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Segregating Gotham's Youngest: Racial/Ethnic Sorting and the Choice Architecture of New York City's Pre-K for All

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New York City's *Pre-K for All* (PKA) is the Nation's largest universal early childhood initiative, currently serving some 70,000 four-year-olds. Stemming from the program's choice architecture as well as the City's stark residential segregation, PKA programs are extremely segregated by child race/ethnicity. Our current study explores the complex forces that influence this segregation, including the interplay between family choices, seat availability, site-level enrollment priorities, and the PKA algorithm that weighs these and other considerations. We find that a majority of PKA segregation lies within rather than between local communities, suggesting that reducing segregation would not necessarily require families to choose programs far from home. On a more troubling note, areas with increased options and greater racial/ethnic diversity also exhibit the most extreme segregation.

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Abstract

New York City's *Pre-K for All* (PKA) is the Nation's largest universal early childhood initiative, currently serving some 70,000 four-year-olds. Stemming from the program's choice architecture as well as the City's stark residential segregation, PKA programs are extremely segregated by child race/ethnicity. Our current study explores the complex forces that influence this segregation, including the interplay between family choices, seat availability, site-level enrollment priorities, and the PKA algorithm that weighs these and other considerations. We find that a majority of PKA segregation lies within local communities, suggesting that reducing segregation would not necessarily require families to choose programs far from home. On a more troubling note, areas with increased options and greater racial/ethnic diversity exhibit the most extreme segregation.

Keywords: Segregation; choice; early childhood education

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In recent years policymakers have sought to provide equitable access to high-quality early childhood programs (Cascio, 2021; McCoy et al., 2017; Van Huizen & Plantenga, 2018; Weiland & Yoshikawa, 2013). State funding for pre-kindergarten initiatives more than tripled from $2.4 billion in 2002 to $9 billion in 2019 (Friedman-Krauss et al., 2021). These resources have fueled expansions beyond programs targeted at low-income children to include universal access for all families, regardless of income. New York City's *Pre-K for All* (PKA) initiative is the largest and one of the most complex universal early childhood programs in the U.S. Established in 2014, some 70,000 children—roughly two out of every three New York City (NYC) four-year-olds—currently attend one of more than 2,000 PKA programs free of charge (Latham, Corcoran, Sattin-Bajaj, & Jennings, 2021; Potter, 2016). To put the magnitude of the effort into context, New York City educates more pre-K children than there are K-12 students in Boston, Seattle, Detroit, or San Francisco (U.S. Department of Education, 2020).

Beyond PKA's universal approach, other aspects of the program were designed with an eye toward promoting equitable access to quality. Families can apply to any PKA program citywide, potentially increasing access to high-quality and demographically diverse programs unavailable in their immediate neighborhood. One concern, however, is that family choices within this vast system, combined with New York City's severe residential segregation, will sort children into programs by their racial/ethnic backgrounds. In addition to family preferences, many pre-K sites target their services to low-income families, while others include geographic preferences in the admissions process, design components that potentially influence pre-K site

racial/ethnic composition. Thus, beyond residential segregation, pre-K segregation depends on the alchemy of family choices, the availability of seats, site-level enrollment priorities, and the PKA algorithm that weighs these and other considerations.

Our current study examines this interplay between NYC's pre-K choice and allocation process and the highly segregated context in which families make their decisions. We describe the nature and location of racial/ethnic segregation across PKA programs, and the extent to which it varies by children's race/ethnicity. We also contrast segregation among programs with different enrollment priorities and programmatic offerings. We then explore segregation patterns across NYC's five boroughs and 32 community school districts (see Figure 1), highlighting the degree to which those patterns relate to local racial/ethnic enrollment characteristics. Finally, we compare levels of pre-K segregation among families who do and do not participate in the PKA choice process during the regular application period and conduct a simulation that estimates PKA segregation under different choice outcomes. The results indicate the inherent challenge of fostering racial/ethnic diversity in pre-K programs within a highly segregated residential context and across sites that include programs primarily intended to serve low-income families.

