Information or Obfuscation:
What do Census Tract Demographics Tell us About Program Participants?

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ABSTRACT

Income and racial disparities in energy burden are gaining increased attention. As demographic characteristics typically are not assessed as part of program participation, most program administrators have relied on survey data to assess whether their programs are serving their customer population equitably. However, typical customer surveys may not provide sufficiently reliable information on customer demographics to generate a sensitive assessment of program equity.

Some studies have used Census data to assess the demographic characteristics of program participants. In 2018, Energy Trust of Oregon conducted the Diversity, Equity, and Inclusion (DEI) Baseline study to assess how well it was serving demographically diverse customers. This study examined the demographics of US Census tracts where program participants lived as a proxy for assessing the demographics of the participants themselves. The study found program penetration was higher in higher-income Census tracts and in moderately-high-racial diversity tracts.

But the tract-level demographics of program participants may not represent the demographics of those participating households if participation is differentially associated with demographics in some tracts compared to in others.

We investigated this issue with data from Energy Trust's 2020 Customer Insights Study, which surveyed more than 7,000 program participants and nonparticipants in Energy Trust's Oregon service territory. Results showed a closer correspondence between household-level and tract-level participation rates for income than for race but that participation is differentially related to income in low- and high-income tracts and to race in low- and high-racial-diversity tracts.

Census data on income may provide an acceptable proxy for participation differences between higher- and lower-income households but not for participation differences between people of color and white households.

Introduction

Income and racial disparities in energy burden are gaining increased attention (e.g., Drehobl, Ross, and Ayala 2020) and some evidence exists that the disparities are much larger than previously thought (Tong, Ramaswami, Xu, Feiock, Schmitz, and Ohlsen 2021). Many energy efficiency program administrators recognize that affluent white homeowners have benefitted the most from their programs and that changes are needed to serve their entire residential constituency. Most offer programs serving low-income customers, and some have examined how well their programs serve customers across other indices, such as race/ethnicity. As such characteristics typically are not assessed as part of program participation, most program administrators have relied on survey data to tell them what their participant population looks like. Program administrators might then compare the characteristics of survey respondents to general population characteristics reported by the U.S. Census to gauge how representative program participation is of the general population. However, participant surveys may not provide sufficiently reliable information on the demographics of respondents to generate a sensitive assessment of program equity.

Some program administrators have used Census data to attempt to assess the demographic characteristics of program participants (DNV-GL 2020; Energy Trust of Oregon 2018; Wirtshafter, Radke, Bodner, Kreitler, and Samiullah 2001). Such approaches use the demographics of the Census units (e.g., tracts or block groups) of participant addresses as proxies for the household demographics of those addresses.

Wirtshafter et al (2001) used such an approach to assess the distribution of vouchers for contractor services in the California utilities' Residential Contractor Program. In that analysis, they identified the Census tract associated with each participant and found higher voucher amounts in tracts that were more white, non-Hispanic, rural/suburban, and higher income.

Energy Trust of Oregon (2018) similarly analyzed the relationship between program participation and demographics (race, income, and rural/urban geography). Similar to Wirtshafter et al (2001), the analysis examined how the participation rates of Census tracts related to the aggregate demographic characteristics of those tracts. This study, called the Diversity, Equity, and Inclusion (DEI) Baseline Analysis, found that high-income Census tracts showed a higher participation rate than low-income Census tracts. Racial demographics showed a more complex relationship, with Census tracts that were moderately to highly racially diverse (i.e., had a higher prevalence of people of color) showing a *higher* participation rate than those that were the least diverse.

More recently, DNV-GL (2020) conducted a similar analysis but using a finer-grained approach by associating participation rates with Census block groups, which represent subsets of tracts. The purpose of this analysis was to assess participation among renters, moderate income and non-English speaking households, and small business customers. This study found participation rates to be negatively associated with a higher concentration of moderate income, renter, and limited English proficiency households.

The concern with the above type of approach is that, for it to accurately represent the relationship between demographic characteristics and participation, the relationship between participation within various Census *divisions* and the demographic characteristics of those divisions must accurately represent the relationship between participation and the demographics of the *households* in those divisions. In other words, if a certain difference in median household income (say) among Census divisions equates to a given difference in participation rate among those divisions, then that difference in income among households must equate to the same difference in participation rates among households. This may not be the case if the relationship between participation and household demographics is different in different Census divisions. For example, consider a scenario where participation is strongly skewed toward higher income customers in Census divisions with generally lower incomes, but only moderately skewed – or not skewed at all – in divisions with generally higher income. In such a case, the difference in participation between low- and high-income Census divisions would not accurately represent the difference between low- and high-income households.

