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What Determines the Success of Housing Mobility Programs?

Dionissi Aliprantis, Hal Martin, and Kristen Tauber

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There is currently interest in crafting public housing policy that combats, rather than contributes to, the residential segregation in American cities. One such policy is the Housing Mobility Program (HMP), which aims to help people move from disinvested neighborhoods to ones with more opportunities. This paper studies how design features influence the success of HMPs in reducing racial segregation. We find that the choice of neighborhood opportunity index used to define the opportunity areas to which participants are encouraged to move has limited influence on HMP success. In contrast, we find that three design features have large effects on HMP success: 1) whether the geographic scope is confined to the central city or is implemented as a metro-level partnership; 2) whether the eligibility criteria are race-based, race-conscious, or race-neutral; 3) whether tenant counseling, tenant search assistance, and landlord outreach are successful in relaxing rental housing supply constraints.

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1   Introduction

There is currently interest in crafting public housing policy that combats, rather than contributes to, the residential segregation in American cities. The largest federal public housing program in the United States is the Housing Choice Voucher (HCV) program, which subsidizes recipients' rental payments in the private market. There has long been suspicion that by setting a single, metro-wide subsidy cap for the value of a voucher, the HCV program effectively requires voucher holders to live in low-opportunity neighborhoods and attend low-performing schools: This is certainly what we see in the data (Galvez (2010); Lens (2013); Horn et al. (2014)). One recent policy innovation has been to allow HCV subsidy caps to rise and fall with local rents, a policy known as Small Area Fair Market Rents (SAFMRs).

While the adoption of SAFMRs has led HCV recipients to move to higher opportunity neighborhoods in some cases (Collinson and Ganong (2018)), this does not appear to be true across all sites (Dastrup et al. (2019); Reina et al. (2019); Bergman et al. (2020)), and there is reason to question whether SAFMRs alone can generate sustained opportunity moves (Aliprantis et al. (2020)). Housing Mobility Programs (HMPs) are a potential solution to the obstacles not addressed by SAFMRs. HMPs offer assistance searching in high opportunity neighborhoods, pre- and post-move counseling, and landlord outreach. Originally designed as a remedy to past public housing policies designed to segregate cities by race (Polikoff (2006); Rothstein (2017)), HMPs are central to the US Department of Housing and Urban Development's (HUD's) reforms to the HCV program.

The success of previous HMPs in empowering moves to opportunity has varied widely. Figure 2 shows the results of two prominent HMPs in 2019. Those who moved in the Baltimore Regional Housing Partnership (BRHP) typically increased from the 5th to the 77th percentile of neighborhood poverty rates for non-Hispanic whites. Participants who moved through the Creating Moves to Opportunity (CMTO) HMP typically increased from the 23rd percentile to the 41st percentile.

(a) Baltimore Regional Housing Partnership   (b) Creating Moves to Opportunity
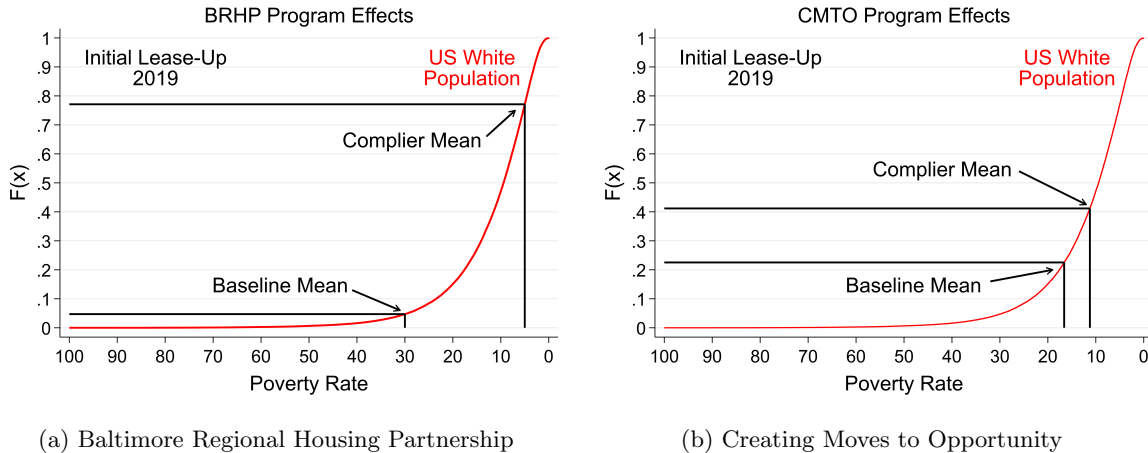
Figure 1: Program Effects on Participants' Tract-Level Poverty Rates

Note: Both figures display the Cumulative Distribution Functions of tract-level poverty for the United States' population of non-Hispanic whites in the 2014-2018 American Community Survey/NHGIS. The left panel shows the pre-program and post-move means of BRHP program participants in 2019. The right panel shows the baseline mean and treatment group complier mean for CMTO participants in April 2019, where the complier mean is calculated as the control mean plus the treatment on the treated (TOT) effect.

The differences in outcomes of previous HMPs directs attention toward the range of features Public Housing Authorities (PHAs) can choose when designing HMPs. How important are these choices for HMP success? Should a regional scope beyond a single PHA's jurisdiction be a priority for PHAs setting up new HMPs? What happens to the success of an HMP as we change the eligibility criteria to include race or neighborhood characteristics? How important to the success of a program are services like tenant search assistance, counseling, and landlord outreach that expand the reachable housing supply?

It only becomes possible to judge the importance of other HMP design choices after making the first HMP design choice: Defining success. We evaluate HMPs in terms of their ability to reduce the residential segregation of Black and white poor residents. While individual neighborhood mobility is an alternative definition of success, we focus on racial segregation because the Gautreaux and Baltimore HMPs were created in response to the discrimination and violence that helped to generate racial segregation (Polikoff (2006)). Moreover, there remain large gaps in the neighborhood characteristics of Black and white residents in American cities (Aliprantis et al. (2020)), and our simulations show that HMPs are an effective policy for solving this problem.

This paper studies how four design features influence the success of HMPs in bringing about racial equality of neighborhoods: geographic scope, services that relax rental supply constraints, eligibility criteria, and the choice of opportunity neighborhoods. We simulate the residential outcomes of HMP participants in large metros after altering some of the major design features that differentiate previous HMPs. Our simulation results are informative about which design choices have the potential to significantly reduce residential segregation.

In our baseline model, we set design choices to favor the greatest gains to racial equality: The baseline model uses race-based eligibility criteria and a regional geographic scope for selecting receiving neighborhoods. We account for housing supply constraints by only allowing families to move into a fixed percentage of the rental units in each eligible tract. We compare the results of racial integration in this model with ones that implement fewer features that favor racial equality. For policymakers seeking advice in the design of an HMP, we interpret our results as follows:

First, an HMP will bring about greater improvement in racial equality if it is designed as a regional partnership that encourages moves across multiple counties in a metro rather than just the metro's central city. We show that restricting an HMP to its metro's central city decreases the gains in racial equality by 56 percent of our baseline model.

Second, HMPs should devote considerable resources to tenant support and outreach to landlords. Such features relax the housing supply constraint, which greatly increases the success of HMPs. Eliminating the supply constraint would increase overall HMP success by 65 percent.

Third, even if HMPs cannot be race-based, a race-conscious design is preferable to a race-neutral design when the goal is to foster racial equality. Race-conscious eligibility criteria focused on low-ranking neighborhoods result in a 42 percent decrease in success relative to the baseline design. This contrasts favorably with a race-neutral design, which would decrease success by 89 percent.

And fourth, while opportunity mapping matters and deserves careful attention, choosing among

measures for identifying the high-opportunity neighborhoods is a secondary consideration relative to the three other design features we consider. Choosing the "wrong" measure to select opportunity neighborhoods reduces success by 8 to 19 percent. These numbers are likely overestimates due to uncertainty in the measurement of neighborhood effects (Aliprantis and Martin (2020)) and the discretionary changes that a PHA would likely make when drawing an opportunity map (See chapter 3 of Scott et al. (2013), Appendix A of Bergman et al. (2020), or Weismann et al. (2020)).

The rest of the paper proceeds as follows: In Section 2 we discuss the design features of housing mobility programs; in Section 3 we discuss the results of simulations modeling different HMP design decisions; Section 4 concludes.

2 Design Features of Housing Mobility Programs

2.1 Previous Housing Mobility Programs

Previous housing mobility programs, such as Gautreaux, Moving to Opportunity (MTO), Baltimore Housing Mobility Program (BHMP), and Creating Moves to Opportunity (CMTO), have differed along five principal design features:[1]

1. The geographic scope of the program;
2. The individual characteristics that determine the eligible population for the program;
3. The neighborhood characteristics that determine the eligible population for the program;
4. The characteristics that determine the receiving neighborhoods to which participants are eligible or encouraged to move;
5. The types of tenant counseling, search support, and landlord outreach offered to both facilitate leasing up and to keep participants in stable housing after their initial lease-up.

Figure 2 shows how residential outcomes for movers vary across different existing HMPs. Changes in neighborhood poverty rates between baseline and initial lease-up locations were largest in Gautreaux and the BHMP, both of which are regional programs. The gap between initial placement and subsequent locations is the smallest in the BHMP. The long-term success of BHMP participants' residential outcomes is likely a function of the BHMP's focus on tenant counseling, search support, and landlord outreach. These features serve to overcome resistance to subsidized tenants among landlords and increase the effectiveness of search among those tenants, thereby increasing the reachable housing supply.

Gautreax and the BHMP have been implemented as regional partnerships, encouraging residents to move beyond a single PHA's jurisdiction and throughout their respective metropolitan areas. While MTO technically encouraged participants to move across jurisdictions, the program's Section 8 certificates and vouchers were allocated to the central city PHAs at each site (Feins et al. (1996),

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[1]The BHMP precedes the BRHP, which incorporates different design choices and reflects different results. Data for BRHP are reflected in Figure 1a, while data for BHMP are reflected in Figure 2c. For outcomes in 2015 and onward we refer to the BHMP and the BRHP interchangeably.

