



Avista Low Income Needs Assessment: Phase I

Final Work Plan

July 15, 2019

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I Work Plan

I.1 Background

Avista contracted with Evergreen Economics in July 2019 to identify the population within their Washington service territory that is eligible to receive energy assistance. Specifically, our research will estimate the number of low- and moderate-income households broken down by gas, electric, or combination service. The results will be used to design energy assistance programs, targeted outreach approaches, and determine energy assistance funding needs.

The overall approach will be to use Avista customer information system and billing data combined with Census data to estimate the size of the eligible population and characterize it using the available data. Avista customer data contains a variable that indicates whether households have received a low-income grant, which will allow for analysis of participation in programs at the zip code or Census tract level. Combined, these two metrics can provide insight into the program penetration and coverage by geography and household demographics.

An important caveat of this analysis is that the Census data upon which we are relying to identify low-income program eligibility (e.g., up to 200% of the federal poverty level, or up to 300% in some cases) is not available at the household level, but instead for geographic areas such as county or Census tract.

Characterization of the low-income population and of high or low program participation levels will be based on review of characteristics such as demographic and housing stock across small geographic areas. The program penetration and eligibility results may be presented at the Public Use Microdata Areas (PUMA) or county level (as described in Task 3), though we will use more granularity (e.g., Census tract) during analysis of key demographics to best identify regions with underserved populations for future outreach and/or research efforts.

I.2 Scope of Work by Task

The following *Scope of Work* outlines the specific tasks proposed for completing the research described above.

Task I: Project Initiation Meeting

The project began with a project initiation meeting on July 8, 2019, during which time Evergreen's key personnel met with Avista via webinar to discuss the research questions, budget, and the schedule of deliverables. We also discussed specific project elements including:

- Low-income programs, eligibility requirements, and history

- Data requirements and the data request process
 - Content of existing customer information system database (e.g., Census tract or GIS coordinates for existing customers)
 - Low-income program eligibility tracking, participation records
- Reporting requirements
- Options for regular study check-in calls vs. email updates

During the meeting, we also obtained feedback on our proposed approach and sought to establish study priorities. We confirmed our understanding of the available data sources and discussed protocols for obtaining data and other information from Avista and the Agencies. We provided Avista with a copy of the slide deck and meeting notes, summarizing the main discussion points from this meeting.

Deliverables: Presentation slides, meeting notes.

Task 2: Develop Work Plan

Following the project initiation meeting, we will work with Avista to develop and finalize a work plan integrating key decisions made and comments received at the kick-off meeting. This document is the final work plan. It includes updated research goals and methodologies, detailed data collection and analysis methods, and a complete schedule for research activities and deliverables. This final approved version will serve as a roadmap for the remainder of the project.

Deliverables: Draft and final work plan.

Task 3: Conduct Data Analysis

Immediately after the Evaluation Plan is finalized, we will begin work on the various analysis tasks. We anticipate three phases of analysis, each of which are described below.

Participant Data Analysis

Our analysis will focus on the program offerings between October 2015 and September 2018, covering multiple program cycles since the introduction of Avista's current billing system in 2015. Table 1 provides a summary of Avista's energy assistance programs, including their eligibility criteria and type of benefits offered. Note that we have excluded the IBPP and BMA pilots from this list, as they did not start until October 2018 and are not within the scope of this research; a separate impact and process evaluation is underway to address these two pilots.

Table 1: Avista Energy Assistance Programs

Program	Eligibility Criteria	Benefits
LIHEAP	125% FPL	Heating and cooling assistance
LIRAP Heat	150% FPL	Energy assistance; mimics LIHEAP Customer cannot receive both LIHEAP and LIRAP Heat
LIRAP Senior/Disabled Outreach	151-200% adjusted FPL 60+ with fixed income or verifiable disability	Levelized billing based on the annual average \$400 heating or \$100 non-heating grant
LIRAP Share	No income qualification At risk of disconnection	Emergency assistance; mimics Project Share \$350 max
Avista CARES	No income qualification Heat with Avista fuel	Hardship grant, distributed by agencies*
Project Share	No income qualification At risk of disconnection	Community fuel fund Emergency/hardship grant \$300 max per year
MISC	Varies by agency*	Hardship grant, distributed by agencies*
Senior/Disabled Rate Pilot	126-200% FPL 60+ with fixed income or verifiable disability Limited to 4 counties**	Rate discount

* The CARES and MISC assistance grants are distributed by non-profit service agencies, government agencies or churches that provide energy assistance as a secondary service to their core service in the course of helping individuals. For example, the MISC assistance grants are distributed by several dozen organizations including the Salvation Army, Department of Health and Human Services or the local Housing Authority. These agencies differ from the community action agencies (e.g. Spokane Neighborhood Action Partners - SNAP, Rural Resources, OIC, WGAP, Community Action Partnership, and Community Action Center), that typically administer energy assistance (e.g., LIHEAP, LIRAP, and Project Share).