Recently, Energy Trust of Oregon examined the above issue as part of a general population study of customers of Energy Trust's sponsor utilities (ADM Associates 2021). Energy Trust has conducted a general population study, called the Customer Insights Study, for the past several years to inform marketing efforts and learn more about the demographics of both participants and nonparticipants in its residential energy programs. The study assesses household demographics, awareness of Energy Trust and its services, home improvements, and energy-related attitudes and behaviors. Historically, the study assessed how program participation related to demographics, awareness of Energy Trust and its offerings, barriers, and motivations to taking energy-saving actions (e.g., Dethman, Folks, and Wirtshafter, 2018). Understanding such differences helped Energy Trust develop program, marketing, and outreach strategies for groups with lower awareness or knowledge, or higher barriers to participation.

For 2020, Energy Trust expanded the scope of the study, considerably increasing the sample size and introducing completion quotas for certain communities of color. This had two goals. First Energy Trust wished to better assess program equity, identify populations that have been underserved, and help steer program services to those populations. Second, Energy Trust wished to test the validity of using Census tract-level demographic data as a proxy for customer demographics in assessing whether its programs were reaching and serving various demographic groups equitably. This second goal is the topic of this paper.

The research question that this paper addresses is whether the difference in participation rates between high- and low-income Census tracts, or between high- and low-racial-diversity Census tracts, reflects the difference in participation rates between high- and low-income households or between households of color and white households. This may not be the case if the relationship between participation and demographics differs depending on the characteristics of the Census tracts.

In 2020, under a contract with Energy Trust, ADM Associates carried out the new Customer Insights Study, fielding a multimodal survey in English and Spanish. The survey sampled residential households in Oregon confirmed to be customers of the utilities served by Energy Trust.

Methodology

Survey Instrument

Energy Trust and a separate vendor, ILLUME Consulting, developed the draft survey instrument. The survey instrument covered customer awareness of energy services available in Oregon; awareness of Energy Trust; participation in Energy Trust programs; barriers to participation; energy-related attitudes; purchase of energy efficient lighting; and property maintenance practices. The survey also collected information on the building characteristics and ownership of each survey respondent's homes and respondent demographics.

Sampling

The population for this study is all residential utility premises in Oregon with electricity or natural gas service from Energy Trust's funding utilities, including both single-family and multifamily dwellings. Eligible respondents are all customers with confirmed utility service involved in paying bills or managing home energy use. Although we targeted occupants, all homeowners, tenants, landlords, and home-based businesses were eligible.

The overall sampling approach consisted of a core stratified random sample, where the strata were based on program participation status and Census tracts, with oversampling of tracts having high concentrations of people of color. The oversample ensured sufficient sample sizes to validate the findings of the 2018 DEI Baseline Analysis and conduct participation rate analyses. We created the sampling strata using a combination of two indices that Energy Trust developed for the 2018 DEI Baseline Analysis. Energy Trust constructed both indices – the Racial Diversity Index and the Income Diversity Index – using variables from the Census Bureau's American Community Survey. The Racial Diversity Index ranges from 1 (lowest percentage of people of color) to 5 (highest percentage of people of color). The Income Diversity Index also ranges from 1 (most affluent) to 5 (least affluent).[1] The combination of the two indices yielded 25 strata.

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[1] The income index is a composite of two indices created with data from the American Community Survey. One index was based on adjusted median income, and the other was based on average housing burden, calculated as total housing cost / (adjusted median income / 12) x 100. For each index, all Census tracts in Energy Trust service territory

Energy Trust established quotas for the core sample and the communities of color oversample, for a total of 1,125 participants and 1,880 nonparticipants.[2] Energy Trust also established completion targets for the three oversampled racial groups – Black/African American, Asian American, and Native American – as well as for Hispanic/Latino households and for the Census tracts representing the highest and lowest racial and income diversity. Although Energy Trust established survey completion targets for Hispanic/Latino households, it did not specifically oversample that group, as it expected a sufficient number of respondents from the core sample to achieve the completion targets.

ADM selected a stratified random sample of households for recruitment. The total sample size was based on previous response rates obtained with program participants and nonparticipants.