(a) Gautreax

(b) Moving to Opportunity

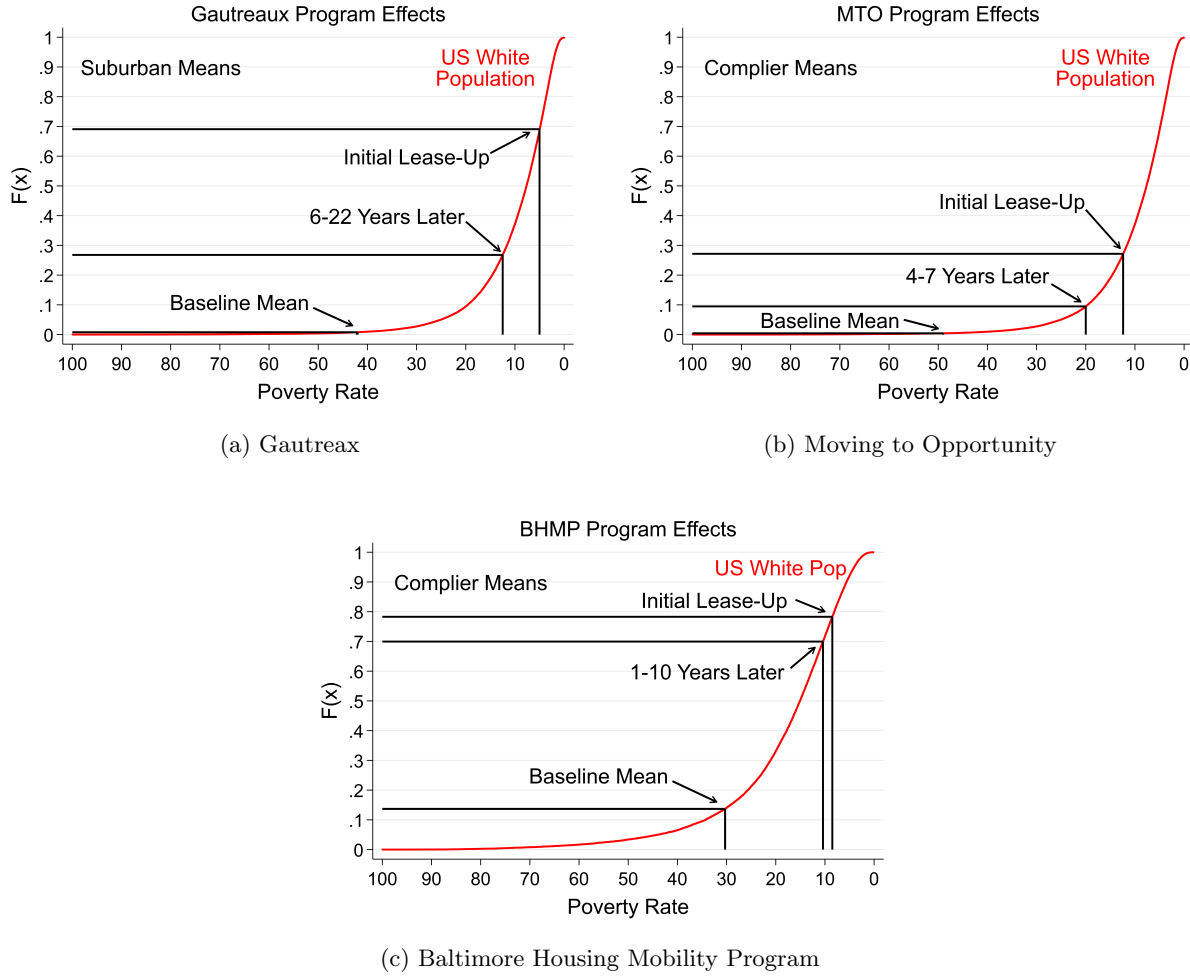(c) Baltimore Housing Mobility Program

Figure 2: Residential Outcomes of Movers in Housing Mobility Programs

Note: Panel a shows mean neighborhood poverty rates in Table 1 of Keels et al. (2005) in terms of the 2000 Census distribution of the US non-Hispanic white population. Panel b shows mean tract poverty rates in the 2000 Census from Orr et al. (2003), with baseline poverty rates taken from Exhibit 2.7, complier mean in initial lease-up location taken from Exhibit 2.3, and complier mean 4-7 years after randomization taken from Exhibit 2.5. Panel c shows mean neighborhood poverty rates in the 2005-2009 American Community Survey from DeLuca and Rosenblatt (2017), with complier locations at baseline, after initial lease-up, and 1-10 years after program locations taken from Table 2 and suburban mean 1-10 years later taken from Table 4.

p 1-4), and it is unclear how much the obstacles to portability across PHA jurisdictions constrained participants' choices (Feins et al. (1996), pp 13-4 to 13-9).[2] And while CMTO was implemented by two PHAs, the Seattle and King County PHAs, it does not appear that moves across these PHAs' jurisdictions were encouraged (Bergman et al. (2020)).

Gautreaux is the only HMP to explicitly use an individual's race as an eligibility criterion for program participation. Gautreaux targeted low-income African Americans in Chicago public housing (Rosenbaum and DeLuca (2008)). The BHMP does not select tenants based on their individual race or ethnicity. Although the BHMP is based on the same legal precedent as Gautreaux

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[2]Two thirds of MTO experimental compliers' initial lease ups were within their site's central city (de Souza Briggs et al. (2010), p 150).

– that HUD has the obligation to remedy segregation by doing more than simply refraining from discriminating (PRRAC (2005)) – court rulings have disallowed race-based individual eligibility criteria.[3] MTO targeted residents of public housing in the lowest ranked neighborhoods in the country, and the participating population ended up being about two thirds African American (Orr et al. (2003)). The eligible population in CMTO was any household with a newly-awarded Housing Choice Voucher (HCV); this made the target population of CMTO effectively the poor residents of King County, Washington.

In Gautreaux eligible neighborhoods were defined in terms of racial composition; eligible tracts were those with no more than 30 percent Black residents (Rosenbaum (1995)). In the BHMP neighborhood eligibility has changed over time. From 2002 until 2015, eligible neighborhoods were those with no more than 30 percent Black residents, no more than 10 percent poverty, and no more than 5 percent of residents receiving housing assistance. From 2015 until today, the BHMP has been administered by the Baltimore Regional Housing Partnership (BRHP), which uses a combination of 21 variables to determine tract eligibility.The eligible neighborhoods in MTO were defined in terms of poverty rates; eligible tracts were those with less than 10 percent poverty. In CMTO, eligible tracts were determined by combining the Opportunity Atlas data with several additional variables in an estimation procedure that shrinks the OA ranking toward contemporaneous variables like 2010 poverty rates and 4th grade test scores (Bergman et al. (2020), Appendix A).

Tenant counseling pre- and post-move have been a part of each HMP; what has varied considerably across HMPs has been the precise form of counseling provided, financial support to tenants, and outreach to landlords. For example, the BHMP makes its workshops mandatory for program participants. The BHMP and CMTO provide financial assistance toward moving costs, while Gautreaux and MTO did not. And while the BHMP actively recruits landlords in opportunity areas, contacts landlords on behalf of searching clients, and provides mediation between tenants and landlords, these services varied across sites in MTO. See Table 2 in Schwartz et al. (2017) or Cunningham et al. (2010) for further details.

2.2 The Problem to Be Solved

The above differences illustrate the importance of selecting features of a HMP in accordance with a program's goals. Many PHAs today focus on economic integration by deconcentrating poverty. In the cases of Gautreaux and the BHMP, the primary goal has been to reduce racial segregation for Black residents.

Black neighborhoods have struggled to gain upward mobility in a way ethnic enclaves have not because of specific exclusionary policies, coupled with durable systemic racism and violence that have left many Black communities disinvested of the institutions that support upward mobility. Without minimizing racial disparities faced by other groups, we focus this analysis on the residential segregation of Blacks and whites. While HMPs are not the only approach to addressing racial segregation, they are a means of addressing the areas of concentrated economic disadvantage that

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[3]See Scott et al. (2013) and Tegeler (2009) for related discussions.

are still with us today. Figure 3a shows the remarkable clustering of poor Black residents in Baltimore in the lowest quality neighborhoods. A third of Baltimore's poor Black residents live in tracts below the 5th percentile of the national distribution of quality.

(a) Poor Black and White Residents
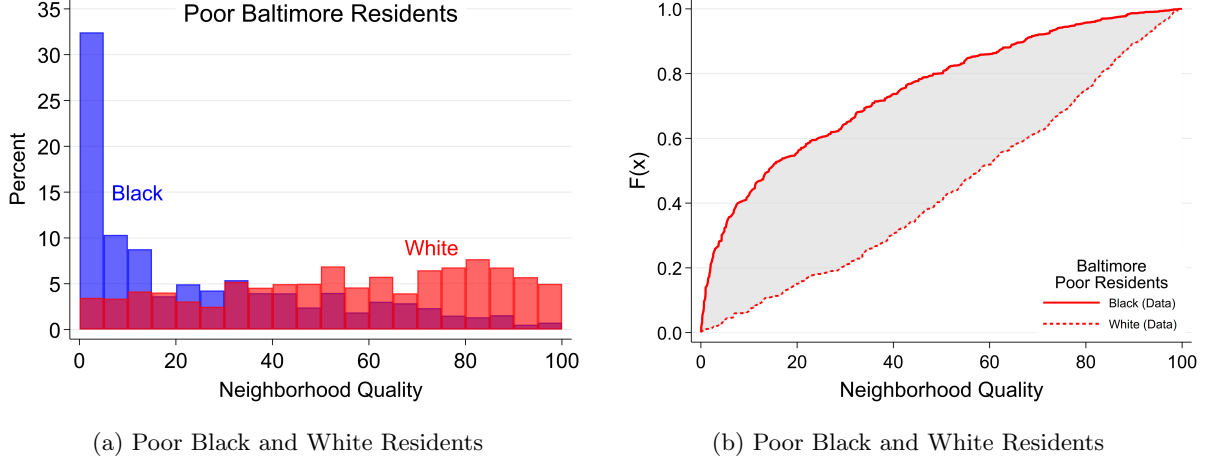
(b) Poor Black and White Residents

Figure 3: Racial Segregation of Neighborhood Quality in Baltimore

Note: These figures show the distributions of Black and white poor residents of Baltimore using data from the 2014-2018 ACS/NHGIS. The left panel shows the distributions in terms of their Probability Mass Functions (PMFs) and the right panel shows the distributions in terms of their Cumulative Distribution Functions (CDFs). The construction of neighborhood quality is described in Section 3.1 of the text.

