**S.T. Yau High School Science Award**

**Research Report**

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**Title of Research Report**

Presence Is Not Access: Walking Accessibility to Basic Needs Services on Long Island

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**Aaron Shi**

**Abstract**

Households experiencing housing instability may still face difficulties accessing basic needs services even when those services are present within their region. This study examines the geographic accessibility of those services and whether they are located near areas of higher need on Long Island. By combining poverty, rent burden, and renter share, this study classifies 167 out of 665 census tracts in Nassau and Suffolk counties as high need. Accessibility is measured using the straight-line distance from a representative point within each tract to 137 food assistance, shelter, or intake and outreach locations; the point is classified as covered if located within 1.2 kilometers of a resource, using a simple approximation of a 15-minute walk. The results show that 40.1 percent of high-need tracts are covered compared with 18.5 percent of other tracts. However, 100 high-need tracts remain outside the 1.2-kilometer threshold and contain 47,311 renter households. This number describes the total number of renter households instead of the number of households unable to access services. Coverage increases along with population density, and high-need tracts maintain greater coverage in the three broad density groups. The difference in coverage decreases when removing renter share from the need score, showing how the results are directly influenced by the definition of socioeconomic need. This study serves as a local comparison of socioeconomic need, proximity to basic needs services, and household scale that can direct the focus of limited resources for service review. The results identify areas that may require further investigation rather than proving that services are sufficient or that residents cannot reach them.

**Keywords**: basic needs assistance; housing insecurity; spatial accessibility; census tracts; Long Island

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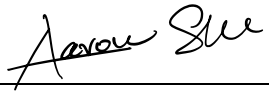
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2. actually perform the research work ourselves and thus truly understand the content of the work.
3. observe the common standard of academic integrity adopted by most journals and degree theses.
4. have declared all the assistance and contribution we have received from any personnel, agency, institution, etc. for the research work.
5. undertake to avoid getting in touch with assessment panel members in a way that may lead to direct or indirect conflict of interest.
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**We understand and agree that failure to honour the above commitments may lead to disqualification from the competition and/or removal of reward, if applicable; that any unethical deeds, if found, will be disclosed to the school principal of team member(s) and relevant parties if deemed necessary; and that the decision of YHSA is final and no appeal will be accepted.**

*(Signatures of full team below)*

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**Presence Is Not Access: Walking Accessibility to Basic Needs Services on Long Island**

Services such as food assistance, shelter intake, and outreach are able to provide direct and immediate support for households experiencing instability, whether financial or housing. Viewing this from an economic perspective, the usefulness of these services depends on both service provision and the costs of reaching that provision. Accessing these services requires travel time and physical effort, even if the resource itself is free. Distance can represent an important component of the nonmonetary costs, such as walking for households that don't have access to a vehicle. This suggests that establishing services and making them geographically accessible are two separate objectives. This study reviews this distinction using a tract-level walking distance screen, while analyzing whether recorded basic needs services are located within walking distances of regions with relatively higher need.

This study focuses on the two counties on Long Island: Nassau and Suffolk. Long Island counties vary heavily in settlement patterns, housing conditions, and concentrations of renter households. This means that treating both counties as one service market may disregard important local gaps in access, while identifying areas alone without services in close proximity may exaggerate the importance of gaps in places with relatively sparsely populated areas. Evaluating the distribution of services requires consideration of both the relative levels of need and the size of the residential population being described.

This study uses housing and economic conditions of poverty, rent burden, and renter share to identify areas of high need. The identified areas could warrant closer attention as a result. Poverty describes limited financial resources. Rent burden reflects the pressure that housing costs place upon renter households. Renter share indicates the housing tenure structure of a specific area. The three indicators provide a consistent way to compare need across a tract, but they do not identify individual households seeking assistance or estimate the homeless population in a given area. The purpose of this study is to identify areas with relatively higher pressure in terms of economics and housing inside the study region using available and organized data from reliable sources.

The central research question is whether the representative points of higher need tracts are within the approximate 15-minute walk screen of a listed resource location. The study identifies higher need tracts and compares their coverage with the coverage of other tracts. In addition, reports renter household counts living inside the high-need areas. This additional information provides additional context by distinguishing the number of geographic units from the scale of the residential communities represented by those units. This distinction is important because the

number of census tracts alone does not indicate how many households are represented by those areas.

This contribution of this study is an empirical overview of resource distribution on a local scale, combining tract-level socioeconomic conditions, a centralized resource inventory, and household scale. It differentiates resources that are relatively closer to higher-need areas and those areas having widespread coverage. Comparisons of population density and an alternative need score are used to analyze how the results depend heavily on local settlement patterns and the definition of need. The originality of this study comes from applying these methods specifically to Long Island and from the findings revealed by this analysis, instead of creating a new distance algorithm. In terms of economics, this study addresses a practical resource allocation question of where limited resources should be directed for further investigation before considering service and resource expansions.

## Literature Review

### Spatial Mismatch and the Location of Assistance

Spatial mismatch research explores the separation between where people live and where opportunities are located. Kain's original study analyzed how housing segregation and metropolitan employment patterns affected the job opportunities available to Black residents (Kain, 1968). Subsequent research expanded this idea by studying how residential constraints, transportation, and employment location can interact to influence access to work (Kain, 1992; Ihlanfeldt & Sjoquist, 1998). The main conclusion from this literature is that the presence of opportunities within a metropolitan region does not ensure that they are accessible from all residential locations.