Survey Recruitment

We carried out survey recruitment via letter, postcard, email, phone, and mailed paper survey. Initial recruitment was by letter-push-to-web, with an inbound phone option and postcard follow-up. This was followed by a postcard and then either two rounds of email (if an email address was available), outbound calling (if a phone number was available), or additional postcards (if no email address or phone number was available). After all these efforts, we still had not achieved our completion goals for people of color despite having achieved more than double the completion goal for white respondents. Therefore, we sent a paper survey with postage-paid return envelope to customers in Census tracts with high prevalence of people of color. All recruitment efforts offered a $15 incentive for completing the survey.

Survey Response

The combined efforts achieved all quotas with a total of 7,257 responses, for an overall response rate of 19%.

Data Preparation

We weighted the results for all comparisons, to account for the stratified sample design and offset potential biases introduced through survey implementation procedures and respondent self-selection. The primary sample design weight was based on Census tract groups, which formed the basis for the stratified sampling approach. We also weighted on program participation status and on a combination of race and income, as higher response rates for participants, high-income respondents, or respondents from one or more race groups could bias results. We weighted on a combination of race and income rather than on the two separately, because the two factors are correlated. We created the race-income weights by binning both the population of households within Energy Trust's Oregon service area (based on the latest American Community Survey data) and the survey sample into six categories based on the cross-tabulation of race (white or person of color) and income level (low, moderate, and high).

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were grouped into quintiles, with the first (highest) quintile assigned a score of one, the second quintile assigned a score of two, and so on. For each tract, the final index income was the average of the adjusted median income and housing burden indices (Energy Trust of Oregon 2018).

[2] Program participation was assessed at the site level and included measures installed in homes and multifamily buildings during a seven-year period from 2013 through 2019. Participation was assessed at the site level, as it is the site that is treated, not the individual or household. Note that we also did ask respondents about their participation in Energy Trust programs, regardless of how the site was categorized. This has no bearing on the current analysis, however.

The DEI Baseline validation analyses required grouping survey respondents by income level (low-, moderate-, and high-income) and race (white or person of color). To create income categories, we used reported household annual income and household size together to define the above categories. We adapted the classification scheme that Energy Trust used to identify moderate income households in 2019, which were based on Federal poverty definitions. Thus, for example, a larger household must have a higher annual income than a smaller one to be classified as high-income. We classified all respondents as white or a person of color; if someone identified themselves as both white and another race or Hispanic, we classified them as a person of color (see *Methodological Note* at the end of the paper). Respondents could select multiple racial/ethnic identifiers. We classified respondents as white if they selected white and nothing else. We classified respondents as a person of color if they selected any identifier other than white.

Statistical Testing

Analyses included two-by-two comparisons of program participation rates (percentages) between two groups of customers in two groups of Census tracts (e.g., between high- and low-income customers in high- and low-income Census tracts). We tested the statistical significance of the interactions using the Q' test, developed by Michael (2007). The Q' statistic tests the interaction of two variables on a proportion, where one variable has two levels and one has two or more levels. Q' is distributed as chi-square, with *k*-2 degrees of freedom, where *k* represents the number of categories in the second variable.

Results

To reiterate, the research question for this study is whether the difference in participation rates between high- and low-income Census tracts, or between high- and low-racial-diversity Census tracts, reflects the difference in participation rates between high- and low-income households or between households of color and white households. The following section addresses this question by examining what the survey data say about the participation rates for high- and low-income Census tracts and high- and low-income households. Subsequent sections provide additional analyses to elaborate on these findings.