** Pilot participants reside in Spokane, Lincoln, Stevens, or Ferry county.

We will start by preparing a data request memo for review and approval by the study manager. Based on our current understanding of Avista's needs, we anticipate the data request will include:

- Low-income program participation records by premise and account ID (since October 2015);
- Utility account details for all participants and one full year of monthly billing records prior to receiving assistance from Avista; and

- All available household demographics for households participating in LIRAP from the Department of Commerce.

We will use the program participation records, eligibility details, and billing history to estimate the energy burden for each household at the time they first received assistance from one or more of Avista's low-income programs. This analysis will help to characterize the population that is currently being reached by Avista's low-income programs (i.e., a subset of the eligible population) by region, fuel service, and account characteristics.

Identifying and Characterizing the Eligible Population

None of the public data sources, such as the Census, American Housing Survey (AHS), or Residential Energy Consumption Survey (RECS) contain personally identifying information, income, or energy usage for specific households. Rather, they provide the estimates for the size and composition of the population for a given geographic region. These public data sources provide the best available characterization of Avista's service territory, without primary data collection (e.g., customer surveys). However, it will not be possible to identify specific households who are eligible and should be targeted for participation.

The American Community Survey (ACS) is conducted by the U.S. Census Bureau on an annual basis and provides detailed statistics about the social and economic needs of local communities. The ACS Public Use Microdata Sample (PUMS) files provide a wealth of information, with anonymized survey responses from individual housing units and weights to allow custom tabulation.¹ This trusted public data source provides an opportunity for us to clearly define and characterize the population of households eligible for participation in Avista's low-income programs in each region.

Table 2 provides a list of specific fields available in the ACS PUMS files that will make it possible for us to conduct the analysis outlined in the scoping document provided by Avista. As requested, we will be able to determine each household's income as a percentage of the federal poverty line (FPL), and then characterize the eligible population by tenure, primary language, and presence of seniors. A separate PUMS file will be utilized to identify which of these households include one or more disabled person, linked to the household data by a distinct household serial number.

¹ <https://www.census.gov/programs-surveys/acs/technical-documentation/pums.html>

² Fraser, J., Rasmussen, T., Bensch, I., and Edwards, C. "More Tools in the Toolbox – An Examination of Metrics for Low-Income Customer Energy Burden." International Energy Program Evaluation Conference, 2017. <https://www.iepec.org/wp->

Table 2: Data Available in the ACS PUMS

Intended Use	Name	Description
Estimate energy burden among utility rate payers	TYPE	Type of unit (to exclude institutional and group housing)
	ELEP, GASP	Electricity and natural gas costs per month (option for N/A)
	FULP	Other fuel costs per month (option for N/A)
Calculate household income as a % of FPL	NP	Number of persons in housing unit
	HINC	Household income
	ADINC	Adjustment factor for income and earnings dollar amounts
Characterize the population	TEN	Tenure (own vs. rent)
	HHL	Household language
	R65	Presence of persons 65 years and over in household
	BLD	Units in structure
	MV	When occupant moved into this house/apartment
	HFL	Home heating fuel
	YBL	Year when structure was first built
	FS	Indicator for receiving food stamps/SNAP
DIS	Disability status	