The present study applies that geographic insight to basic needs assistance while also understanding that social services are not equivalent to employment opportunities. Jobs and assistance services can be different in their requirements, organizational structures, and use patterns. A household may use a food pantry periodically, contact a shelter intake office during a crisis, or receive assistance through outreach. These differences mean that a service directory cannot be interpreted as a simple inventory of interchangeable opportunities. Nevertheless, the relationship between residential location and resource location continues to be important when evaluating whether nearby assistance is available.

Service locations may reflect available premises, partnerships, administrative responsibilities, or historical patterns of development. Referrals, deliveries, and mobile activities may also be represented poorly by a single fixed address. As a result, a map can identify geographic separation

between households and services without establishing institutional neglect or explaining the causes of the observed pattern.

Equity therefore cannot be reduced to providing every census tract with the same number of facilities. Census tracts differ in population, household composition, and geography, so equal provisions by tract could allocate similar resources to areas with substantially different numbers of potential users. At the same time, a smaller population does not imply an absence of need. The relevant question is whether the type and location of support correspond to local circumstances. This study addresses the first part of that assessment by locating potential geographic gaps and describing the socioeconomic context in which they occur.

**Measuring Spatial Accessibility**

Spatial accessibility can be measured in several ways, including the distance to the nearest facility, the number of facilities within a defined distance range, and models that compare the supply of present resources with the surrounding demand for these resources. Each approach measures a different aspect of accessibility. Guagliardo differentiates spatial accessibility from other dimensions of obtaining services and analyzes the strengths and limitations of conventionally used measures. Being close to a service location alone does not guarantee that a service is accessible, as additional factors such as cost, eligibility, opening hours, and limited capacity may act as a barrier to prevent its use. The appropriate accessibility measure depends on available information and the specific question being examined.

The two-step floating catchment method measures accessibility by relating a facility's available supply to the population within its catchment area and combining these ratios for surrounding residential locations (Luo & Wang, 2003). The enhanced version of this method involves distance decay, accounting for the idea that closer opportunities may be more accessible than those located near the edge of a catchment area (Luo & Qi, 2009). These methods are especially useful when analyzing the relationship between available resources and potential users, as they can reveal differences that a simple binary coverage measure would most likely overlook.

The usefulness of these methods also depends on how their supply and demand inputs are defined. Treating each resource location as one unit of supply does not account for the differences between facilities. For example, a large food distribution organization and a small local pantry have significant differences in terms of capacity. Renter household counts also do not represent the number of households seeking assistance at a particular time. A more developed accessibility model does not remove these underlying measurement limitations. Delamater (2013) further demonstrates that the spatial distribution of both supply and demand can significantly affect floating catchment

estimates. The choice of an accessibility model therefore must be accompanied by careful interpretation of what its inputs actually represent.

For the research question examined in this study, a direct distance rule is a sufficient measure of geographic proximity. The outcome measures whether at least one listed resource is located within a specific distance of a representative tract point. The calculation does not treat the number of facilities as a measure of service capacity or assign potential demand to service locations. Although this narrower approach does not capture competition for services or service intensity, it also avoids implying that these factors have been measured. The resulting classification can be traced to three elements: an origin, a resource coordinate, and a defined distance threshold.

Distance-based measures still require careful interpretation. Neutens (2015) emphasizes the importance of individual circumstances, time, and equity when evaluating accessibility. Single representative tract points cannot account for the disparity of where residents live within a tract, their daily activities, or mobility status. Straight-line distance also does not account for actual walking routes or route conditions. These limitations do not make a distance-based approach ineffective, but rather define how the results should be interpreted. In this study, the simulated walking distance coverage is used to identify geographic conditions for further investigation. It does not establish that an individual can complete the trip, obtain assistance after arrival, or access the service when it is needed.

**Housing Insecurity and Area Level Need**

Housing insecurity includes a range of conditions that cannot be fully represented by a single census measure. Community-level research has connected homelessness with housing market conditions and socioeconomic characteristics while also demonstrating that these relationships can vary depending on the geographic scale at which they are examined (Quigley et al., 2001; Byrne et al., 2013). Research on families in New York City likewise shows the relevance of housing conditions and preserving economic disadvantage in relation to shelter entry and later housing stability (Shinn et al., 1998). These studies support attention to economic and housing context without treating census indicators as direct counts of people experiencing homelessness.

Indicators such as poverty, rent burden, and renter share describe the different dimensions of this economic and housing context. Poverty describes the prevalence of low income relative to the official poverty threshold. Rent burden represents the share of households within the selected rental housing universe whose housing costs reach a specific proportion of income. Renter share describes housing tenure instead of financial hardship itself. These three measures combined reflect the idea that areas can experience housing pressure through multiple dimensions. Despite this conclusion,

the use of these indicators does not suggest that renting is inherently insecure or that every resident of a high-scoring area requires assistance.

The relative needs of a certain area must also be separated from the number of households represented. For example, a census tract with a high poverty rate may contain a relatively small population, while a more populated tract with a moderate percentage may contain a greater number of households experiencing hardship. Relying only on rates can overlook the scale of the population involved, while relying only on households can disregard the concentration of socioeconomic disadvantage. This study keeps these measures separate. Socioeconomic rates are used to determine the need group, while renter household counts describe the size of each coverage category. Preserving this separation avoids turning a readily available population measure into an unsupported estimate of actual demand for services.

