Funding Options**	**Eligible Project Costs**	**Interest Rate (Loan only)**	**Interest Rate**
Standard (Non-distressed)	Eligible for low interest loans	1. PWB funds up to $2M 2. 50% of the total project cost	Fifty percent of Average Daily Market Rate (ADMR)	0.85%
Distressed 1. Rural; and/or 2. Tribal	Eligible for distressed interest rate loans	1. PWB funds up to $5M 2. 90% of total project cost	Fifty percent of standard interest rate	0.42%
Severely distressed 1. Rural; and/or 2. Tribal 3. Unemployment rate is 20% above the three-year state average 4. A MHI that is 75% of the state MHI for the three previous years	Eligible for severely distressed interest loans	1. PWB funds up to $5M 2. 90% of the total project cost	Twenty-five percent of standard interest rate	0.21%

Figure 1: Heat Map of WA Commerce survey results showing areas reported as being Unserved or having No Broadband Service by WA state individuals.

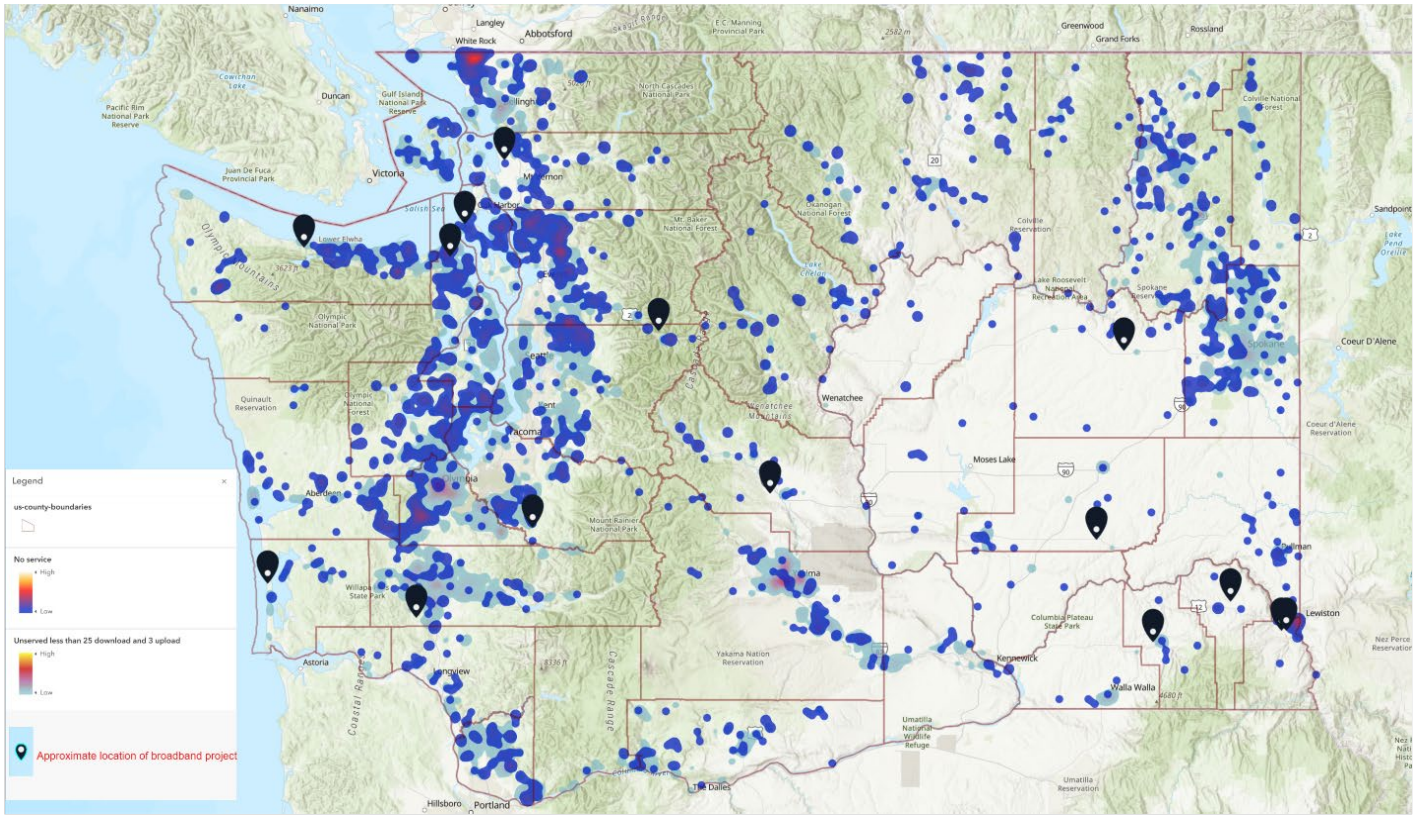

Figure 1. (The map provides a general area where waypoints currently awarded projects, and the colored regions displaying respondents in the survey are defined as unserved. Here is the link for the interactive map: https://www.arcgis.com/apps/mapviewer/index.html?webmap=95b17f75dba447d78cd0c36382ca578b)

Appendices

Table D1

Descriptive Statistics

	N	Min	Max	Mean	Std. Dev.
Counties with PUDs providing telecommunications services	39	0	1	.38	.493
median household income 2019	39	$44,777	$102,338	$63,085.69	$11,813.054
median household income 2020	39	$47,722	$102,620	$64,790.95	$12,249.140
median household income 2021 estimated	39	$47,213	$102,903	$66,770.95	$13,869.716
Median household income below 75% WA median income for the past three years	39	0	1	.33	.478
% Households without a computer in the household	39	4.4	18.4	9.244	3.3959
% Households with No internet subscription	39	10.5	29.7	17.910	4.6423
$20,000 to $74,999: HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2019 INFLATION-ADJUSTED DOLLARS)					

% Households with No internet subscription $75,000 or more: HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2019 INFLATION-ADJUSTED DOLLARS)	39	2.6	22.0	6.749	3.9675