Comparison of Tract-Level and Household-Level Participation Rates in Survey Data

Figure 1 shows that the tract-level and household-level participation rates correspond closely. The high- and low-income participation rates are similar at the tract and household levels, as are both the absolute and relative differences between the high- and low-income groups. The participation rate for low-income tracts is 72% that of high-income ones. Similarly, the participation rate for low-income households is 70% that of high-income ones. Thus, the difference between low- and high-income tracts provides a good sense of the actual participation difference between low- and high-income households.
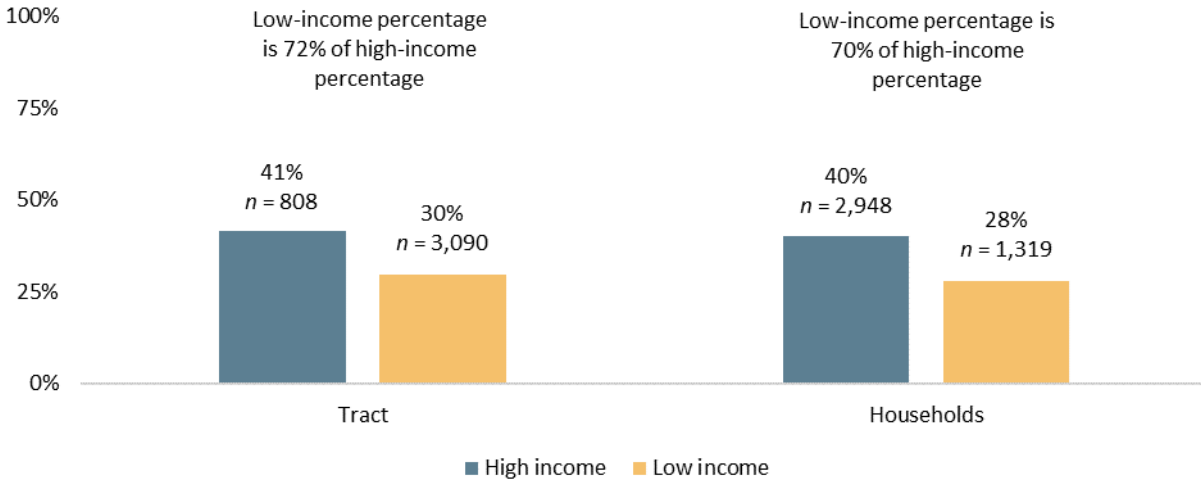
Figure 1. Participation rates for high-income and low-income Census tracts compared to participation rates for high-income and low-income households.

Figure 2 shows that, when it comes to racial identify, the tract-level and household-level participation rates do not track as closely as they do for income. Comparing the relative differences between high- and low-racial-diversity tracts and between households of color and white households illustrates the differences. In this case, the participation rate for high-racial-diversity tracts is 70% of that of high-racial-diversity ones. However, the participation rate for households of color is much closer to that of white households. Thus, the difference between high- and low-racial-diversity tracts *does not* provide as good a sense of the actual participation difference between households of color and white households as does the comparable comparison of the actual difference between low- and high-income households.
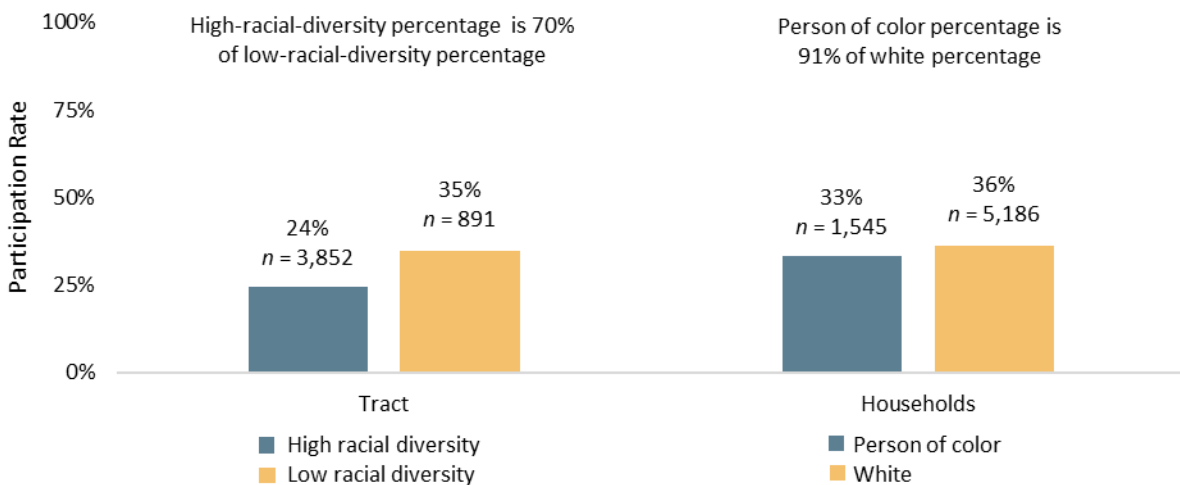

Figure 2. Participation rates for high- and low-racial-diversity Census tracts compared to participation rates for households of color and white households.