## Data

### Study Area and Geographic Units

The study area includes Nassau and Suffolk counties, excluding Brooklyn and Queens. The 2022 TIGER/Line boundary file contains 671 census tracts in the two counties. Six have zero land area, including five in Nassau County and one in Suffolk County. After removing these six tracts, the final study area contains 665 study tracts: 281 in Nassau and 384 in Suffolk (U.S. Census Bureau, 2022a). No additional tracts are excluded because of small populations, low renter household counts, or low need scores. This approach ensures sparsely populated areas remain part of the analysis while allowing their population scale to be considered during interpretation.

Census tracts are statistical geographic units and do not correspond with municipal boundaries or exact representations of locally understood communities. Population density is calculated as the ACS population estimate divided by TIGER/Line land area in square kilometers, with water area excluded from the calculation. Density is used to represent the general settlement pattern of each tract rather than assuming that residents are distributed evenly across the land area. Census tract counts, population totals, and renter household counts are maintained as separate measures throughout the study as a result.

### Socioeconomic Indicators and Assistance Records

Socioeconomic data comes from the 2018–2022 American Community Survey five-year estimates (U.S. Census Bureau, 2022b). Poverty is calculated as the population below the poverty threshold divided by the population for whom poverty status is determined in Table B17001. Rent burden is calculated using the sum of B25070 categories 007 through 010, representing gross rent of

at least 30 percent of income, divided by the total number of cash rent households in B25070. Renter share is calculated as renter-occupied housing divided by all occupied housing in B25003, and renter household counts come from the same tenure table. These variables represent economic conditions and housing tenure instead of observed requests for assistance.

The rent burden denominator includes the B25070 category where the rent-to-income ratio is not computed. This definition follows the saved project data and is different from a rate restricted to calculable ratios. The preparation code also includes a ratio of zero when the denominator is zero, meaning that a zero value may instead reflect an undefined rate rather than an observed absence of hardship. The revision reviews the code and saved indicators but does not reconstruct a separate valid ratio burden measure because the necessary raw category counts were not kept in the analyzed file, which remains an unresolved measurement limitation; one that is not addressed by the sensitivity checks.

The updated facility inventory contains 182 records, including 96 in Nassau and 96 in Suffolk County. Nassau labels include 87 Island Harvest records, four OpenStreetMap records, three Long Island Cares records, and two youth-service records reflected as RHY. Suffolk records contain organization or directory links, as well as revised service classifications, coordinates, and verification status. However, these labels come from the supplied inventory and should not be interpreted as independent verification conducted as part of this study. The inventory is evaluated as a fixed research dataset instead of a record of service availability throughout the ACS timeframe since the collection dates are not recorded consistently.

The primary analysis maintains the original scope of food assistance, shelter or intake, and outreach services. Of 182 records, 160 have a positive access-resource flag. Twenty of these records are classified as health, behavioral health, housing support, or legal services and are therefore outside of the scope of the primary analysis. Three flagged records are excluded as fixed destinations: a discontinued Amagansett food pantry, Lighthouse Mission's approximate mobile location, and a confidential Family and Children's Association shelter placeholder. The dataset contains 137 records, including 119 food assistance locations, eight shelter or intake locations, and outreach locations, after the exclusions mentioned. Of these, 84 are in Nassau, and 53 are in Suffolk. Manhasset Food Pantry remains included due to its replacement record identifying a successor operator and a physical address. Its status is evaluated in a stricter sensitivity check separately. The 22 records without a positive access-resource flag remain excluded, and all original records are preserved in the source inventory.

Factors such as location quality also vary across the 137 retained records. 61 are labeled as verified physical locations, 69 kept the existing Nassau geocoded-layer note, and seven are classified as approximate locations. It is important to note that these descriptions do not represent field verification, and some intake or outreach locations may also require additional appointments or referrals. A more precise sensitivity check excludes the seven approximate locations and the replacement status record, which reduced the inventory to 129 locations. A separate scope check includes all 157 flagged records that pass the fixed location screen, adding the 20 health, behavioral health, housing support, and legal service records. This expanded inventory is able to answer a generalized service-proximity question and is analyzed separately instead of replacing the primary basic needs inventory as a result.

**Population and Facility Distributions**

Table 1 reflects the regional data before the coverage comparison. The retained tracts contain approximately 2,913,646 residents and 175,667 renter households. Median tract population density is about 2,807 residents per square kilometer in Nassau and 1,141 in Suffolk County. These median values reflect individual census tracts equally rather than each county's population divided by county land area. Reporting these values with population totals helps separate settlement density from the number of residents living in each county.