% Households with No internet subscription $20,000: HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2019 INFLATION-ADJUSTED DOLLARS)	39	22.9	52.8	37.418	8.2051
Per capita funds allocated per passing (potential house or business access to new project network)	39	$0.00	$47,751.92	$5,575.2033	$11,336.55111
% Asian alone	39	.5	20.6	2.985	3.8556
% Black or African American alone	39	.3	7.6	1.554	1.6529
% American Indian and Alaska Native alone	39	.8	18.1	3.074	3.3323
% Native Hawaiian and Other Pacific Islanders alone	39	.0	2.2	.410	.4297
County Poverty % all individuals (2015-2019)	39	7.3	26.5	13.492	4.1192
Percent of responded to total population	39	.11	4.21	1.0841	.95598
% Two or More Races	39	5.4	15.6	9.349	2.3731
% Unserved over responded to survey (ratio of unserved to served/ the bias of surveys towards low internet ratio)	39	24.09	81.28	49.5754	13.10769
% White alone	39	60.5	92.9	82.631	6.7319
Population 2021 estimates	39	2,300	2,287,050	199,153.21	405,090.628

Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	39	0	1	.21	.409
Is its rural county as defined by WA	39	0	1	.77	.427
% Of population with less than three broadband providers in rural designated areas	39	.00	38.28	9.7149	8.35222
Qualifies for severely distressed county status for PWB	39	0	1	.21	.409
# Of Residences or businesses that have access to the network from all awarded PWB funds 2020-2022	39	0	2788	325.97	673.876
Total received PWB broadband funds	199	0	1	.90	.295
Total PWB funds allocated 2019-2022	39	$0	$9,459,658	$1,614,240.44	$2,483,875.847
Total $ Grant and/or loan distributed from PWB 2020-2021	39	$0	$5,000,000	$457,147.69	$1,263,804.485
Total $ Grant and/or loan allocated from PWB 2021-2022	39	$0	$9,459,658	$1,145,554.28	$2,129,776.223
Total surveyed	39	22	4700	815.15	908.166
Total Respondent unserved less than 25/3 Download/upload or no service	39	13	1419	367.13	339.529
Unemployment rate average for past three years (May 19-April 22) WA	39	4.26	10.13	6.7072	1.15732
Unemployment rate above 120% for May 2019-April 2022 WA	39	0	1	.31	.468