We measure success in terms of the racial equality of poor Black and white residents' neighborhood characteristics. In the case of neighborhood quality q, we define the racial equality in metro m after HMP h as a function of the area between Black and white CDFs,

$$RE_m(h) = 100 \left\{ 1 - 2 \left[\int_0^{100} \left(F_{B,m,h}(q) - F_{W,m,h}(q) \right) dq \right] \right\}.$$

This measure of racial equality is equal to 100 if poor Black and white residents are equally exposed to neighborhood characteristics in metro m under HMP h (ie, if $F_{B,m,h} = F_{W,m,h}$). The measure is equal to zero if all poor Black residents live in the lowest quality neighborhood and poor white residents are uniformly distributed (ie, if $F_{B,m,h}(0) = 1$ and $F_{W,m,h} \sim U[0, 100]$). Figure 3b displays the empirical CDFs for Baltimore, which is 38 according to our measure of racial equality.

2.3 How to Measure Neighborhood Effects?

The goal of an HMP that targets racial desegregation is not simply to expose Black participants to more white neighbors; there is nothing special about living next to white neighbors per se. Instead, the goal of an HMP that targets racial desegregation is to expose Black participants to neighborhood externalities, or neighborhood effects, that will improve their economic outcomes and life-satisfaction. For example, children in Gautreaux and the BHMP had higher academic achievement after attending higher-performing schools (Rubinowitz and Rosenbaum (2000); DeLuca et al. (2016)). Children in MTO did not experience higher academic achievement, but they also

did not attend higher-performing schools (Sanbonmatsu et al. (2006)). Labor market outcomes improved for adults who moved to higher quality neighborhoods due to MTO (Aliprantis and Richter (2020)). And adults' mental health improved in MTO as a result of movers' decreased exposure to toxic stress in their neighborhoods (Kling et al. (2007); Popkin et al. (2002); Han and Madaleno (2019)).

While the objective of exposing participants to positive neighborhood externalities is straightforward, the question of how to identify those externalities is not. There are many measures of neighborhood effects, and here we consider making opportunity maps using three: neighborhood quality, the Childhood Opportunity Index (COI), and the Opportunity Atlas (OA) income estimates for poor children.[4]

Figure 4 shows the disagreement between the top third of each measure in Baltimore. While these measures agree about the top-third ranking of many tracts, there are many tracts over which they disagree. Which measure should a PHA use to define opportunity areas when we cannot be sure that observed characteristics like those in quality and the COI capture neighborhood effects (Chetty et al. (2020)), while different concerns arise in the OA due to statistical noise (Mogstad et al. (2020); Aliprantis and Martin (2020)) and neighborhood sorting (Aliprantis and Martin (2020))?
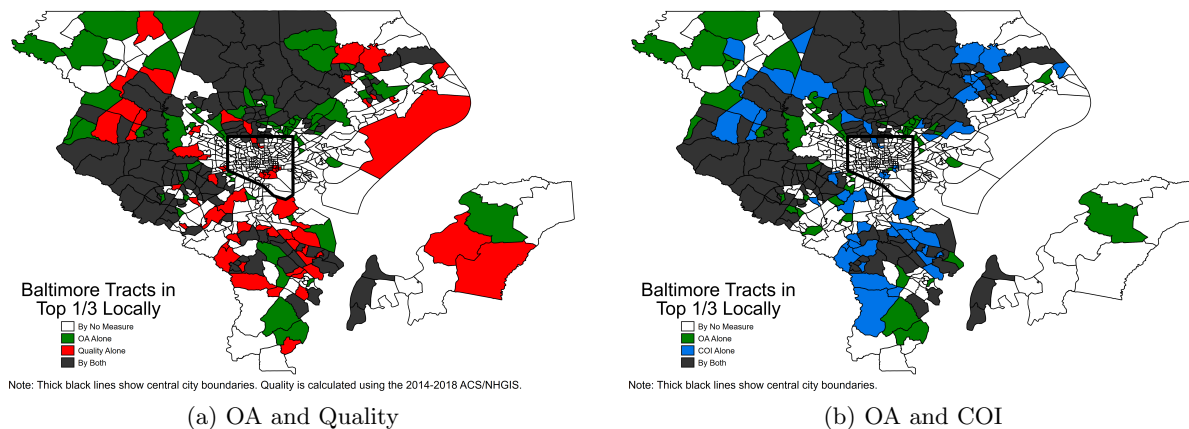

(a) OA and Quality   (b) OA and COI

Figure 4: Overlap in Opportunity Maps
Note: These maps show the overlap in tracts ranked in the top third of the Baltimore metro by alternative measures of neighborhood effects. The left panel shows rankings based on Opportunity Atlas (OA) income estimates for poor children and neighborhood quality. The right panel shows OA income estimates for poor children and the Childhood Opportunity Index (COI) 2.0. Tracts where different measures agree about ranking in the top third are shaded in black, and tracts where measures agree about ranking in the bottom third are left white. Tracts where measures disagree, so that only one of the displayed measure ranks the tract in the top third, are colored in either green, red, or blue.

2.4 Geographic Scope

Assuming it has selected criteria to identify opportunity neighborhoods, an HMP must also consider the geographic scope over which moves will be made possible. Previous HMPs encouraging moves across multiple counties, like Gautreaux and the BHMP, achieved the largest changes in

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[4]For details of each measure, see Section 3.1 below.

residential outcomes. Is this true in general? HMPs restricted to a metro's central city tend to have fewer eligible receiving tracts, which dampens the effectiveness of the program in promoting residential desegregation. While policies beyond the control of HMPs often govern this aspect of a program, how costly are such policies in terms of racial segregation?
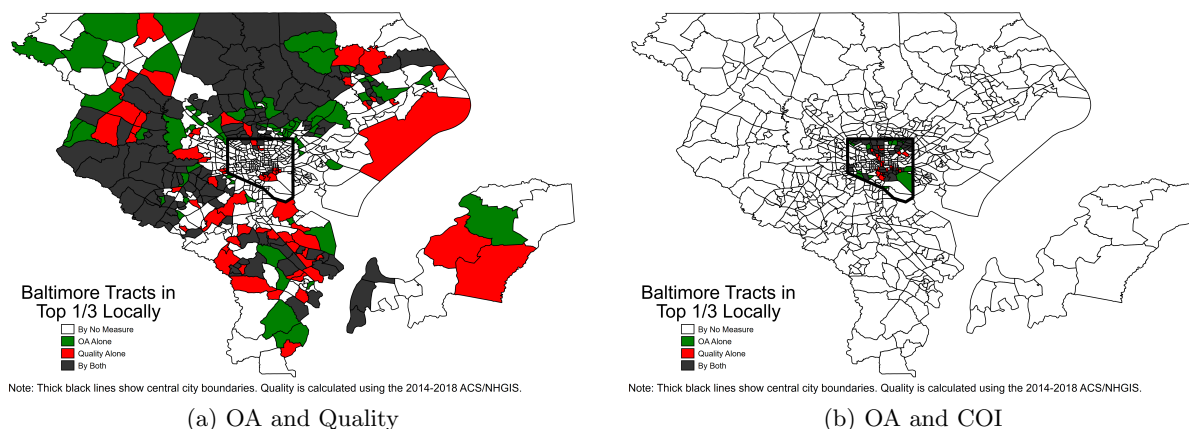

Baltimore Tracts in
Top 1/3 Locally
☐ By No Measure
■ OA Alone
■ Quality Alone
■ By Both
Note: Thick black lines show central city boundaries. Quality is calculated using the 2014-2018 ACS/NHGIS.

(a) OA and Quality

Baltimore Tracts in
Top 1/3 Locally
☐ By No Measure
■ OA Alone
■ Quality Alone
■ By Both
Note: Thick black lines show central city boundaries. Quality is calculated using the 2014-2018 ACS/NHGIS.

(b) OA and COI

Figure 5: Overlap in Opportunity Maps

Note: These maps show the overlap in tracts ranked in the top third of the Baltimore metro and Baltimore's central city by alternative measures of neighborhood effects. Both panels show rankings based on Opportunity Atlas (OA) income estimates for poor children and neighborhood quality. The left panel highlights tracts in the top third of the Baltimore metro, and the right panel highlights tracts in the top third of Baltimore's central city.

Figure 5b shows the tracts that are in the top third of quality and OA if we only focus on Baltimore's central city. There are far fewer available tracts to choose from under this restriction, and many of those that qualify here do not meet the bar when the program scope encompasses the entire metro. This means that a program restricted to a central city could struggle to provide the same level of opportunity to its participants.

2.5   Devote Resources to Tenant Counseling and Landlord Outreach?

The supply of rental housing is one of the most important constraints HMP practitioners face. Polikoff (2006) describes how supply constraints emerged early on in the 1970s as a major issue for the implementation of Gautreaux (Chapter 5.3). Today the supply of rental units in high-opportunity areas is an elibility criterion facing PHAs applying for HUD's HCV Mobility Demonstration (HUD (2020)).