Table 1

Study Area and Included Resource Inventory

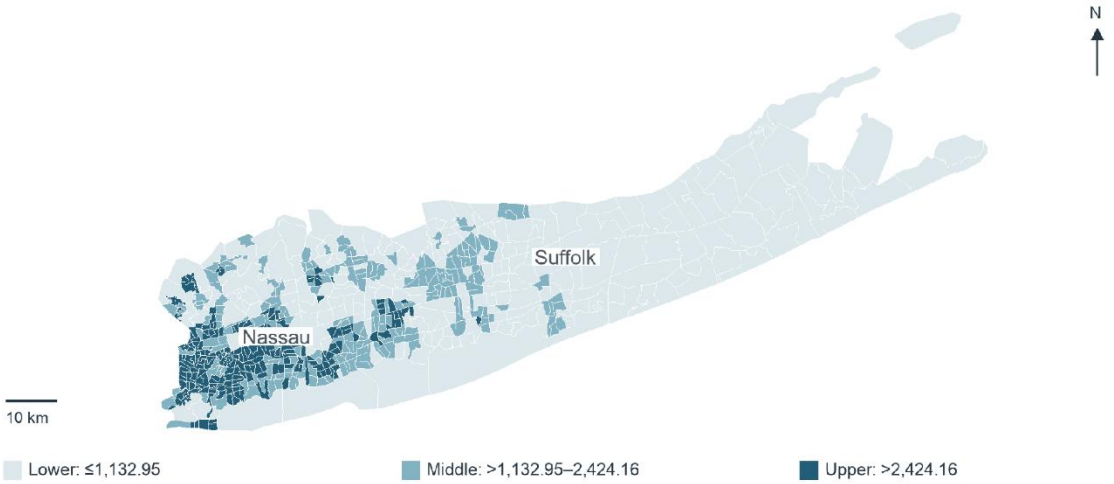
| Measure | Nassau | Suffolk | Total |
|---|---|---|---|
| Census tracts | 281 | 384 | 665 |
| Residents (ACS) | 1,389,160 | 1,524,486 | 2,913,646 |
| Renter households | 82,750 | 92,917 | 175,667 |
| Median tract density (residents/km²) | 2,807 | 1,141 | 1,753 |
| Food locations | 80 | 39 | 119 |
| Shelter / intake locations | 0 | 8 | 8 |
| Outreach locations | 4 | 6 | 10 |
| Included locations | 84 | 53 | 137 |

Figure 1 displays population density using the same three broad categories that are later used in the comparison analysis. The broad west-east contrast is clear, although variations also exist within each county. Figure 2 maps the included facilities by the type of service provided. Food

assistance represents 86.9 percent of the locations and has the greatest influence on the combined average as a result. A point located near a food resource is not necessarily near a shelter intake or outreach service. These two maps combined provide context on residential settlement patterns and the distribution of services before the need and coverage results are presented.

Figure 1

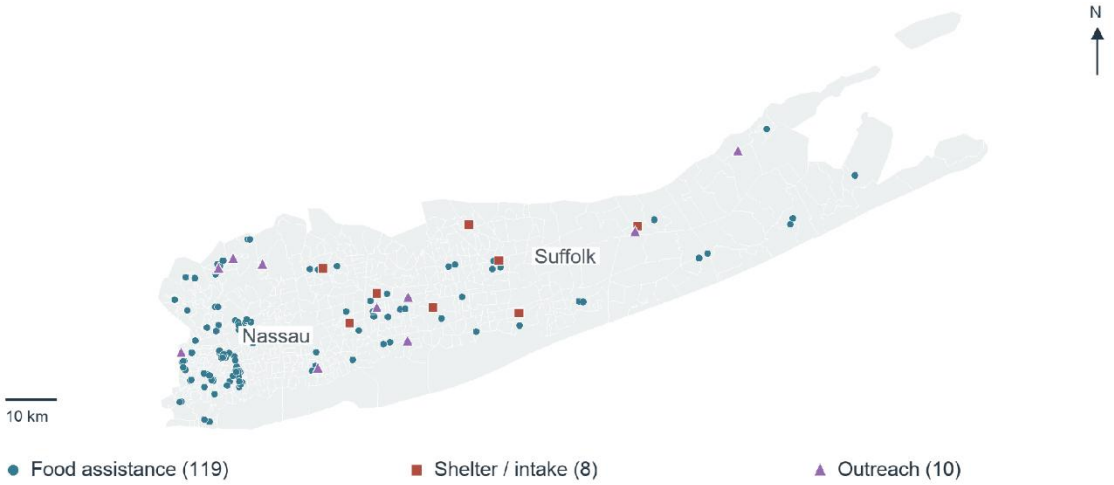
Population density by tract. Regional tertiles are used in the density comparison




Regional tertiles are used in the density comparison

Figure 2

Included Facilities by Service Type




Coordinates include approximate locations; collection dates are not consistently recorded.

The median tract poverty rate is 4.6 percent, with the middle 50% of the tracts ranging from 2.4 to 7.4 percent. For the recorded rent burden measure, the median is 50.0 percent, with the middle 50% ranging from 33.4 to 64.4 percent. The median renter share is 12.4 percent, with the middle 50% of tracts ranging from 5.6 to 23.8 percent. These distributions demonstrate why the raw percentages should be standardized before they are combined into the need score. They also demonstrate that renter presence and financial hardship represent different aspects of local housing conditions.

## Methodology

The methodology addresses the main question of whether the representative point of a high-need tract has any included assistance facilities nearby. The need score determines which tracts are classified as high need, and the distance rule determines whether their representative points are covered. The analysis does not estimate the amount of assistance available to a tract, distribute demand among service providers, or treat facility counts as measures of service capacity. Population and household measures instead provide additional context about the areas identified, while sensitivity checks examine whether the comparisons change under alternative methodological choices.

Poverty, recorded rent burden, and renter share are standardized and then averaged using equal weights. In Equation (1), $x$ represents an indicator value, μ and σ represent its regional mean and standard deviation, $z$ represents the standardized component, and $N_i$ represents the overall need score. The calculation uses the standardized components saved in the project data. Tracts are ranked according to the mean of the three standardized components, with 167 highest-scoring tracts classified as high need, representing approximately the top quarter of the 665 tracts. The remaining 498 tracts form the comparison group. Equal weighting is used as a transparent method of combining the three indicators and should not be interpreted as evidence that each indicator has an equal effect on hardship.

$$z_{ik} = \frac{x_{ik} - \mu_k}{\sigma_k} \; ; \quad N_i = \frac{z_{i1} + z_{i2} + z_{i3}}{3} \quad (1)$$

Renter share is included in the calculations because this study analyzes housing vulnerability within a rental housing context, although renter share itself is not a measure of deprivation. An alternative need score is calculated using only standardized poverty and recorded rent burden while maintaining the same group size of 167 tracts to examine the effects of this indicator. Keeping the group size constant allows for a clearer comparison between the two need definitions. The analysis compares the overlap between the selected tracts and their coverage rates under both definitions.