Valid N (listwise)	39				

Table D2

Statistics

	Counties with PUDs providing telecommunications services	Median household income below 75% WA median income for the past three years	White alone	Population 2021 estimates	Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	rural county as defined by WA	Total PWB funds allocated	Total surveyed	Total Respondent unserved less than 25/3 Download/upload or no service	Unemployment rate above 120% for May 2019-April 2022 WA	Unemployment rate average for past 3 years (may 19-april 22) WA
Valid	39	39	39	39	39	39	39	39	39	39	39
Missing	160	160	160	160	160	160	160	160	160	160	160
Mean	.38	.33	82.631	199,153.21	.21	.77	$1,614,240.44	815.15	367.13	.31	6.7072
Median	.00	.00	3.000	65,750.00	.00	.00	$50,000.00	557.00	215.00	.00	6.6722
Mode	0	0	76.5[a]	2,300[a]	0	1	$0	274	40[a]	0	4.26[a]
Std. Deviation	.493	.478	6.7319	405,090.628	.409	.427	$2,483,875.847	908.166	339.529	.468	1.15732

a. Multiple modes exist. The smallest value is shown

Table D3

Counties with PUDs providing telecommunications services

	N	%
0 No	24	12.1%
1 Yes	15	7.5%

Missing	System	16 0	80.4%

Table D4

Median household income below 75% WA median income for the past three years

		N	%
	0 No	26	13.1%
	1 Yes	13	6.5%
Missing	System	16 0	80.4%

Table D5

% White alone

	N	%
60.5	1	0.5%
69.2	1	0.5%
71.0	1	0.5%
72.6	1	0.5%
76.5	2	1.0%
76.7	1	0.5%
77.5	1	0.5%
77.6	1	0.5%
78.3	1	0.5%
79.6	1	0.5%
80.3	1	0.5%
80.7	1	0.5%
81.5	1	0.5%
82.2	1	0.5%
82.6	1	0.5%
82.8	1	0.5%
82.9	2	1.0%
83.0	1	0.5%
83.5	1	0.5%
84.3	2	1.0%
86.0	2	1.0%
86.3	1	0.5%

	86.4	1	0.5%
	86.6	1	0.5%
	87.4	1	0.5%
	87.5	1	0.5%
	88.2	1	0.5%
	88.8	1	0.5%
	88.9	1	0.5%
	89.3	1	0.5%
	89.4	1	0.5%
	90.6	2	1.0%
	90.7	1	0.5%
	92.9	1	0.5%
Missing	System	16	80.4%
		0	

Table D6

Population 2021 estimates

	N	%
2,300	1	0.5%
3,950	1	0.5%
4,475	1	0.5%
7,250	1	0.5%
10,900	1	0.5%
11,750	1	0.5%
13,475	1	0.5%
17,850	1	0.5%
20,900	1	0.5%
22,500	1	0.5%
23,000	1	0.5%
23,425	1	0.5%
33,100	1	0.5%
42,350	1	0.5%
43,550	1	0.5%
44,600	1	0.5%
45,225	1	0.5%
46,725	1	0.5%
62,100	1	0.5%
65,750	1	0.5%

	76,050	1	0.5%
	77,750	1	0.5%
	80,000	1	0.5%
	82,700	1	0.5%
	87,100	1	0.5%
	98,350	1	0.5%
	100,800	1	0.5%
	111,500	1	0.5%
	130,000	1	0.5%
	209,400	1	0.5%
	226,300	1	0.5%
	258,100	1	0.5%
	277,700	1	0.5%
	297,800	1	0.5%
	513,100	1	0.5%
	542,100	1	0.5%
	837,800	1	0.5%
	928,200	1	0.5%
	2,287,050	1	0.5%
Missing	System	16	80.4%
		0	

Table D7

Received a planning feasibility grant for $50,000 FROM PWB 2019-2020

		N	%
	0 No	31	15.6%
	1 Yes	8	4.0%
Missing	System	16	80.4%
		0	

Table D8

rural county as defined by WA

		N	%
	0 No	9	4.5%
	1 Yes	30	15.1%

Missing	System	16	80.4%
		0	

Table D9

Received PWB broadband funds

	N	%
No	19	9.5%
Yes	18	90.5%
	0	

Table D10

Total PWB funds allocated

		N	%
	$0	19	9.5%
	$50,000	3	1.5%
	$196,202	1	0.5%
	$648,023	1	0.5%
	$788,946	1	0.5%
	$1,146,046	1	0.5%
	$1,165,000	1	0.5%
	$1,620,000	1	0.5%
	$3,388,946	1	0.5%
	$3,719,663	1	0.5%
	$3,827,365	1	0.5%
	$4,162,072	1	0.5%
	$4,842,933	1	0.5%
	$4,907,970	1	0.5%
	$4,917,382	1	0.5%
	$5,050,000	1	0.5%
	$5,577,791	1	0.5%
	$7,387,380	1	0.5%
	$9,459,658	1	0.5%
Missing	System	16	80.4
		0	%