Successful HMP moves must overcome barriers that limit supply like search costs, information frictions (Bergman et al. (2020)), and landlord avoidance of voucher holders (Phillips (2017)). When practitioners provide services such as tenant search assistance, counseling, and landlord outreach, they find that they are able to reduce the constraint for the participant, and increase the available housing to choose from in receiving neighborhoods. How important are HMP services inasmuch as they increase the reachable supply of rental housing?

2.6 Eligibility Criteria

Finally, practitioners must decide who they are going to help. While all HMPs target low-income households, HMPs can add criteria to more precisely target the program according to its goals. For instance, an HMP that values not only increasing income mobility but also deconcentrating poverty might focus on low-income people living in high-poverty neighborhoods. An HMP that wants to explicitly target racial equality might screen specifically for race alongside other criteria if the law allowed.

The choice of eligibility criteria can have direct and indirect impacts on racial equality, with policies ranging from race-neutral to race-conscious to race-based. For instance, eligibility criteria that focuses only on low-income households is relatively race-neutral. In many metros, low-income Black residents are disproportionately represented in low-income neighborhoods. A policy that targets any low-income resident in low-income neighborhoods would disproportionately reach Black residents. We term such policies "race-conscious." A policy that explicitly incorporates race into eligibility criteria would be considered race-focused. These labels reflect points on a continuum that we explore in the simulations to follow.

3 Simulating Results of HMP Design Decisions

3.1 Data

We consider four measures for ranking neighborhoods, where we define neighborhoods as Census tracts. For each measure, we rank neighborhoods, most often in terms of the local metro or county's distribution of individuals.[5]

The first measure we use is the poverty rate in a tract, a common measure since at least Wilson (1987). The second measure we use is termed "neighborhood quality" as originally used in Aliprantis and Richter (2020), and is the first principal component of six socio-economic factors available in the 2014-2018 American Community Survey (ACS), downloaded from the National Historical Geographic Information System (NHGIS, Manson et al. (2020)). The Childhood Opportunity Index 2.0 (COI) developed at Brandeis University (Noelke et al. (2020)) is our third measure, and incorporates 29 elements, many of which come from data sources beyond the Census, like the National Center for Education Statistics (NCES) and the Environmental Protection Agency (EPA). The final measure we consider is from the Opportunity Atlas (OA), which uses the outcomes for individuals born between 1978 and 1983 who spent time growing up in a given neighborhood to predict outcomes for children growing up in those neighborhoods today. Unless otherwise stated, our analysis focuses on the OA ranking of neighborhoods based on the estimated average family income at age 29 for children with parents at the 25th percentile of income.

There are over 3,000 PHAs in the US (Docter and Galvez (2020)), each with varying jurisdictions and capacities for porting HCVs in and out of those jurisdictions. Thus, to think about the

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[5]When interpreting our results, it is important to recall that there are statistical challenges specific to rank measures (Mogstad et al. (2020)).

geography over which tenants can use their vouchers to move in an HMP, we focus on two geographies. We define a metro as a metropolitan division, or core-based statistical area if it is not split into metropolitan divisions, using 2018 delineations downloaded from the US Census Bureau. And we define each metro's central city as the Census Designated Place (CDP) in each metro containing the largest number of HCVs in the 2018 Picture of Subsidized Households downloaded from HUD's website. Tracts are assigned to CDPs using 2019 Tigerline shapefiles downloaded from the Census Bureau website.

3.2 Baseline HMP

As a baseline HMP, we rank tracts in each metro according to neighborhood quality. We adopt design features from each of the four most prominent HMPs. Following Gautreaux, the baseline HMP targets poor Black residents. Following MTO, the baseline HMP prioritizes residents in the lowest-ranking tracts in each metro. Following CMTO, the baseline assumes that participants are encouraged to move to the top third of local tracts. And following the BHMP and Gautreaux, the baseline assumes that participants are encouraged to move to tracts throughout their entire metro.

We assume that rental housing supply, the number of available and affordable units in a tract, is equal to 7.5 percent of the 2 bedroom and larger rental units in the tract.[6] We consider a "fully developed" HMP, so that if rental housing supply is greater than or equal to 30 units, then 30 families move into a given opportunity tract.[7] If rental housing supply is $r < 30$ units, then we assume that r families move into the opportunity tract.[8]

Figure 6 shows the joint distribution of rental housing supply and neighborhood quality for tracts in Baltimore and Cleveland. We see that the rental supply constraint is binding at all levels of quality, and that the constraint is strongest in the highest quality tracts. In many of the highest-ranked tracts less than 10 families will be able to move in under our baseline simulations.

We assume that participants move uniformly into available units in eligible tracts. This is a strong assumption about counseling and participant preferences. In the BHMP participants often initially held preferences against eligible neighborhoods (Darrah and DeLuca (2014)), and in MTO participants did not move to all eligible neighborhoods (Aliprantis and Kolliner (2015); Davis et al. (2020)).[9]

Finally, we assume that no one in receiving neighborhoods moves in response to the HMP participants' arrival. This is likely reasonable given the small scale of the HMPs in question. In the baseline HMP where no more than 30 families can move per receiving tract, in Baltimore and Cleveland, respectively, movers represent 1.2 and 1.3 percent of the original population of opportunity area tracts. Again, assuming that these moves occur over the course of a decade or

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[6]The number 7.5 is selected based on a conversation with BRHP staff estimating that 5-10 percent of rental units in opportunity tracts are available and affordable to their program participants. Scott et al. (2013) cite 5 percent as a typical market vacancy rate when designing an HMP.

[7]We assume 30 families is $4 \times 30 = 120$ individuals.

[8]We again assume r families is $4r$ individuals.

[9]The evidence from MTO suggests that counseling must have very strong effects to offset poverty restrictions (Galiani et al. (2015); Shroder (2002)).

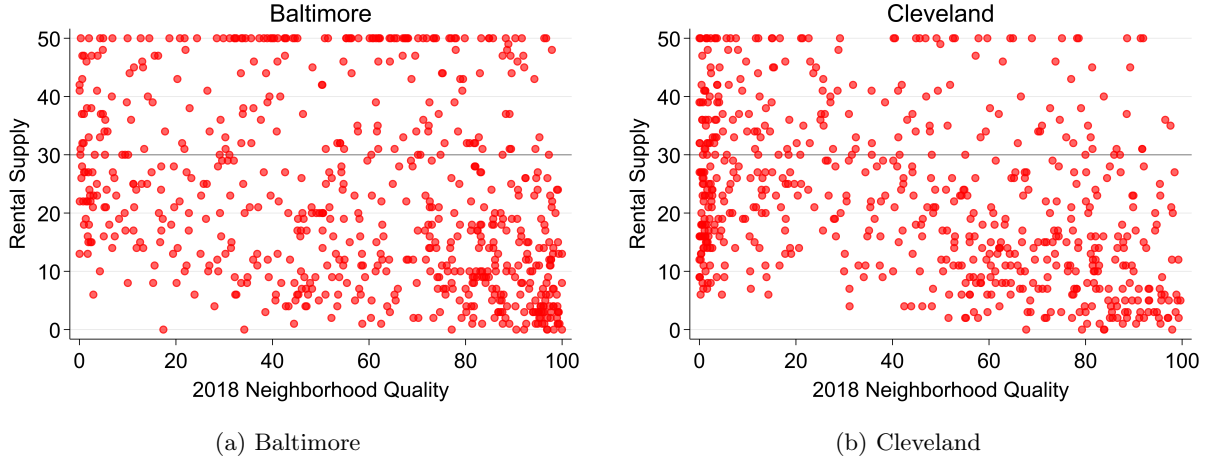(a) Baltimore   (b) Cleveland

Figure 6: Supply of Rental Housing Units

Note: This figure shows the joint distribution of rental housing supply and neighborhood quality for tracts in Baltimore and Cleveland. As described in the text, we define "Rental Supply" as 0.075 times the number of 2 bedroom or larger rental units in the tract in the 2014-2018 ACS/NHGIS.

two, an assumption of no mobility in response to the HMPs appears reasonable. Investigating the types of equilibrium dynamics that could result in neighborhoods (Hartley et al. (2020); Aliprantis and Carroll (2018); Caetano and Maheshri (2020)) and schools (Caetano and Maheshri (2017); Agostinelli et al. (2020); Angrist and Lang (2004)) are difficult to model and are left for future work.

Figure 7 shows the result of the baseline HMP in Baltimore. We see that the baseline HMP improves racial equality. The CDF of poor Black residents shifts right, so that our measure of racial equality improves from 38 to 52.
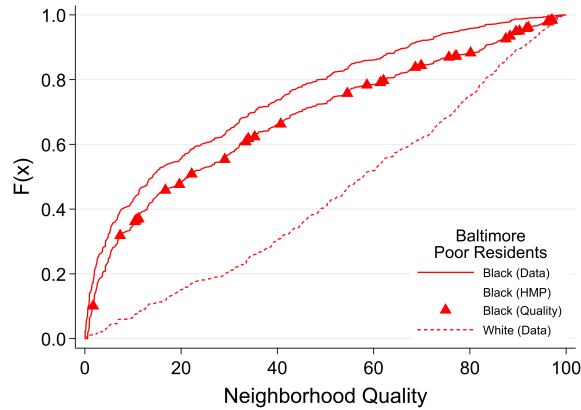

Figure 7: Results of the Baseline Housing Mobility Program in Baltimore

Note: This figure shows the neighborhood quality distribution of Baltimore's Black poor residents after the baseline HMP, highlighted by the triangle markers. The figure also shows the distributions of Baltimore's Black and white poor residents in the 2014-2018 ACS/NHGIS, indicated, respectively, with a solid and dashed line.