The weights are not adjusted or tested to identify a combination that produces the largest difference in coverage between the groups.

All census tracts with positive land area remain in the analysis. Eleven tracts have zero estimated renter households, including one that is classified as high need based on its other indicators. These tracts are retained to avoid excluding unusual areas only because of their household situation. Their renter household totals contribute zero to the household summaries, while their coverage is determined independently based on distance to the nearest resource. Before interpreting these tracts as a priority for renter assistance, their ACS estimates and residential context would require further review.

A geometric representative point is generated within each tract polygon. Unlike a geometric centroid, which may fall outside an irregularly shaped polygon, the representative point lies within the tract boundary. However, it is not a population-weighted center or a verified residential address. Great-circle distances are then calculated from each representative point to every included resource using an Earth radius of 6317 kilometers. The distance to the nearest resource determines whether the tract is classified as covered. Resources may cover representative points across tract or county boundaries, while resources that are not included in the inventory cannot contribute to coverage.

Equation (2) expresses this coverage rule. The set $J$ contains the 137 included resource locations, $d_{ij}$represents the distance between the representative point of tract $i$ and resource $j$, and $d_i$represents the minimum distance from that point to any included resource. The coverage indicator $C_i(r)$ equals one when the nearest resource is within threshold $r$, and zero otherwise. The primary threshold is 1.2 kilometers, equivalent to 15 minutes at an assumed speed of 4.8 kilometers per hour. This is a walking distance approximation rather than a measure of an actual route and does not account for sidewalks, crossings, detours, or differences in individual walking speeds.

$$d_i = min_{j \in J} d_{ij}\,; \quad C_i(r) = 1[d_i \leq r] \quad (2)$$

Equation (3) summarizes coverage and renter household totals for each tract group $G$. $P_G(r)$ reflects the percentage of representative points that are covered within the group, with every tract contributing one observation to this percentage. $H_G(r)$ represents the total of renter households in tracts whose representative points are uncovered. $R_i$ represents the ACS renter household count for tract $i$. The renter household total describes the residential scale of the areas identified and does not classify individual households as covered or uncovered. No part of a tract's area is multiplied by its population, and the analysis does not assume that residents are uniformly distributed throughout a tract to estimate household access.

$$P_G(r) = \frac{\Sigma_{i \in G} C_i(r)}{|G|} \times 100\%; \quad H_G(r) = \Sigma_{i \in G} R_i[1 - C_i(r)] \quad (3)$$

Table 2

Variables and Interpretation

| Symbol | Meaning |
|---|---|
| $i, j, J$ | Tract, resource, and the set of 137 locations |
| $x_{ik}, z_{ik}, N_i$ | Raw indicator, standardized value, and need score |
| $d_{ij}, d_i, r$ | Point-to-resource distance, nearest distance, and threshold (km) |
| $C_i(r)$ | 1 when a point is within r of a resource; otherwise 0 |
| $G, \|G\|, P_G(r)$ | Tract group, group size, and covered percentage |
| $R_i, H_G(r)$ | Renter households and their total in uncovered tracts |

The 665 tracts are divided into three groups using the regional population-density tertiles in order to compare tracts with broadly similar settlement patterns. The density cutoffs are 1,132.95 and 2,424.16 residents per square kilometer, resulting in groups of 222, 221, and 222 tracts. The lower density group includes values up to the first cutoff, the middle group includes values above the first cutoff and into the second, while the upper density group includes values above the second cut-off. The main need classification remains unaltered, and coverage is compared between high need and other tracts within the three density groups. This analysis only offers a descriptive comparison and should not be interpreted as a statistical adjustment that isolates the effect of need.

Coverage is then recalculated using distance thresholds of 0.8 and 1.6 kilometers. The primary set of 137 resource locations, with a stricter 129-location subset and the broader 157-location service set defined above, are compared using two inventory checks. Together with the alternative need score, these checks examine how the results are affected by walking range, need definition, location uncertainty, and service scope. However, these checks do not establish the accuracy of all resource coordinates, account for uncertainty in ACS estimates, or validate residents' actual travel patterns. Coverage is recalculated using the updated resource coordinates and tract geometry instead of using the exported E2SFCA access or spatial diagnostic fields as alternatives for the distance-based coverage measure. Source files are preserved, and tract-level outputs record the need group, distance, density group, and household total used in the tables.

## Results

### Need Groups and Population Context

The 167 high-need tracts contain 761,479 residents and 94,860 renter households, representing approximately one quarter of all tracts, 26.1% of residents, and 54.0% of renter households. The remaining 498 tracts contain 2,152,167 residents and 80,807 renter households. This indicates that renter households are concentrated in the high-need group, which is expected since renter share is included as one part of the need score. This concentration, however, should not be interpreted as independent evidence that the need score accurately measures socioeconomic need.