Why would the assumptions behind the DEI Baseline Analysis generally be supported with regard to income but not for race? We present additional analyses below that help shed light on this

question. Specifically, we used data from the survey to examine whether participants and non-participants show the same degree of difference in high- and low-income tracts and in high- and low-racial diversity tracts. Presumably, if the relative difference between participants and nonparticipants is similar in high- and low-income or high- and low-racial-diversity Census tracts, then the Census tract-level participation differences might function as an acceptable proxy for household-level differences. That is, the difference in participation level between high- and low-income Census tracts might serve as a proxy for the difference between high- and low-income households, and likewise regarding racial/ethnic diversity.

However, if the relative difference between participants and nonparticipants is not similar in high- and low-income or high- and low-racial-diversity Census tracts, then Census tract-level differences cannot be an accurate proxy for household-level differences.

Relative Difference between Participants and Nonparticipants in Income Level

We used data from the survey to examine the relative difference between participants and nonparticipants in high- and low-income Census tracts. We specifically examined the percentage of self-reported low-income households within those tract types. For this analysis, a high-income Census tract was a tract with a value of 1 on Energy Trust's income index. A low-income Census tract was a tract with a value of 5 on the income index (see *Methodology* section).

The question was whether the *relative difference* in the percentage of low-income households between participants and nonparticipants is more-or-less the same in low- and high-income areas. As seen in Figure 3, the survey results suggest that the relative difference between participants and nonparticipants is not precisely the same in low- and high-income areas. While nonparticipants were more frequently low-income than were participants across all areas, this difference was slightly *greater* in low-income than in high-income Census tracts (Q' [1 df] = 4.33, *p* < .05). In other words, the relative difference in participation between lower- and higher-income residents is greater in low-income areas than in high-income areas.
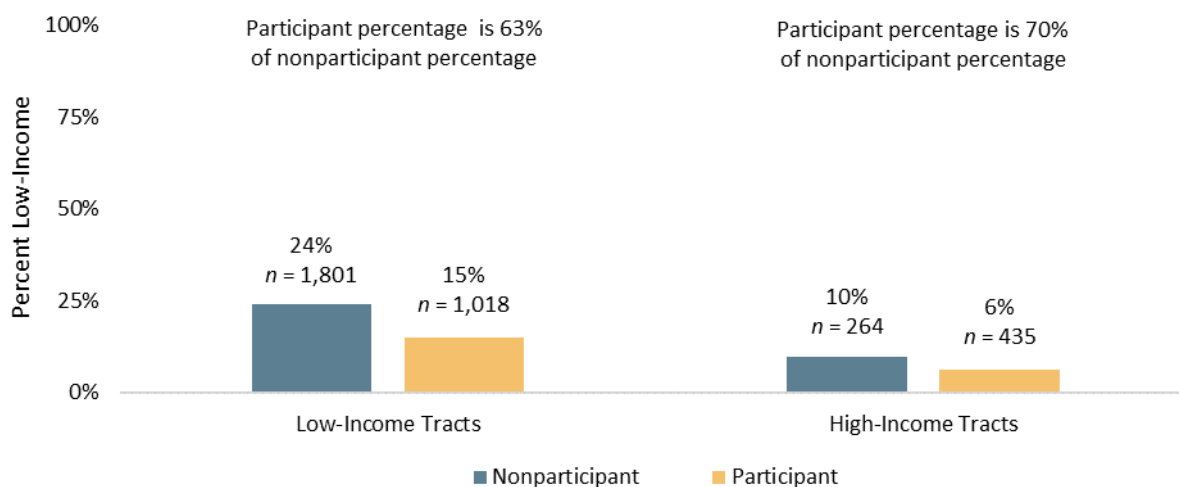

Figure 3. Percentages of low-income participants and nonparticipants, in low- and high-income tracts.

However, while the difference between low- and high-income tracts was statistically significant, it was not large. In low-income tracts, nonparticipants were 59% more likely to be low-income than were participants; in high-income tracts, nonparticipants were 55% more likely to be low-income than were participants. This similarity in the relative differences between participants and nonparticipants

across low- and high-income tracts reflects the above finding that tract-level differences are a fair approximation of the household-level differences.