Figure 8 shows the result of the baseline HMP in all 54 metros in our sample, chosen because

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they all had at least one million residents in the 2017 ACS. The x-axis in the figure shows racial equality as measured in the current data, and the y-axis shows racial equality in the metro after implementation of the baseline HMP. All metros are above the 45 degree line, meaning there were improvements to racial equality. The metros currently having low levels of racial equality, like Baltimore, experience large improvements in racial equality. Some metros with a relatively small Black population share achieve full racial equality. A few cities are highlighted due to their prominent HMPs, and DC is highlighted due to its early adoption of SAFMRs.
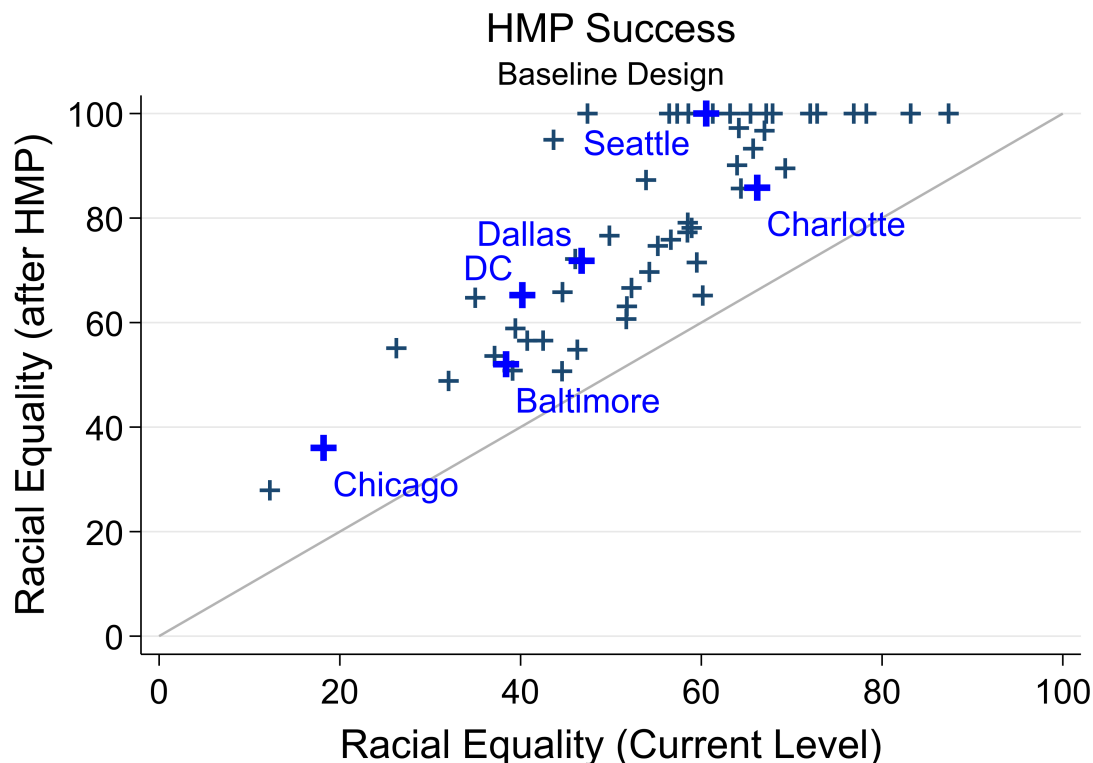

Figure 8: Results of the Baseline Housing Mobility Program in Large Metros

Note: This figure shows the racial equality measure defined in Section 2.2, which summarizes the area between the neighborhood quality CDFs of Black and white poor residents of a metro. On the x-axis is the racial equality measure from the data, the 2014-2018 ACS/NHGIS. On the y-axis is the racial equality measure after the baseline HMP simulations in each metro.

3.3 Changing the Measure of Neighborhood Effects Used in Opportunity Map

Under the assumptions of our baseline HMP, results are similar regardless of the measure of neighborhood effects used to draw the opportunity map. That is, an alternative program that ranks tracts according to another measure of neighborhood effects will generate very similar results to the baseline HMP. Figure 9 shows what will happen to each measure's distribution of poor Black residents in Baltimore under the baseline HMP that ranks tracts according to each possible measure. So, for example, Figure 9a shows how the neighborhood poverty rate of poor Black Baltimore residents would change under an HMP that was designed in terms of the COI (hollow

squares), neighborhood quality (hollow triangles), the OA (hollow circles), and poverty (solid X's). The counterfactual distributions are almost identical; the largest gap in CDFs appears in the far right tail of tracts. The same pattern holds across measures: If one is concerned with improving HMP participants' neighborhoods according to a specific measure, the baseline HMP with a design change to rank tracts according to any of the measures considered here would all perform similarly. The largest change would be for OA rankings of tracts.

(a) Simulated Effects of HMPs on Poverty

(b) Simulated Effects of HMPs on Quality

(c) Simulated Effects of HMPs on the COI

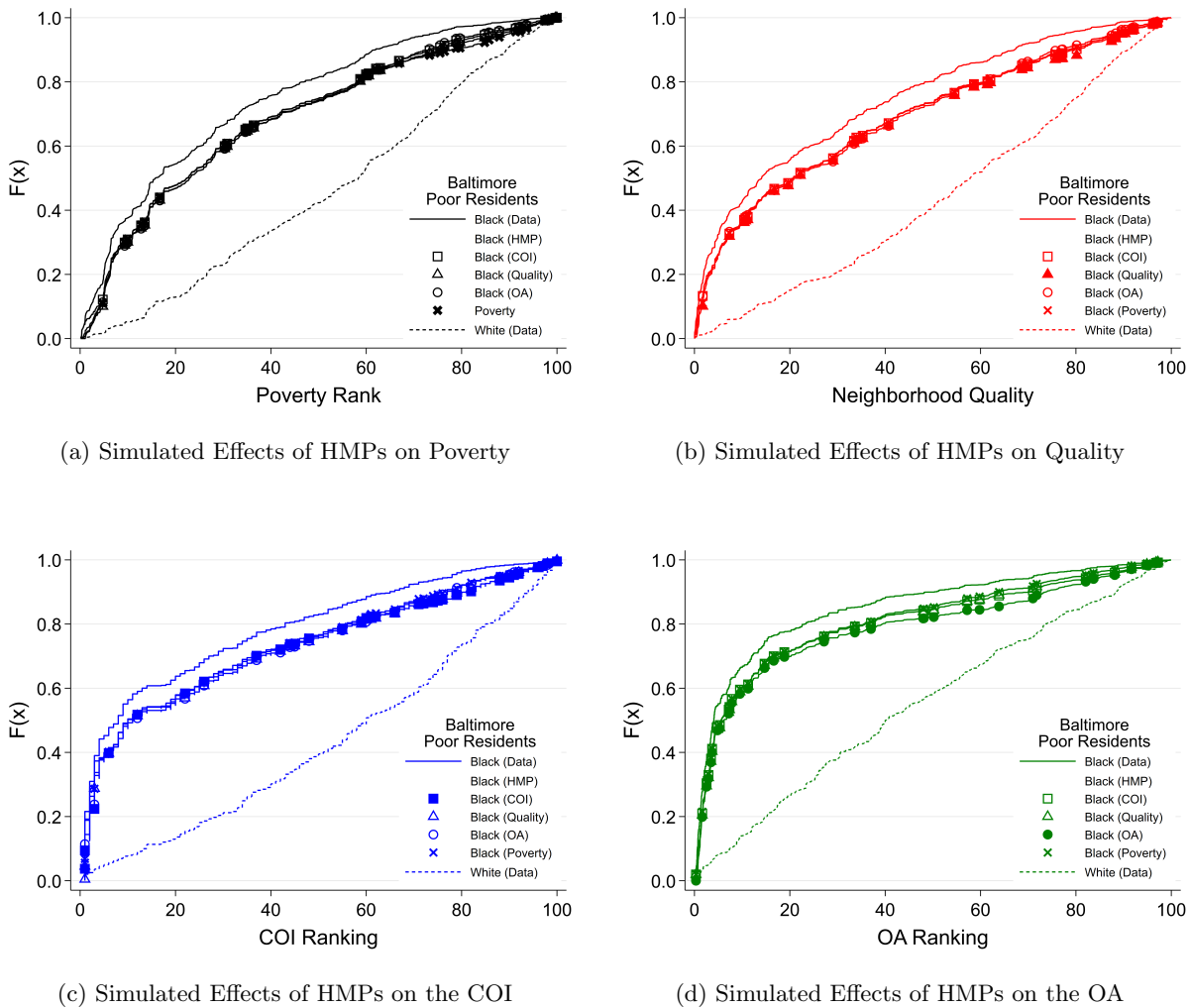(d) Simulated Effects of HMPs on the OA

Figure 9: Simulated Effects of HMPs in Baltimore, by Targeted Neighborhood Measure
Note: Each figure shows, for Baltimore, the simulated effects of HMPs targeting each measure of neighborhood effects on a given neighborhood measure. For example, Panel a shows how the neighborhood poverty rate of poor Black Baltimore residents would change under an HMP that was designed in terms of the COI (hollow squares), neighborhood quality (hollow triangles), the OA (hollow circles), and poverty (solid X's).

Changing the measure used to rank tracts in the design of an HMP results in small changes in racial equality across nearly all metros. Figure 10 shows the improvement in racial equality as measured by neighborhood quality that would result in all metros from using neighborhood quality rather than an alternative measure. For example, the bottom of the vertical lines in Figure 10a

shows the counterfactual racial inequality that would result from an HMP designed in terms of COI, and the tops of the vertical lines show the counterfactual racial inequality that would result from an HMP designed in terms of quality. If one cares about racial inequality, measured in terms of inequality, then an HMP designed in terms of COI rather than quality would yield very similar results. Of course, the remaining assumptions of our baseline HMP may not hold in reality, but these results suggest that focusing on those factors would be more fruitful than focusing on which measure to use to rank tracts.