The median poverty rate, recorded rent burden, and renter share among the high need tracts are 9.9%, 61.4%, and 35.%, respectively. In the other tracts, the corresponding medians are 3.6%, 43.7%, and 9.2%. These differences describe the socioeconomic characteristics of the selected groups but are partly a result of the indicators used to define them. High need tracts are also present across all three density groups, with 49 in the lower density group, 53 in the middle, and 65 in the upper density group. Therefore, high need is not limited to the region's most densely populated tracts.

### Coverage and Comparison Checks

At the primary 1.2 kilometer threshold, 159 of the 665 representative points are covered, resulting in an overall coverage rate of 23.9%, while the remaining 506 are uncovered. Among high-need tracts, 67 representative points are covered, and 100 are uncovered, creating a coverage of 40.1%. Among the other tracts, 92 representative points are covered, and 407 are uncovered, producing a coverage rate of 18.5%. The coverage rate for high need tracts is therefore 21.6 percentage points higher than that of other tracts, although 59.9% of high need representative points remain beyond the 1.2 kilometer threshold.

Table 3

Coverage and renter household scale

| Need group | Point status | Tracts | Within group | Renter households |
|---|---|---|---|---|
| High need | Covered | 67 | 40.1% | 47,549 |
| High need | Uncovered | 100 | 59.9% | 47,311 |
| Other | Covered | 92 | 18.5% | 22,087 |

| Need group | Point status | Tracts | Within group | Renter households |
|---|---|---|---|---|
| Other | Uncovered | 406 | 81.5% | 58,720 |

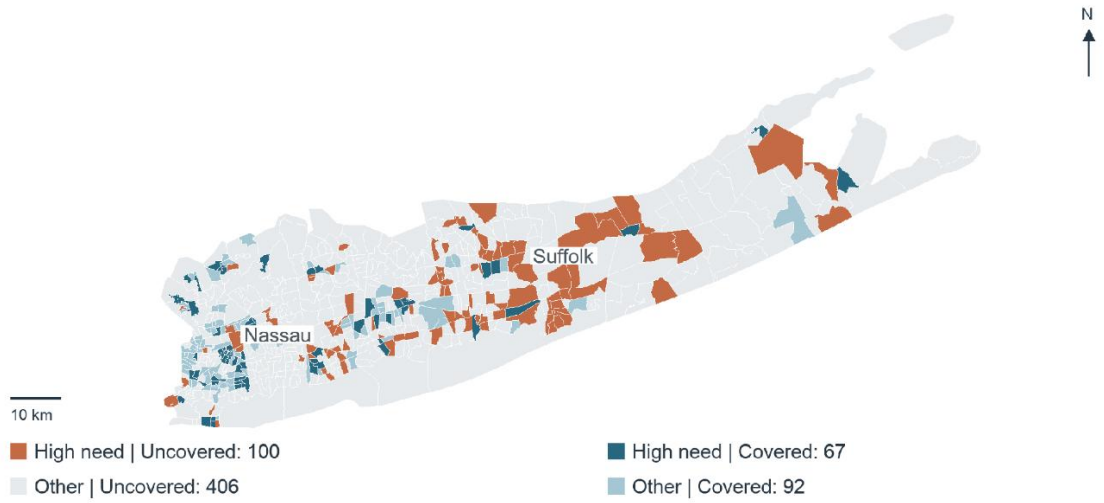
Household totals describe complete tracts, not individually measured access.

The 100 uncovered high-need tracts contain 47,311 renter households, representing 49.9% of all renter households in the high-need group. The 67 covered high-need tracts contain 47,549 renter households. Among the other tracts, the 406 uncovered tracts contain 58,720 renter households, while the 92 covered tracts contain 22,087. These totals describe renter households within complete tracts grouped according to the coverage status of their representative points. As a result, they do not indicate that 49.9% of renter households in the high need group lack a walkable route to an included resource.

Nassau County has 105 covered representative points among 281 tracts, resulting in a coverage rate of 37.4%. Suffolk County has 54 covered representative points among 384 tracts, resulting in a coverage rate of 14.1%. Figure 3 displays the geographic distribution of the four need and coverage categories. Although entire tracts are shaded on the map, this is a visualization of the point-based classification and does not indicate that access conditions are uniform within each tract. The map also does not assign the same access conditions to every resident or gives larger census tracts greater population weight.

Figure 3

Need and Coverage at 1.2 Kilometers




Polygon colors represent point classifications, not uniform coverage within tracts.

Coverage increases across the three population density groups. Among high need tracts, coverage rises from 18.4% in the lower density group to 26.4% in the middle and 67.7% in the upper density group. Among other tracts, the corresponding coverage rates are 4.6,% 16.1%, and 36.3%. Therefore, high need tracts have higher coverage within each broad density group, although substantial differences in settlement context remain across the groups. The lower, middle, and upper density groups contain 40, 39, and 21 uncovered high need tracts, respectively, with 16,307, 20,420, and 10,584 renter households.

Table 4

Coverage within Population Density Groups

| Density group | High need covered / total | Coverage | Other covered / total | Coverage |
|---|---|---|---|---|
| Lower | 9 / 49 | 18.4% | 8 / 173 | 4.6% |
| Middle | 14 / 53 | 26.4% | 27 / 168 | 16.1% |
| Upper | 44 / 65 | 67.7% | 57 / 157 | 36.3% |

Table 5 reports the results of the comparison checks. At the 0.8 kilometer threshold, 44 high-need representative points are covered, resulting in a coverage rate of 26.3%. At the 1.6-kilometer threshold, 81 high-need representative points are covered, resulting in a coverage rate of 48.5%, which means that more than half remain uncovered even at the larger distance. Using the stricter 129 location subset, 64 high-need and 85 other representative points are covered, compared with 67 and 92 in the primary analysis. Expanding to the broader set of 157 fixed location service records results in 68 high-need and 100 other points being covered. The higher coverage rate among high-need tracts remains in both inventory checks, while the exact coverage classification varies depending on resource location assumptions and the scope of included services.