Table D11

Total surveyed

	N	%
22	1	0.5%
28	1	0.5%
78	1	0.5%
106	1	0.5%
110	1	0.5%
120	1	0.5%
137	1	0.5%
142	1	0.5%
181	1	0.5%
213	1	0.5%
219	1	0.5%
259	1	0.5%
272	1	0.5%
274	2	1.0%
336	1	0.5%
347	1	0.5%
461	1	0.5%
470	1	0.5%
557	1	0.5%
567	1	0.5%
576	1	0.5%
659	1	0.5%
768	1	0.5%
813	1	0.5%
822	1	0.5%
937	1	0.5%
975	1	0.5%
1116	1	0.5%
1129	1	0.5%
1265	1	0.5%
1272	1	0.5%
1392	1	0.5%
1703	1	0.5%
1909	1	0.5%
1912	1	0.5%
2156	1	0.5%
2514	1	0.5%

	4700	1	0.5%
Missing	System	16	80.4%
		0	

Table D12

Total Respondent unserved less than 25/3 Download/upload or no service

	N	%
13	1	0.5%
14	1	0.5%
24	1	0.5%
40	2	1.0%
66	2	1.0%
83	1	0.5%
100	1	0.5%
102	1	0.5%
118	1	0.5%
125	1	0.5%
129	1	0.5%
150	1	0.5%
163	1	0.5%
178	1	0.5%
191	1	0.5%
192	1	0.5%
205	1	0.5%
215	1	0.5%
268	1	0.5%
335	1	0.5%
383	1	0.5%
400	1	0.5%
433	1	0.5%
445	2	1.0%
456	1	0.5%
544	1	0.5%
549	1	0.5%
625	1	0.5%
639	1	0.5%
705	1	0.5%

	725	1	0.5%
	729	1	0.5%
	850	1	0.5%
	977	1	0.5%
	1177	1	0.5%
	1419	1	0.5%
Missing	System	16	80.4
		0	%

Table D13

Unemployment rate above 120% for May 2019-April 2022 WA

	N	%
0 No	27	13.6%
1 Yes	12	6.0%
Missing System	16	80.4%
	0	

Table D14

Unemployment rate average for past 3 years (may 19-april 22) WA

	N	%
4.26	1	0.5%
4.83	1	0.5%
4.92	1	0.5%
5.28	1	0.5%
5.50	1	0.5%
5.58	1	0.5%
5.68	1	0.5%
5.71	1	0.5%
5.84	1	0.5%
5.98	1	0.5%
6.03	1	0.5%
6.07	1	0.5%
6.16	1	0.5%
6.23	1	0.5%

	6.24	1	0.5%
	6.26	1	0.5%
	6.34	1	0.5%
	6.65	1	0.5%
	6.65	1	0.5%
	6.67	1	0.5%
	6.88	1	0.5%
	6.91	1	0.5%
	7.00	1	0.5%
	7.07	1	0.5%
	7.09	1	0.5%
	7.12	1	0.5%
	7.12	1	0.5%
	7.21	1	0.5%
	7.24	1	0.5%
	7.29	1	0.5%
	7.33	1	0.5%
	7.44	1	0.5%
	7.64	1	0.5%
	7.67	1	0.5%
	7.69	1	0.5%
	8.42	1	0.5%
	8.64	1	0.5%
	8.82	1	0.5%
	10.13	1	0.5%
Missing	System	16	80.4%
		0	