(a) Quality Rather Than COI   (b) Quality Rather Than OA
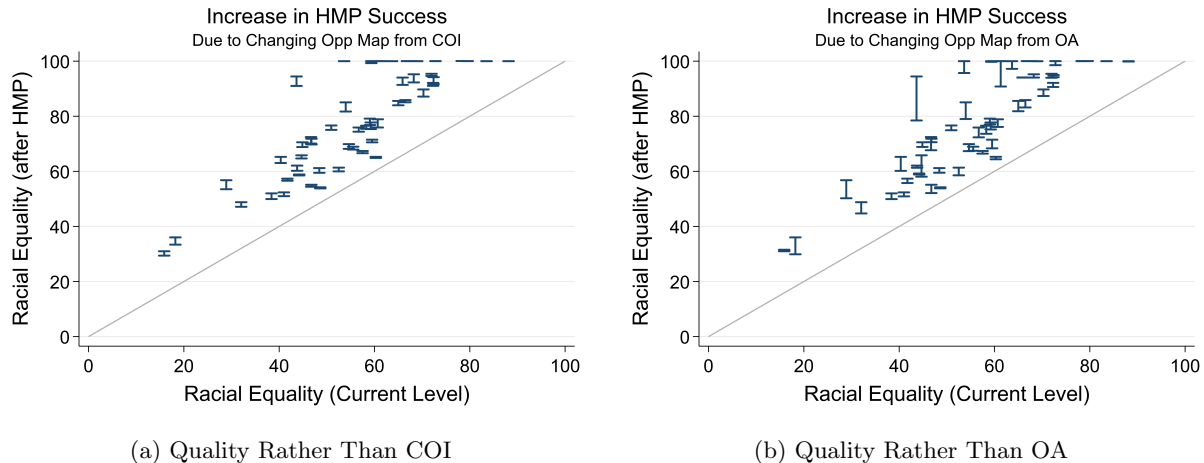
Figure 10: Increase in HMP Success Due to Changing Measure Used for Opportunity Mapping
Note: This figure shows the improvement in racial equality, as measured by neighborhood quality, that would result in all metros from using neighborhood quality rather than an alternative measure. The top of each vertical line shows the baseline HMP in a given metro targeting tracts in the top third of quality, and the bottom of each vertical line shows the baseline HMP in the same metro when instead targeting tracts in the top third of an alternative measure of neighborhood effects.

3.4 Changing the Target Population

What happens if the baseline HMP is changed from a race-based criteria targeting poor Black residents of a metro's lowest-ranking neighborhoods, to instead serve all poor residents of a metro, wherever they might live?[10] Figure 11a shows that if one's objective is racial equality, such HMPs might as well not be run. The top of each vertical line shows the counterfactual racial equality in each metro after the baseline HMP. The bottom of each vertical line shows the counterfactual racial equality in each metro after the baseline HMP adjusted to target only poverty to the exclusion of either race or current neighborhood ranking. In nearly every metro the HMP focused on poverty results in racial equality all but equal to the current racial equality seen in the data.

While race-based eligibility criteria might currently be prohibited under the current legal precedence, race-neutral policies may not be the only alternative. Race-conscious policies that disproportionately benefit African Americans could be both legally feasible and useful for generating racial equality. Figure 11b shows the results of race-conscious HMPs that target the poor residents

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[10]We randomly select poor individuals to simulate this HMP; details are provided in Computational Appendix A.

in the lowest ranked tracts in each metro.[11] Since Black residents are disproportionately found in the lowest ranked tracts, such a policy will disproportionately benefit African Americans. Again the top of these vertical lines show the baseline race-based HMPs, and the bottom of these vertical lines show the counterfactual outcomes from the race-conscious HMPs. In many cities, racial equality falls precipitously. However, in cities with a relatively large Black population share, the fall is muted. Thus, targeting poor residents in the lowest ranked tracts is an improvement over race-neutral HMPs, but does not entirely regain the lost ground relative to race-based HMPs.

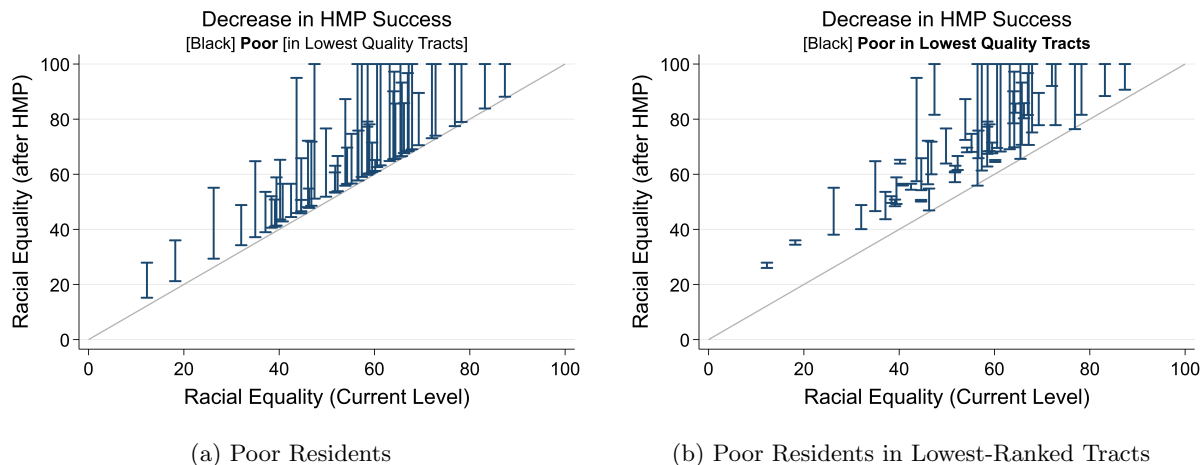(a) Poor Residents   (b) Poor Residents in Lowest-Ranked Tracts

Figure 11: Decrease in HMP Success Due to Changing Eligibility Criteria

Note: The top of each vertical line shows the counterfactual racial equality in each metro after the baseline HMP. The bottom of each vertical line shows the counterfactual racial equality in each metro after the baseline HMP adjusted to target a different group. The left panel shows the decrease from only targeting poverty to the exclusion of either race or current neighborhood ranking. The right panel shows the decrease from targeting poor residents in the lowest-ranking tracts.

3.5 Changing the Target Destination

We might also ask if, given political constraints, an organizing PHA might choose to design an HMP around its jurisdiction. Outside of legal judgments resulting in consent decrees like those obtained after lengthy court battles in Chicago and Baltimore, this option might be the status quo facing PHAs. We ask here: How critical is the regional design of an HMP relative to an HMP based on a metro's central city? Figure 12a shows that the counterfactual racial equality resulting from a central city HMP would be much lower than a metro-wide HMP. The tops of each vertical line shows the results of the baseline HMPs, and the bottoms of each vertical line shows the results of the central city HMPs. In nearly all metros there is a large reduction in racial equality.

3.6 Weakening the Housing Supply Constraint

Finally, we ask: How critical is the rental housing supply constraint to our results? We answer this question by simulating the baseline HMP after removing the rental supply constraint. In the

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[11]In many ways such a design is inspired by MTO, which targeted participants in the most socio-economically disadvantaged neighborhoods in the county.

simulations, this means that if a tract is ranked in the top third, then 30 families move into the tract. In reality, this means that the PHA or group of PHAs administering the HMP devote resources toward pre- and post-move counseling for tenants, moving cost and search assistance for tenants, post-move support for tenants, and landlord outreach in the form of recruitment and mediation. In the long term, this could also mean construction of rental units, whether focused on the affordable (Diamond and McQuade (2019); Joseph (2019)) or market-rate (Been et al. (2019); Mast (2019)) segments of the market.

Figure 12b shows that removing the supply constraint results in large improvements in racial equality. The bottoms of the vertical lines show counterfactual racial equality after the baseline HMPs, and the tops of the lines show counterfactual racial equality after the HMPs without housing constraints.

(a) Central City v. Entire Metro
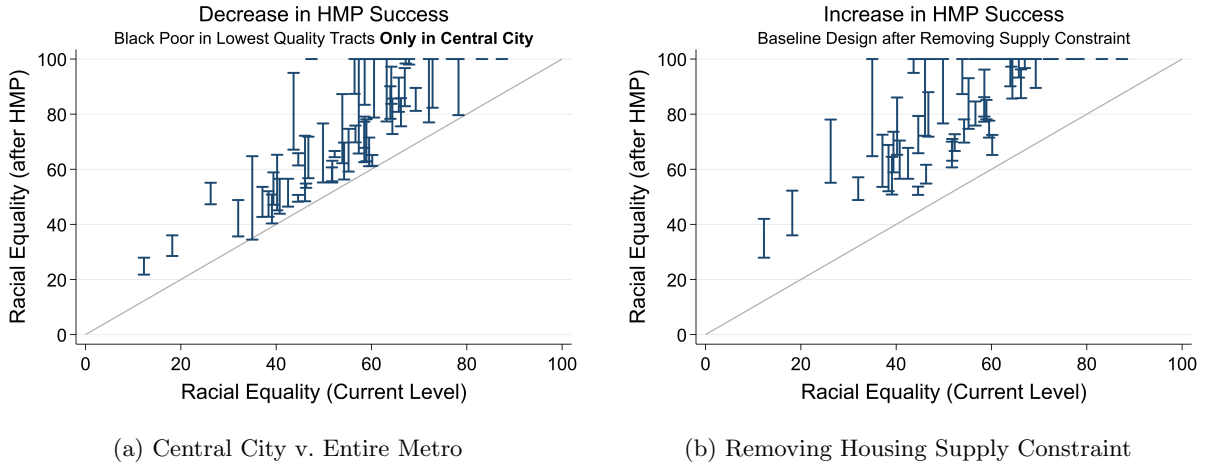
(b) Removing Housing Supply Constraint

Figure 12: Change in HMP Success Due to Changing Geographic Scope or Supply Constraint
Note: This figure shows changes in HMP success after changing two design features. The left panel shows results after changing the geographic scope of the baseline HMP to the restricted area of each metro's central city. The tops of each vertical line shows the results of the baseline HMPs, and the bottoms of each vertical line shows the results of the central city HMPs. The right panel shows the increase in HMP success when the rental housing supply constraint is removed. In the right panel the bottom of each vertical line shows the baseline HMP results and the top shows the results after the supply constraint is removed.