Table 5

Distance, Need definition, and Inventory Checks

| Scenario | High need covered / 167 | Other covered / 498 | Difference (pp) |
|---|---|---|---|
| 0.8 km; main score | 44 (26.3%) | 43 (8.6%) | 17.7 |
| 1.2 km; main score | 67 (40.1%) | 92 (18.5%) | 21.6 |
| 1.6 km; main score | 81 (48.5%) | 123 (24.7%) | 23.8 |
| 1.2 km; poverty + burden | 53 (31.7%) | 106 (21.3%) | 10.5 |
| 1.2 km; strict 129 locations | 64 (38.3%) | 85 (17.1%) | 21.3 |
| 1.2 km; broader 157 locations | 68 (40.7%) | 100 (20.1%) | 20.6 |

Differences use unrounded rates. The first four scenarios use 137 locations. The strict subset has 129 locations; the broader service set has 157. The alternative score selects a different set of 167 tracts.

Removing renter share from the need score results in 117 of the same 167 tracts being classified as high need, representing an overlap of 70.1%. Under this alternative definition, 53 high-need representative points are covered, resulting in a coverage rate of 31.7%, compared with 106 of the 498 other points, or 21.3%. The coverage advantage for high need tracts remains positive but falls to 10.5 percentage points when calculated using the unrounded coverage rates, and the number of uncovered high need tracts also increases to 114. These results maintain the focus of the main comparison. It also demonstrates that the magnitude of the coverage differences and the specific tracts identified as high need are heavily influenced by the definition of need.

## Discussion

### Relative Proximity and Remaining Gaps

The main finding contains two distinct observations. Included assistance locations are more frequently near high-need tract representative points than other tract points, yet most high-need points remain beyond the selected distance threshold. The findings do not contradict one another. The higher relative coverage rate indicates where recorded services are located in relation to high-need areas, but it does not demonstrate that nearby support reaches all important areas or meets the needs of the people living there.

The population density comparison provides additional context to this finding. The coverage advantage for high-need tracts remains within each of the three density groups, suggesting that the overall difference is not simply a result of high-need tracts being concentrated in denser areas. However, these density groups remain broad, and differences in population density, tract size, land use, and resource inventory quality still exist within each group. Therefore, the comparison does not demonstrate that service providers located resources based on socioeconomic need independently of population concentration. It also does not establish whether the apparent gaps in lower density areas would remain if accessibility were measured from the actual locations of resident clusters.

**Population Scale and Appropriate Forms of Support**

The results should not be interpreted as a recommendation to install one facility in every uncovered tract. Every census tract is different in terms of population, the number of renter households, population density, and spatial extent. This means that equal numbers of facilities would not match the number of potential users of the facility or the travel difficulties they may encounter during their journey. The analysis included sparsely populated tracts because a smaller population does not make the hardships experienced unimportant. Renter household totals are also able to offer additional context for evaluating the scale of an area identified for further review.

The population density results reflect this distinction since the lower density group contains 40 uncovered high need tracts with a total of 16,307 renter households. Although these tracts are not empty spaces, their populations are likely to be dispersed across large areas. On the other hand, the upper density group contains only 21 uncovered high need tracts with a total of 10,584 renter households. The difference in population scale and spatial distribution cannot be accounted for simply by counting the number of uncovered tracts, but rental household totals also cannot determine whether households are concentrated near a tract boundary or close to a service that the representative point fails to include.

In terms of resource allocation decisions, this study considers three important questions: how adverse are the measured conditions of an area, how far is its representative point from recorded services, and how many renter households live within the tract? An area with relatively high population counts and concentrated need may justify evaluating the need for a fixed service location or community partnership, while a relatively dispersed area might consider examining mobile distribution or transportation assistance. Additional local data on costs, demand, and travel patterns is required for determining which approach is most appropriate for a specified area. The current analysis does not identify the most efficient intervention method or establish funding priorities through the use of a formula.

**Defining Need Changes Which Places Receive Attention**

The alternative need score reveals that defining socioeconomic need involves a planning choice rather than only a technical classification. Removing renter share reduces the coverage advantage from 21.6 to 10.5 percentage points and replaces 50 of the 167 tracts classified as high need. The two definitions reveal different regions for further investigation, although they share the same 117 census tracts. This difference is important to consider since a screening may affect agencies' decisions on where to investigate first, before the results are used to inform decisions about funding or service locations.

The primary need score gives explicit weight to rental tenure with poverty and rent burden, bringing areas with larger renter populations into greater attention. On the other hand, the alternative need score emphasizes measures of economic hardship without giving renter share that same weight. The smaller coverage advantage under the alternative need score implies that the relationship between the location of a resource and need is partially related to the concentration of renter households, but this does not demonstrate that one definition of need is correct and the other is incorrect. Each definition highlights a different choice about which area characteristics should be used to guide the initial identification of communities for further investigation.

This interpretation makes the sensitivity checks useful since it goes beyond testing whether the results change. The 117 tracts shared by the two definitions identified as high need under both definitions reflect areas receiving consistent attention across the two measures, while the tracts selected by only one definition reveal regions where the meaning of need warrants closer review. However, agreements between the two scores do not provide independent validation that those tracts are truly areas of greatest need, and disagreement is not a reason to dismiss a community from further review. The practical lesson for agencies is that they should clearly define the populations and circumstances they intend to serve before using a composite need score to determine which areas should receive the initial attention to maximize efficiency.