Table C1

Correlations

			Counties with PUDs providing telecommunications services	Median household income below 75% WA median income for the past three years	% White alone	% of responded to total population	% unserved over responded to survey (ratio of unserved to served / the bias of surveys towards low internet ratio)	Population 2021 estimates	Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	Rural county as defined by WA	% of population with less than 3 broadband providers in rural designated areas	Qualifies for severely distressed county status for PWB	Received PWB broadband funds	Total PWB funds allocated	otal surveyed	Total Respondent unserved less than 25/3 Download/upload or no service	Unemployment rate average for past 3 years (May 19-april 22) WA	Unemployment rate above 120% for May 2019-April 2022 WA
Spearman's rho	Counties with PUDs providing telecommunications services	Correlation Coefficient	.000	000	.012	028	.131	075	251	183	.164	251	243	309	063	028	440**	387*
		Sig. (2-tailed)		.000	944	865	426	650	123	265	319	123	136	056	702	865	005	015
		N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
	Median household income below 75% WA median income for the past three years	Correlation Coefficient	000	.000	027	401*	358*	.333*	.090	387*	116	718**	145	170	.130	.126	217	471**
		Sig. (2-tailed)	.000		872	011	025	038	587	015	482	.001	378	302	428	446	184	002
		N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

% White alone	Correlation Coefficient	.012	027	.000	507**	356*	.653**	.079	492**	119	.164	166	290	.448**	.397*	.023	.032
	Sig. (2-tailed)	944	872		.001	026	.001	633	001	470	319	311	073	004	012	891	846
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
% of responded to the total population	Correlation Coefficient	028	401*	507**	.000	684**	.656**	048	530**	211	302	226	271	.020	081	292	368*
	Sig. (2-tailed)	865	011	.001		.001	.001	772	.001	198	062	167	095	903	625	072	021
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Percent unserved over responded to survey (ratio of unserved to served/ the bias of surveys towards low internet ratio)	Correlation Coefficient	.131	358*	356*	684**	.000	.591**	.158	395*	321*	243	087	162	.209	.042	330*	257
	Sig. (2-tailed)	426	025	026	.001		.001	337	013	046	137	600	324	201	800	040	115
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Population 2021 estimates	Correlation Coefficient	075	.333*	.653**	.656**	.591**	.000	158	.719**	.141	.039	.109	.188	728**	642**	.130	.178
	Sig. (2-tailed)	650	038	.001	.001	.001		337	.001	391	811	507	251	.001	.001	432	279
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Received a planning feasibility	Correlation Coefficient	251	.090	.079	048	.158	158	.000	.023	051	056	495**	384*	288	265	293	212

grant for $50,000 FROM PWB 2019-2020	Sig. (2-tailed)	123	587	633	772	337	337		889	759	733	001	016	076	103	070	196
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
rural county as defined by WA	Correlation Coefficient	183	387*	492**	530**	395*	.719**	.023	.000	092	278	197	259	.562**	.511**	379*	365*
	Sig. (2-tailed)	265	015	001	.001	013	.001	889		578	086	230	112	.001	.001	017	022
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Qualifies for severely distressed county status for PWB	Correlation Coefficient	251	718**	.164	302	243	.039	056	278	.017	.000	114	180	155	166	587**	762**
	Sig. (2-tailed)	123	.001	319	062	137	811	733	086	919		490	273	346	311	.001	.001
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Recevied PWB broadband funds	Correlation Coefficient	243	145	166	226	087	.109	495**	197	114	114	.000	921**	041	023	255	316*
	Sig. (2-tailed)	136	378	311	167	600	507	001	230	490	490		.001	804	890	117	050
	N	9	9	9	9	9	9	9	9	9	9	99	9	9	9	9	9
Total PWB funds allocated	Correlation Coefficient	309	170	290	271	162	.188	384*	259	091	180	921**	.000	.052	.056	279	341*
	Sig. (2-tailed)	056	302	073	095	324	251	016	112	581	273	.001		754	737	086	034
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total surveyed	Correlation Coefficient	063	.130	.448**	.020	.209	728**	288	.562**	133	155	041	.052	.000	976**	016	067
	Sig. (2-tailed)	702	428	004	903	201	.001	076	.001	419	346	804	754		.001	924	687