3.7   Summarizing Results

To summarize our results across metros, we compute a population-weighted measure of the change in racial equality from HMP h' relative to the baseline HMP h as

$$\text{Change in Success} = \sum_{m=1}^{54} \frac{RE_m(h') - RE_m(h)}{RE_m(h) - RE_m(data)} \pi_m$$

where π_m is the share of the Black poor in all 54 metros that resides in metro m. Figure 13 plots the results.

The first three bars in Figure 13 show that by changing the measure used to rank neighborhoods, racial equality will change by 16, 8, or 19 percent. We interpret these magnitudes as being small

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for three reasons. First is their size relative to the effects of the other changes to HMP design we consider. Second is the uncertainty around the best measure of neighborhood effects. Appendix B shows scatter plots of local tract rankings for the OA and 2018 neighborhood quality that flag tracts with two sources of uncertainty documented in Aliprantis and Martin (2020): Large changes over time and small sample sizes. We see that large disagreements in rankings tend to come in tracts that have experienced large changes in demographics since the OA sample was residing there and in tracts in which OA estimates rely on a small number of children. In most metros, measures are much more tightly correlated in tracts where we are most confident that each measure is accurate. And third, we expect that local knowledge and idiosyncratic program constraints will be used to finalize opportunity maps. The iterative process used to finalize an opportunity map – even when based on a single ranking as a starting point – will likely generate similar differences when measured solely in a data-based analysis. Examples of this iterative process can be found in Chapter 3 of Scott et al. (2013), Appendix A of Bergman et al. (2020), or Weismann et al. (2020).
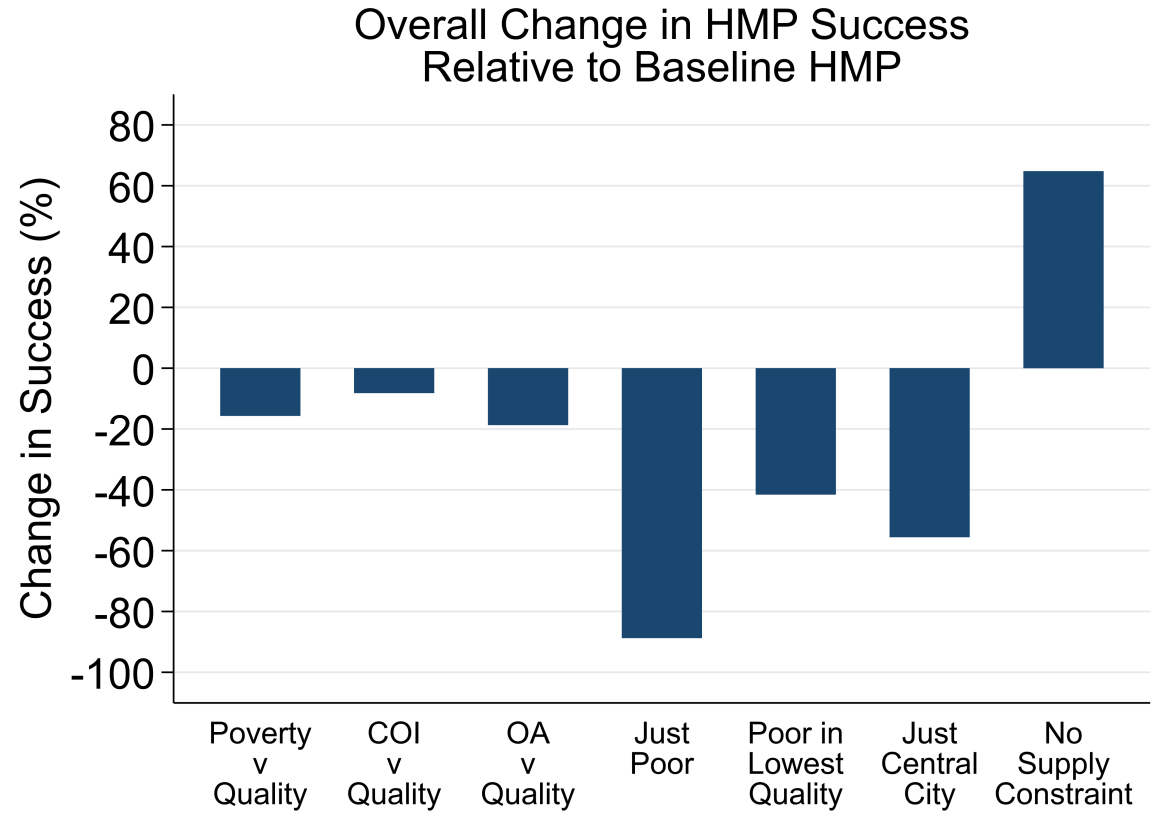

Figure 13: Population-Weighted Change in Success of HMPs by Design Choices

Note: This figure shows how the success of HMPs in fostering racial equality changes relative to the baseline HMP. Each bar shows the metro-level change in success summed across metros after weighting by the share of Black poor residing in each metro. The first three bars show the overall change in success after changing the targeted measure used to rank neighborhoods. The next two bars show changes after changing the criteria determining the eligible population. The penultimate bar shows the results of changing the geographic scope of each HMP, and the final bar reports the weighted change in success if HMPs are able to eliminate the rental housing supply constraint.

The fourth and fifth bars from the left in Figure 13 show that elibility criteria matter tremendously. Adopting an entirely race-neutral design will reduce gains in racial equality by 89 percent. Even adopting a race-conscious HMP design that targets poor residents in the lowest-ranked tracts will reduce gains in racial equality by 42 percent relative to the baseline (race-based) HMP.

The last two bars in Figure 13 show that design choices around expanding geographic scope and weakening housing supply constraints have large effects on the ability of HMPs to foster racial equality. Designing an HMP around the central city of a metro, rather than all counties in the metro, will reduce gains in racial equality 56 percent. And designing an HMP that provides ample resources toward search assistance and counseling for tenants along with outreach to landlords has the potential to increase the gains in racial equality by 65 percent.

4   Conclusion

This paper investigated how impactful various design features of housing mobility programs (HMPs) are to reducing racial inequality.

For a Public Housing Authority (PHA) contemplating the design of an HMP, we interpret our simulation results as follows: While opportunity mapping matters, and deserves careful attention, the precise tracts chosen for inclusion in an opportunity area is a secondary consideration relative to three other design features. An HMP will bring about greater improvement in racial equality if it is designed as a regional partnership encouraging moves across multiple counties in a metro rather than just the metro's central city. Supply of reachable housing units is also key; HMPs will improve outcomes if they increase supply through services such as tenant counseling and outreach to landlords. Targeting the right tenants for moves is also key; even if HMPs cannot be race-based, a race-conscious design that disproportionately benefits African Americans is preferable to a race-neutral design. The benefits of adopting one or more of these features can be significant. In our simulations, progress toward racial equality is made in all metros, and there are some metros in which racial equality for poor residents is achieved completely.

Some design features are likely more costly, both in terms of money and political capital, than others. A roadmap such as this can be useful in weighing the potential benefits of such features against their cost. PHAs may use these results as a starting point to identify which features to prioritize when designing their programs.

While the moves contemplated in these simulations have a substantial impact on the residents, they need not dramatically alter the composition of the receiving neighborhoods. In our baseline HMP, large improvements in the neighborhood characteristics of poor Black residents can be achieved by programs that are approximately the size of the BHMP. The movers in our baseline program typically add about one percent to the receiving neighborhoods' populations; following the lead of prior programs, these moves would typically be implemented over the course of one or two decades. Gradual implementation of such a program allows for the evaluation of its success, adjustments to respond to political concerns, and time for residents in receiving neighborhoods to

understand the proposed program (Eligon (2020)).

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A   Computational Appendix

Step 1: In receiving neighborhoods, determine the total number of movers in each metro given f, the maximum number of families that can move to a new tract.

In HMPs with Rental Housing Supply Constraint:
    Step 1.1: Determine the total number of movers per tract in receiving tracts, or those in the top third of eligible local tracts:
        a. If a tract has housing supply equal to or greater than f, then assign $f \times 4$ as the number of movers to the tract.
        b. If a tract has housing supply $h < f$, then assign $h \times 4$ as the number of movers to the tract.
In HMPs without Rental Housing Supply Constraint:
    Step 1.1: Set the total number of movers per tract in receiving tracts, or those in the top third of eligible local tracts, to $f \times 4$.
    Step 1.2: Add up the movers to each tract to get tm, the total number of movers for each metro.
    Step 1.3: Divide tm by the total number of poor in each metro to get the percentage of poor who can move, pm.

Step 2: In origin neighborhoods, select individuals to move from original tracts.

Race-Based (Baseline) HMP:
    Step 2.1: Order tracts by quality.
    Step 2.2: Select the Black poor people in the lowest-ranked tract until reaching tm.

Race-Conscious HMP:
    Step 2.1: Order tracts by quality.
    Step 2.2: Select the poor people in the lowest-ranked tract until reaching tm.

Race-Neutral HMP:
    Step 2.1: Create a set of indicator variables for whether poor person i of race Any/Black/White/Other resides in tract t.
    Step 2.2: To each poor person i in tract t, assign them a draw u from a uniformly distributed random variable.
    Step 2.3: Let the percentage of movers in metro m be the number of total movers divided by the number of poor residents, $pm = \frac{tm}{\#poor}$.
    Step 2.4: If $u(t, i)$ is less than pm in individual i's metro, then move individual i out of tract t.

Note:
In HMPs administered at the level of their metro's central county, both movers and eligible local tracts are located in the central county.
In HMPs administered at the metro level, both movers and eligible local tracts are located anywhere in the metro.