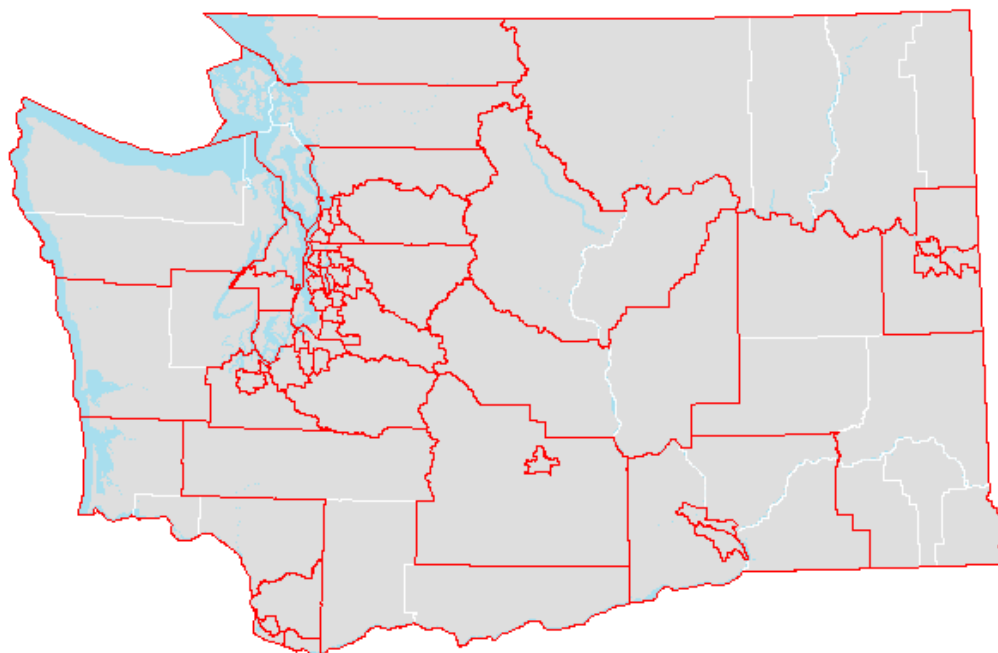
The household income and monthly utility costs available in the PUMS data will allow us to calculate the energy burden for each household. If the PUMS data contains indicators of public assistance (such as food stamps, Medicaid, and housing vouchers), we can also calculate a modified energy burden metric that considers both household income and an estimated value of all public assistance benefits. When adjusting for the value of such non-cash benefits, our prior research has shown that the burden for households at the lowest levels is significantly reduced.² The combination of these two metrics will provide deeper insights into the distribution of need across the population of eligible households.

To maintain respondent privacy, the PUMS data extracts do not list Census tracts or block groups, providing only Public Use Microdata Areas (PUMAs). Figure 1 shows a map of Washington State with the ACS PUMAs outlined in red and counties outlined in white.

² Fraser, J., Rasmussen, T., Bensch, I., and Edwards, C. "More Tools in the Toolbox – An Examination of Metrics for Low-Income Customer Energy Burden." International Energy Program Evaluation Conference, 2017. https://www.iepec.org/wp-content/uploads/2018/02/2017paper_fraser_rasmussen_bensch_edwards-1.pdf

PUMAs are designed to follow county boundaries, with each area representing at least 100,000 people. Spokane County is split into four PUMAs (East Central, North Central, Outer, and South Central), which will enable us to report on the variation in population density, eligibility, and needs across these four regions of the county. The other counties in Avista’s service territory have been grouped with bordering counties to create PUMAs that span a relatively large geographic area. The 2010 and 2015 studies conducted by Eastern Washington University relied on ACS distributions of household income (reported in ranges) by Census tract. We are proposing to use the ACS PUMS to increase the depth of the analysis (e.g., household income and demographics for each respondent with reported fuel costs), sacrificing some geographic granularity.

Figure 1: Washington State Public Use Microdata Areas (PUMA)



Source: Washington State Office of Financial Management, 2010 Census GIS Shapefile

We will request the count of active residential accounts by fuel service (electric, gas, or combination) and region to provide us with a clear definition of the Avista residential service territory. We will use PostGIS and R software to overlay the geographic boundaries of the service territory with the sampling regions of these public data sources (e.g., Census tract, PUMA, county). This task will be key to enabling the tabulation of the Avista customer base, eligible population, and low-income program participants within comparable geographic regions.

We will assemble a master database that enables us to combine our estimates of the eligible population from each of the PUMAs with the data from Avista’s low-income programs, accounting for differences in geographic boundaries for GIS mapping and side-

by-side comparisons. This will allow us to compare and contrast the PUMs estimates for the population of residential households receiving electric and/or gas service by region to the total number of residential service accounts in Avista’s customer database. In regions where Avista is the primary utility service provider, we expect these two counts to closely align. Across all PUMAs, this comparison will provide an estimate for the proportion of households served by Avista. After we have adjusted our estimates of the total population, we can compare our estimates of the eligible households in each PUMA against the number of program participants to determine the current program penetration.