Relative Difference between Participants and Nonparticipants in Race/Ethnicity

We also used data from the survey to examine the relative difference between participants and nonparticipants in high- and low-racial-racial-diversity Census tracts. In this case, we examined the percentage of self-reported people of color within those tract types. A high-racial-diversity Census tract has a value of 5 on Energy Trust's racial diversity index, and a low-racial-diversity Census tract has a value of 1 on the index (see *Methodology* section).

The question was whether the *relative difference* in the percentage of households of color between participants and nonparticipants is more-or-less the same in low- and high-racial diversity areas. Figure 4 shows that the relative difference between participants and nonparticipants does not appear similar in low- and high-racial-diversity areas. Households of color made up almost exactly the same percentage of nonparticipants and participants in high-racial-diversity tracts. By contrast, households of color made up a relatively larger percentage of nonparticipants than participants in low-racial-diversity tracts (Q' [1 df] = 6.17, $p < .05$). Participation in low-racial-diversity areas appears to be skewed toward the white residents of those areas but that is not the case in high-racial-diversity areas.
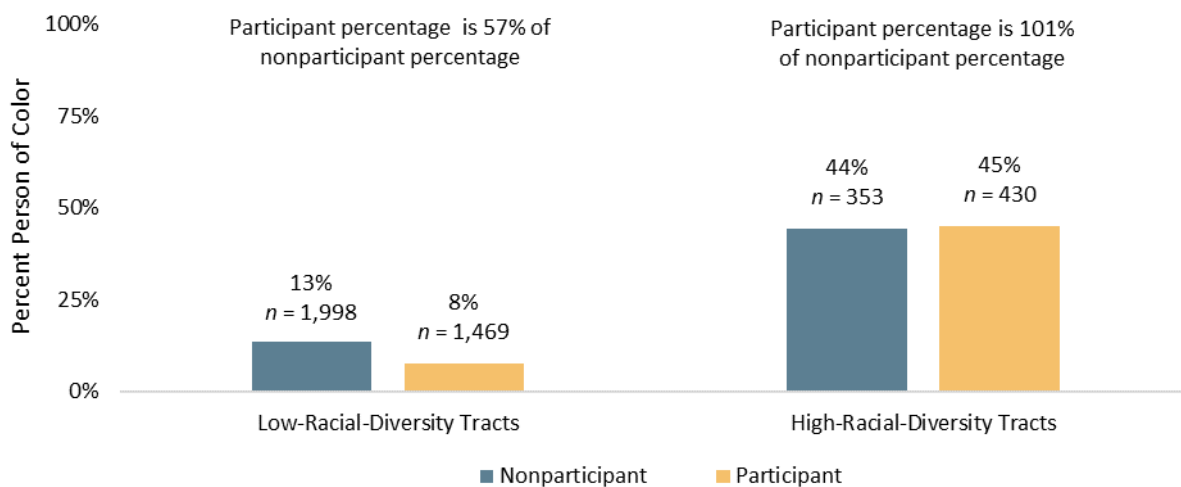

Figure 4. Percentages of people of color among participants and nonparticipants, in low- and high-racial-diversity tracts.

Discussion and Conclusions

The above results indicate that neither the difference in participation between high- and low-income areas nor the difference in participation between areas with high and low concentrations of people of color is a perfect proxy for the difference in participation between high- and low-income customers or between people of color and white customers. However, the difference between high- and low- income areas produces a much closer approximation of the household-level differences than does the difference between high- and low-racial-diversity areas.

Do these results argue against using Census tract data as a proxy in assessing the equity of program services to high- versus low-income households? To some degree, that depends on what decisions the analysis informs and what the consequences are of making a decision based on an over- or

under-estimate of the differences in question. Relying on the Census data would lead us to believe that high-income customers out-participate low-income ones by more than one-third, which would point to the need to increase efforts to engage low-income people and provide them with ways to participate. In this case, the results based on the survey data do not tell us anything fundamentally different. They would tell us that the difference is slightly larger than we thought, but both sources would point to the need to increase efforts with low-income customers.

By contrast, the results clearly argue against using Census tract demographics as a proxy for race in assessing the equity of program services. The survey results do point to a difference in participation, indicating a need to continue efforts to increase participation among customers of color. However, relying on the Census data would lead to the conclusion that white customer participation exceeds that of people of color by a much larger margin than it does.