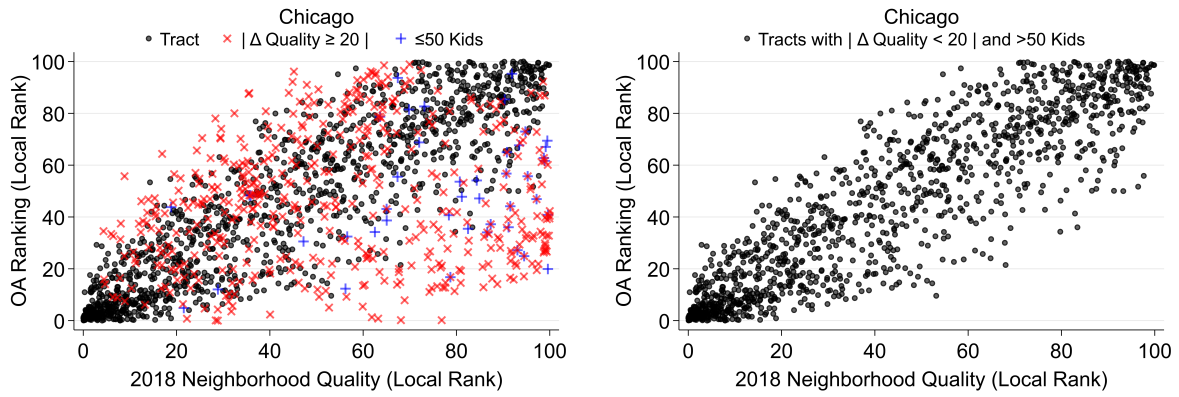# B   Uncertainty in Measuring Neighborhood Effects

Figure 14: Chicago

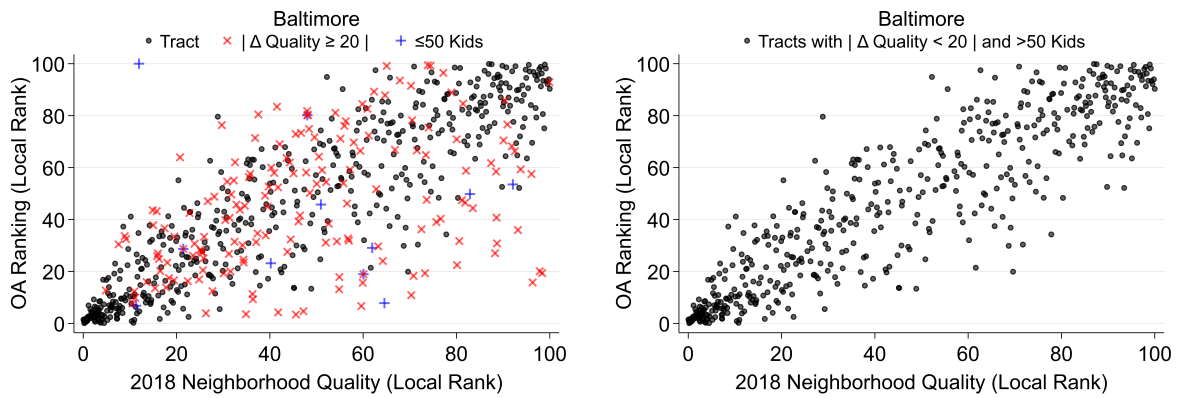Note: See note to Figure 19.

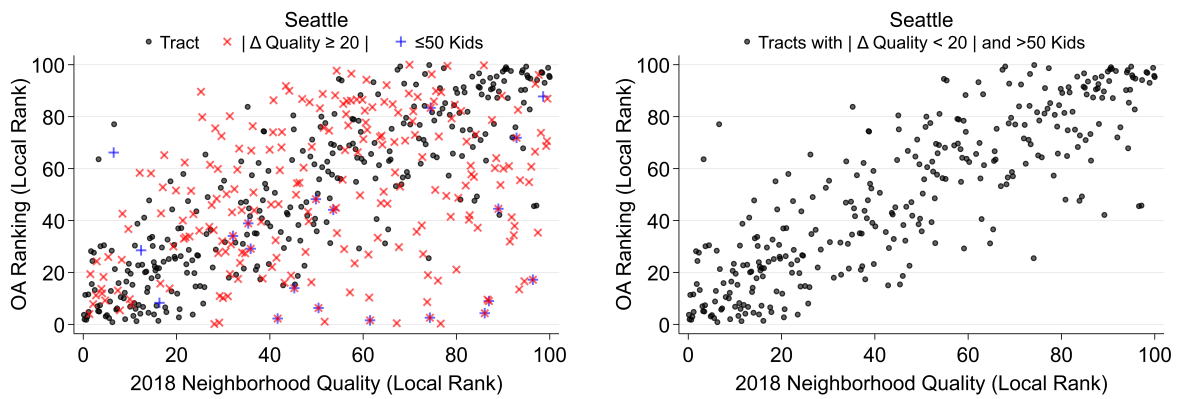Figure 15: Baltimore

Note: See note to Figure 19.

Figure 16: Seattle
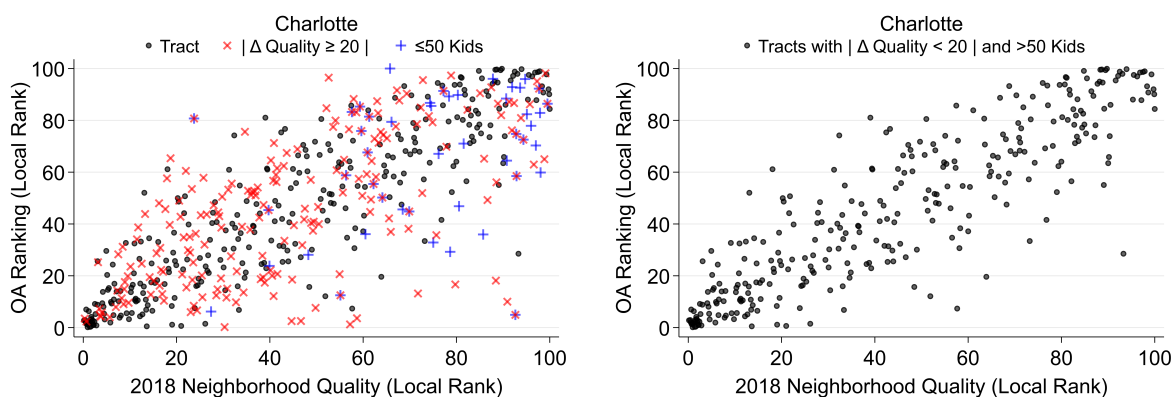
Note: See note to Figure 19.

Figure 17: Charlotte
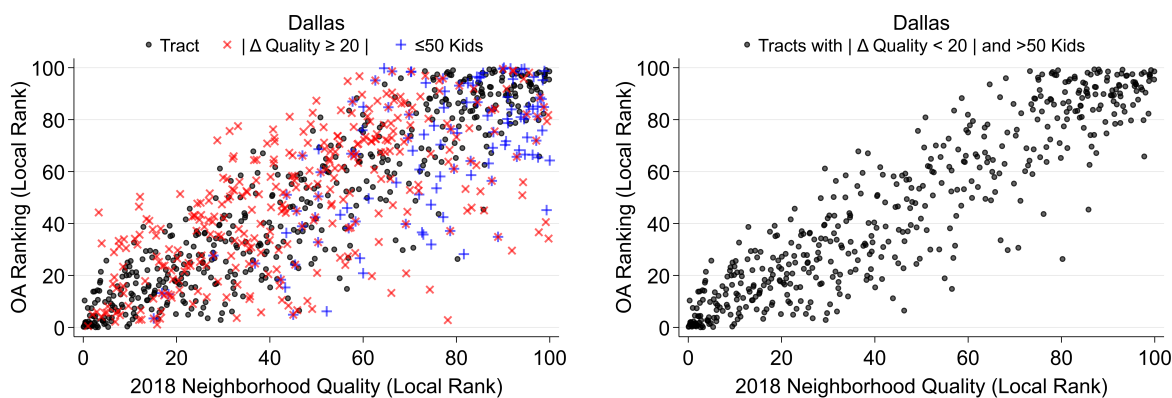
Note: See note to Figure 19.
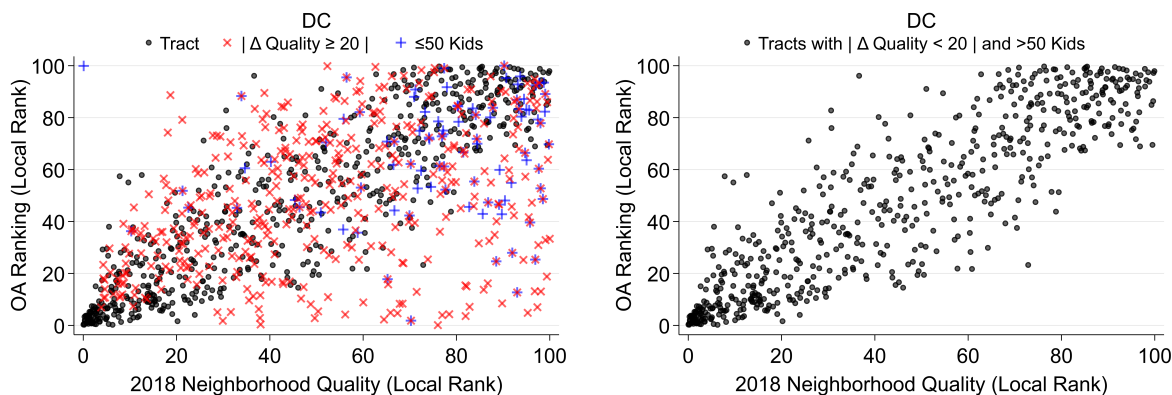

Figure 18: Dallas

Note: See note to Figure 19.

Figure 19: DC

Note: These figures show the joint distribution of the local ranks of tracts in terms of 2018 neighborhood quality and mean family income pooled over race/ethnicity and gender as estimated in the Opportunity Atlas (OA). The left panel flags tracts that either experienced a change in quality (in the local distribution) between 1990 and 2018 of at least 20 percentile points, or else that had less than 50 children in the OA sample age range in the 1990 Census. The right panel shows only those tracts that are not subject to these two sources of uncertainty in OA estimates.