	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Respondent unserved less than 25/3 Download /upload or no service	Correlation Coefficient	028	.126	.397*	081	.042	.642**	265	.511**	160	166	023	.056	.976**	.000	064	079
	Sig. (2-tailed)	865	446	012	625	800	.001	103	.001	332	311	890	737	.001		697	633
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Unemployment rate average for past 3 years (may 19-april 22) WA	Correlation Coefficient	440**	217	.023	292	330*	.130	293	379*	.088	587**	255	279	016	064	.000	800**
	Sig. (2-tailed)	005	184	891	072	040	432	070	017	593	.001	117	086	924	697		.001
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Unemployment rate above 120% for May 2019-April 2022 WA	\Correlation Coefficient	387*	471**	.032	368*	257	.178	212	365*	.069	762**	316*	341*	067	079	800**	.000
	Sig. (2-tailed)	015	002	846	021	115	279	196	022	676	.001	050	034	687	633	.001	
	N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Unemployment rate above 120% for May 2019-April 2022 WA	Correlation Coefficient	387*	471**	.032	368*	257	.178	212	365*	.069	762**	316*	341*	067	079	800**	.000
	Sig. (2-tailed)	015	002	846	021	115	279	196	022	676	.001	050	034	687	633	.001	

Correlation is significant at the 0.01 level (2-tailed).**

Correlation is significant at the 0.05 level (2-tailed).*

Logistic regression (Model 1)

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	39	19.6
	Missing Cases	160	80.4
	Total	199	100.0
Unselected Cases		0	.0
Total		199	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
0 No	0
1 Yes	1

Classification Table[a,b]

Observed			Predicted		
			Total received PWB Broadband funds		
			0 No	1 Yes	
Step 0	Total Received PWB broadband funds	0 No	0	19	.0
		1 Yes	0	20	100.0
	Overall Percentage				51.3

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	SE.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.051	.320	.026	1	.873	1.053

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Unemployment rate above 120% for May 2019-April 2022 WA	3.903	1	.048
		Is it a rural county as defined by wad	1.509	1	.219
		Median household income below 75% WA median income for the past three years	.821	1	.365
		Overall Statistics	4.231	3	.238

Omnibus Tests of Model Coefficients

		Chi-square	df	ig.
Step 1	tep	4.392	3	222
	lock	4.392	3	222
	odel	4.392	3	222

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	49.648[a]	.106	.142

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

Observed		Predicted		
		Received PWB broadband funds		
		0 No	1 Yes	Percentage Correct
Step 1	0 No	16	3	84.2

Total_PWB Received PWB broadband funds	1 Yes	11	9	45.0
Overall Percentage				64.1

a. The cut value is .500

Variables in the Equation

		B	SE.	Wald	df	Sig.	Exp(B)
Step 1[a]	Unemployment rate above 120% for May 2019-April 2022 WA	1.386	.891	2.421	1	.120	3.999
	Is it rural county as defined by WA.	.514	.883	.339	1	.560	1.673
	Median household income below 75% WA median income for the past three years	-.161	.855	.035	1	.851	.851
	Constant	-.693	.707	.961	1	.327	.500

a. variable (s) entered on step 1: Unemployment rate above 120% for May 2019-April 2022 WA, is a rural county as defined by wa, Median household income below 75% WA median income for the past three years.

Logistic regression (Model 2)

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	39	19.6
	Missing Cases	160	80.4
	Total	199	100.0
Unselected Cases		0	.0
Total		199	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
0 No	0
1 Yes	1

Classification Table[a,b]

Observed			Predicted		
			Total_PWB Received PWB broadband funds		
			0 No	1 Yes	Percentage Correct
Step 0	Total PWB Recevied PWB broadband funds	0 No	0	19	.0
		1 Yes	0	20	100.0
	Overall Percentage				51.3

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	SE.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.051	.320	026	1	.873	1.053

Variables not in the Equation[a]

			Score	df	Sig.
Step 0	Variables	Counties with PUDs providing telecommunications services	2.309	1	.129
		% White alone	.655	1	.418
		Population 2021 estimates	.011	1	.917
		Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	9.561	1	.002
		Rural county as defined by WA	1.509	1	.219
		Qualifies for severely distressed county status for PWB	.507	1	.476

	Total			
	Respondent unserved less than 25/3 Download/upload or no service	.382	1	.537
	Unemployment rate above 120% for May 2019-April 2022 WA	3.903	1	.048

a. Residual Chi-Squares are not computed because of redundancies.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	21.077	8	007
	Block	21.077	8	007
	Model	21.077	8	007