Another argument against relying on the Census racial diversity data as a proxy for participation by people of color is that the Census data do not well account for the heterogeneity of people of color. Unlike income level, where "low" and "high" have generally consistent meanings across tracts and households, there are many non-white racial groups included in the definition of people of color, so this label can mean many different things in different tracts and households. Thus, even if using the Census racial diversity data could provide an accurate picture of participation differences between white customers and people of color, it does not tell us anything about participation differences among specific race/ethnicity groups. We know from this study that program participation rates among Asian Americans were significantly higher than white households, while those among Black/African American and Hispanic/Latino households were significantly lower.

Methodological Note

As noted above, we classified survey respondents as persons of color if they self-identified both as white and as either another race or Hispanic. Deciding how to classify them presented something of a conundrum. Persons with multiracial backgrounds differ, for various reasons, in their racial self-identity and even in the extent to which they identify as multiracial (Norman & Chen 2018; Wilton, Sanchez and Garcia 2013). Further, we found that the white-and-other respondents were demographically about as similar to "white only" respondents as they were to other respondents who we classified as people of color. As Figure 5 shows, the distribution of the white-and-other group across Census tracts of varying racial diversity levels was about equidistant from the distributions of the other two groups – compared to other persons of color, a higher percentage lived in low-racial-diversity tracts and a lower percentage lived in high-racial diversity tracts, while the opposite was true in comparison to white-only respondents. A similar pattern held for their distribution across Census tracts of varying income levels and with respect to their income level classification based on self-reported household income and household size. Thus, there may be no particularly compelling reason to group the white-and-other respondents with people of color as opposed to grouping them with white respondents.
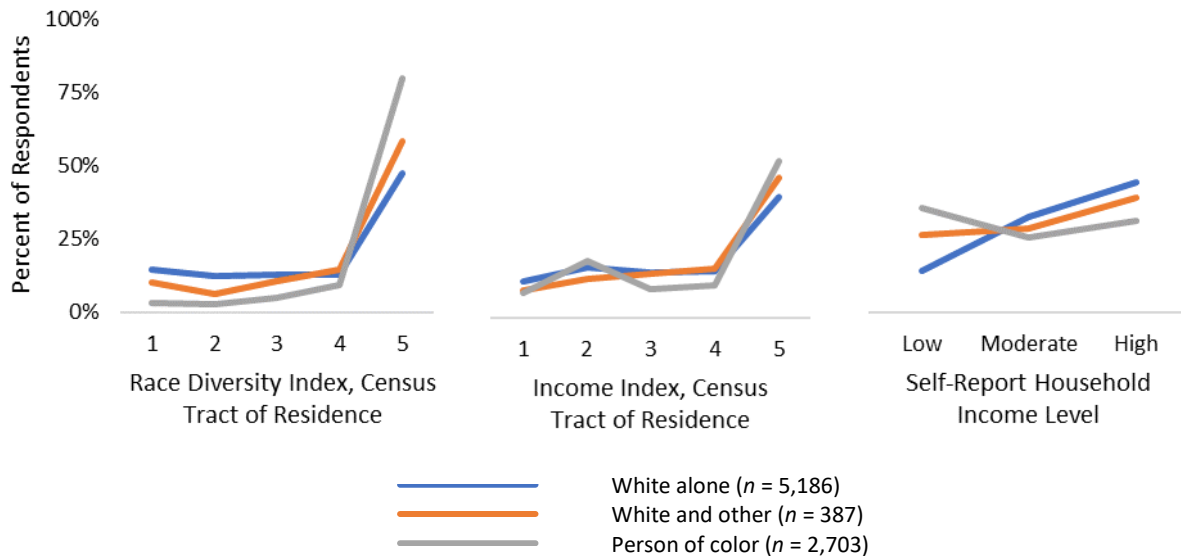
Figure 5. Comparison of White-and-Other respondents with White-Alone and Person of Color respondents in distribution of residence by racial diversity and income index and in household income level. The first panel shows the percentage of respondents living in Census tracts of varying racial diversity levels. The second panel shows the percentage living in Census tracts of varying income levels. The third panel shows the percentage with classified as low-, moderate-, and high-income based on self-reported income and family size.

We considered three alternatives for treating this group of respondents: eliminating them from the analysis; grouping them with the white-alone respondents; or randomly assigning each one to either the white-alone or person of color group. None of those seemed to have a more compelling rationale than the other. Although those respondents made up only about 3% of all survey respondents, each of the above treatments produced a slight change to the results. However, none of the alternative treatments produced such a large change in the results as to have produced different conclusions.

Acknowledgements

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