**Contribution and Practical Use**

The contribution of this study is to make a local planning question answerable using an explicit and reproducible set of rules. The analysis combines assistance records from Nassau and Suffolk counties with a common census tract framework, documents which resource locations can be included in the distance calculation and distinguishes relative socioeconomic need from the number of households represented in the identified areas. The resulting findings provide more information than a regional facility count because they identify where higher measured need matches with a lack of nearby recorded assistance.

The study's originality is in the combination of these methods and its interpretation in the local context of Long Island. The distance measure and standardized need score are well-known methods, and this study does not claim to have developed them. Its contribution comes from demonstrating both the alignment between recorded resources and socioeconomic need and the limitations of that alignment, including the influence of population density and renter share. The screening of the resource inventory also contributes to the analysis by showing why an access resource flag or an organization listed in a directory cannot automatically be treated as an active and fixed service location.

This study's rigor comes from the traceable methodological decisions rather than the use of numerous statistical techniques. The tract universe is defined using an explicit land area rule; service categories and coordinate exclusions are documented; formulas clearly define the reported measures, and sensitivity checks demonstrate how the results depend on specific assumptions. These features combined make the screen replicable, but they do not turn an approximate resource inventory into verified evidence of actual services, and the remaining uncertainties should be considered in the interpretation and application of the findings.

The resource allocation question is how limited resources can be used to improve proximity to assistance in areas of greater potential need, which is important to public agencies and service providers. The resource inventory reflects the location of provisions, the distance-based analysis captures one geographic component of the cost of reaching that provision, and the need indicators and renter household totals reveal areas where this cost may require greater attention. These measures connect service provision, travel burden, and an explicit objective of directing attention toward areas of greater potential need, but this does not imply that every tract has the same number of facilities, nor does the analysis estimate actual travel costs, service demand, monetary benefits, or social welfare. The economic contribution is to identify geographic conditions relevant to resource allocation decisions and guide further local investigation, while leaving comparisons of the costs and benefits of interventions to further research.

## Conclusion

This study examines whether areas of higher socioeconomic need on Long Island are located near basic needs assistance. Across 665 census tracts and 137 recorded resource locations, the 167 tracts classified as high need under the main need score have a representative point coverage rate of 40.1%, compared to 18.5% in the other tracts. 100 high-need points remain more than 1.2 kilometers from every included resource location. These tracts contain 47,311 renter households, which describes the number of renter households represented within these areas rather than the number of

households individually observed to lack access. The high need coverage advantage persists in each of the three broad population density groups, while its reduction under the alternative need score reveals that the strength of the comparison depends heavily on the definition of socioeconomic need.

The findings have several important limitations worth noting. Geometric representative points and straight-line distances cannot account for the uneven distribution of residents or actual walking routes. The resource inventory contains approximate coordinates, incomplete information about current operations, and records that are not synchronized with the ACS data period, while services not included may also affect coverage. ACS sampling error, the treatment of zero denominators, the rent burden denominator, and classification choices may also affect which areas are ultimately identified. In addition, the inventory consists mostly of food assistance, while capacity, eligibility, actual use, and outcomes are not measured. These limitations may likely change individual tract classifications and the magnitude of the reported differences. However, the limitations do not erase the study's contribution of providing a reproducible comparison of socioeconomic need, proximity to assistance, and the household counts reflected in the identified areas.

Future research should proceed in three stages, with each stage providing evidence needed for the next. The first stage should strengthen the underlying records by verifying facility coordinates and current service status, recording data collection dates and access requirements, and retrieving the ACS categories needed to examine alternative burden denominators and sampling uncertainty. This stage would produce a dated and auditable resource inventory along with a revised tract-level analysis showing which classifications change as the input data improves.

The second stage should examine actual accessibility within a manageable selection of areas representing different population density groups and both definitions of socioeconomic need. The question of whether gaps identified using representative points correspond to practical barriers can be determined using more detailed information about residential locations and street routes, combined with local evaluation of street crossings, operating hours, and referral arrangements. Examining both covered and uncovered tracts would also test whether the analysis creates false assurance in some locations as well as apparent gaps in others. This stage would offer evidence about how accurately the regional screen reflects actual accessibility conditions.

The third stage should compare feasible responses with service providers and residents when the practical barriers have been established. Potential interventions such as fixed service locations, community partnerships, mobile distribution, delivery, and transportation assistance should be evaluated based on costs, effects on travel burden, and observed service use. A limited pilot could

test whether a selected intervention actually improves access before it is implemented in other areas within the region. These stages evolved from analyzing the reliability of the underlying data to verifying actual accessibility barriers, and then to evaluating potential intervention methods, instead of simply assuming that every identified gap requires a new facility.

The overall contribution of this study is to separate the two public service objectives that regional resource inventories often overlook, which are having available resources and ensuring they are reachable by the people who actually need them. The originality of this study is in the Long Island-specific evidence and the explicit connection between socioeconomic need, settlement context, and proximity to basic needs assistance. This study gives local agencies and service providers a concrete starting point while also clarifying the additional evidence required to support stronger conclusions by providing a transparent method for identifying areas that may require further investigation. Presence is not access; evaluating public service provisions requires considering both whether services exist and whether the people they are intended to support can reach them.

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