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	32.963	.418	.557

Classification Table[a]

			Predicted		
			Total PWB Received PWB broadband funds		
	Observed		0 No	1 Yes	Percentage Correct
Step 1	Total_PWB Recevied PWB broadband funds	0 No	18	1	94.7
		1 Yes	7	13	65.0
	Overall Percentage				79.5

a. The cut value is .500

Variables in the Equation

		B	SE.	Wald	df	Sig.	Exp(B)
Step 1[a]	Counties with PUDs providing telecommunications services	.677	1.008	.452	1	.501	1.969
	% White alone	.088	.103	.733	1	.392	1.092
	Population 2021 estimates	.000	.000	.265	1	.606	1.000
	Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	29.142	9169.818	.000	1	.997	4530695610328.420
	Is it rural county as defined by wad	-.196	2.234	.008	1	.930	.822
	Qualifies for severely distressed county status for PWB	-20.012	16776.173	.000	1	.999	.000
	Total Respondent unserved less than 25/3 Download/upload or no service	.001	.002	.113	1	.736	1.001
	Unemployment rate above 120% for May 2019-April 2022 WA	20.376	16776.173	.000	1	.999	706273663.366
	Constant	-7.962	9.032	.777	1	.378	.000

a. variable (s) entered on step 1: Counties with PUDs providing telecommunications services, % White alone, Population 2021 estimates, Received a planning feasibility grant for $50,000 FROM PWB 2019-2020, Is it rural county as defined by wad, Qualifies for severely distressed county status for PWB, Total Respondent unserved less than 25/3 Download/upload or no service, Unemployment rate above 120% for May 2019-April 2022 WA.

Multivariate regression (Model 3):

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.616[a]	.379	.126	$2,321,998.127

a. Predictors: (Constant), Unemployment rate average for past 3 years (May 19-April 22) WA, Total Respondent unserved less than 25/3 Download/upload or no service, Median household income below 75% WA median income for the past three years, Counties with PUDs providing telecommunications services, Received a planning feasibility grant for $50,000 FROM PWB 2019-2020, % White alone, rural county as defined by WA, Unemployment rate above 120% for May 2019-April 2022 WA, % Black or African American alone, Qualifies for severely distressed county status for PWB, County Population 2021 estimates

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	88871057401513.280	11	8079187036501.207	1.498	.189[b]
Residual	145575233125536.280	27	5391675300945.788		
Total	234446290527049.560	38			

a. Dependent Variable: Total PWB funds allocated

b. Predictors: (Constant), Unemployment rate average for past 3 years (may 19-April 22) WA, Total Respondent unserved less than 25/3 Download/upload or no service, Median household income below 75% WA median income for the past three years, Counties with PUDs providing telecommunications services, Received a planning feasibility grant for $50,000 FROM PWB 2019-2020, % White alone, A rural county as defined by WA, Unemployment rate above 120% for May 2019-April 2022 WA, % Black or African American alone, Qualifies for severely distressed county status for PWB, Population 2021 estimates

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-27616478.474	11520884.609		-2.397	.024
Counties with PUDs providing telecommunications services	1171862.638	909622.136	.233	1.288	.209
% Black or African American alone	874538.985	522230.338	.582	1.675	.106
% White alone	295353.006	111856.303	.800	2.640	.014
County Population 2021 estimates	.281	2.204	.046	.128	.899
Received a planning feasibility grant for $50,000 FROM PWB 2019-2020	556108.437	1159212.772	.092	.480	.635

Is a rural county as defined by WA	777353.624	1368099.958	.134	.568	.575
Qualifies for severely distressed county status for PWB	1549206.349	2165563.074	.255	.715	.481
Median household income below 75% WA median income for the past three years	340940.447	1397085.352	.066	.244	.809
Unemployment rate above 120% for May 2019-April 2022 WA	22709.429	1625228.478	.004	.014	.989
Total Respondent unserved less than 25/3 Download/upload or no service	980.050	1639.149	.134	.598	.555
Unemployment rate average for past 3 years (May 19-April 22) WA	216125.582	589525.768	.101	.367	.717

a. Dependent Variable: TOTAL_PWBFUNDS_allocated_2019_2022 Total PWB funds allocated