We plan to develop and estimate a statistical regression model to explain the variation in penetration across PUMAs, and what variables (that we may also observe at the county level) might predict higher or lower rates, all else constant. The final set of explanatory variables included in the regression models will be a subset of the variables shared across data sources (i.e., PUMs vs. Census data at the county-level) and will be selected based on their incremental relationship to the respective dependent variable. Many pairs of variables within the Census data sets will be highly correlated – i.e., have a strong positive or negative linear relationship. Because of this, they have the same or very similar relationship with the dependent variable, which can lead to problems in the estimation of the econometric model. For this reason, the model specification will be limited to a subset of variables selected for their explanatory power and ease of interpretation. We will explore a variety of model specifications, including the use of interaction terms.

$$Ratio_i = \alpha_i + \beta_1 Poverty_i + \beta_2 PopDensity_i + \beta_3 NonEnglish_i + \sum \beta_x \bar{X}_i + \varepsilon_i$$

Where :

$Ratio_i$ = Ratio of program penetration (participants vs. eligible) in PUMA region i

$Poverty_i$ = Proportion of households in region i living in poverty (<100% FPL)

$PopDensity_i$ = Population density of region i

$NonEnglish_i$ = Proportion of non-English speaking households in region i

\bar{X} = Vector of additional regional characteristics

α, β = Coefficients to be estimated in the model

ε = Random error term

Next, we can use the coefficients estimated in the model along with county-level data from the ACS to estimate the penetration for each county.

$$Ratio = \hat{\alpha}_i + \hat{\beta}_1 Poverty + \hat{\beta}_2 PopDensity + \hat{\beta}_3 NonEnglish + \sum \hat{\beta}_x \bar{X}$$

Where :

Ratio = Estimated ratio of program penetration in county *c*

$\hat{\alpha}, \hat{\beta}$ = Coefficients estimated in the regression model (of PUMAs)

Poverty, PopDensity... = Characteristics of county *c*

The final result of this analysis will be estimates of the population of eligible households and program penetration ratios for each county in Avista's Washington service territory.

Locating Underserved Groups

For this phase of the analysis, we will define "participants" as households who have received any form of energy assistance, such as rate discounts, account credits/balance forgiveness, or emergency/hardship grant funds.

We will compare the number of program participants to our estimates of the eligible households in each region to determine the current program penetration rate. Comparing this metric across regions, account characteristics, level of energy burden, and household demographics may reveal household traits associated with significantly lower rates of participation. The demographic data will likely be limited to a subset of programs (LIRAP and LIHEAP) but has the potential to identify groups of underserved households (i.e., eligible but not receiving benefits) without primary data collection.

We will use ACS tables by county, tract, and Census block group to create GIS heat maps for each of the key characteristics associated with lower rates of participation. Unlike the PUMS, we can request tables with ACS population estimates broken out by individual characteristics (e.g., primary language) at a fine level of geographic granularity. These heat maps will enable program staff to better understand where these underserved populations are located.

Upon completion of the program coverage mapping and identification of underserved populations, our team will conduct a webinar for Avista to present our findings. In particular, we will discuss population groups found to have lower than average participation rates and high-level recommendations for sampling and targeting of the primary data collection activities for future phases of research, which can dive deeper into program awareness, perceptions, and needs with primary data collection such as customer surveys.

Task 4: Reporting

We will submit an initial draft report to Avista by October 18, 2019, allowing at least two weeks to solicit comments and feedback. At this time, we will hold a webinar to debrief

Avista on the findings and recommendations resulting from our research. We will work with Avista to schedule an appropriate time for this meeting.

Both the draft and final reports will follow the same basic outline:

- An Executive Summary presenting a non-technical overview of the findings;
- An Introduction summarizing the research objectives and relevant background information, including a summary data analysis that characterizes low income programs;
- A Methods section presenting the data collection and analysis techniques employed;
- A Results section, presenting the findings in detail; and
- A Conclusions section summarizing the findings and recommendations.

We will deliver a final report by November 22, 2019. All deliverables will be thoroughly edited by our technical editor prior to dissemination to the study team.

We will prepare monthly status reports for the Avista project manager as part of our invoicing process, showing the progress made during the previous month toward the completion of each task. We will identify any issues and proposed resolution, and expected progress for the next period. Additionally, Evergreen will provide periodic status updates and discuss project issues during regular conference calls with the Avista project manager.

Deliverables: Draft and final reports, webinar presentations to the Advisory Group, and monthly progress reports.

1.3 Timeline

Table 3 provides a general timeline of the project activities and provides a mapping of how each task from our *Scope of Work* covers the various deliverables.

Table 3: Project Timeline and Schedule of Deliverables

Task	Deliverable/Activity	Due Date
Task 1: Project Initiation	Kickoff Meeting	July 8, 2019
	Slide Deck and Meeting Notes	July 9, 2019
Task 2: Research Plan	Data Request Memo	June 25, 2019
	Draft Research Plan	July 12, 2019
	Final Research Plan	July 15, 2019
	Advisory Group Presentation	July 16, 2019
Task 3: Data Analysis	Data Received from Avista	July 18, 2019
Task 4: Reporting	Initial Draft Report	October 18, 2019
	Advisory Group presentation	TBD
	Final Report	November 22, 2019
	Progress reports	Monthly