Background

We ground our conceptual understandings in several distinct but overlapping bodies of research. In the sections below we highlight similarities and divergences between the robust literature on K-12 school choice and school segregation with the parallel (but still emerging) literatures from early education contexts. We then describe in more detail the *Pre-K for All* choice and assignment process, and the highly segregated and stratified residential landscape in which New York City families are matched to pre-K programs.

Educational Choice

In general, the vast literature on K-12 school choice is applicable to early childhood contexts, particularly studies that acknowledge the complex web of forces influencing family educational choices (Berends, 2019; Henig, 1994). This literature stands in stark contrast to "rational choice" interpretations, which view families as educational consumers who logically rank-order options from the most to least desirable, and where the quality of academic curricula and instruction are thought to drive decisions (see Becker, 1981; Chubb & Moe, 1990; Friedman, 1955). Although academic quality may indeed be paramount for many families (Schneider & Buckley, 2002), more nuanced understandings recognize that educational choice processes are also influenced by a host of other family assets, needs, preferences, and values, and the wider contexts in which families make their decisions. Moreover, the outcomes of choice processes are deeply affected by how options are structured and presented, commonly referred to as the "choice architecture" of a given system (Thaler & Sunstein, 2009). This architecture includes the number and nature of options presented, how easy they are to evaluate and compare, the clarity and sufficiency of information, and the extent to which choices are fulfilled. This conceptual frame informs the present analysis by viewing family choices as reflections, in part, of the policy decisions that determine the design and implementation of New York City's pre-K application and enrollment process, and how those structures interact with the lived experiences of children and families.

Of particular importance for our current study is K-12 literature that examines the degree to which school racial/ethnic composition influences the group of schools that families consider—their "choice set" (Bell, 2009a, 2009b). For example, white families often employ a two-step process in which they first eliminate some schools based on a single, dominant criterion

such as racial/ethnic composition (Billingham & Hunt, 2016; Goyette, 2008; Holme, 2002; Roda & Wells, 2013; Saporito & Lareau, 1999). Indeed, white families regularly equate school quality with the presence of white students (Johnson & Shapiro, 2003), and will often not consider schools that serve high proportions of Black and Latino/a students, even when such options have more favorable academic and behavioral characteristics (Goyette, 2008; Saporito & Lareau, 1999). Only after choices are restricted on this characteristic do other criteria—such as school mission, curriculum, and pedagogy—come into play. Conversely, Black families may be somewhat more likely to include predominantly Black schools in their choice sets (Lareau, Evans, & Yee, 2016). As we discuss below, this notion of "choice sets" is quite relevant in the NYC pre-K context, in which families literally submit a set of pre-K programs that they will consider as part of their application.

While the K-12 school choice literature is in many respects relevant to early childhood, some important differences warrant attention. Studies of preschool choice indicate that families consider a host of factors, including program quality and pedagogy, as well as how programs align with their budgets, work schedules, home language, children's dis/ability status, and proximity to their home or employment (e.g., Ansari, 2017; Miller, 2016; Weber et al., 2018). Universal programs take financial constraints out of this complex equation. Yet for many families, proximity to their home may be paramount, given that pre-K children are considerably less likely to travel to school by themselves, either by walking or via public or school-provided transportation. Moreover, many families seek to protect and promote important social bonds between their young children and the local community. In Chicago, for example, the geographic distribution of pre-K sites and the distance from family residence to the nearest pre-K were found to be important for child access and enrollment (Erlich, et al., 2020). This all suggests that

neighborhood segregation may play a larger role in stratifying universal pre-K programs compared to K-12 schools.

When selecting pre-K programs, parents may also, in effect, self-segregate based on preferences regarding school climate and pedagogy. For example, Barbarin et al. (2006) found that when deciding where to enroll their children in preschool, white parents relied more on the emotional tenor of the classroom, while Black parents relied more on the quality of the home-school partnership. Latino/a parents were more often focused on whether programs offered comprehensive services, and particularly how well they attended to children's dual-language development. In addition, some Black and Latino/a parents may prefer programs that adopt more directive pedagogies, while white parents may be more likely to favor child-centered approaches (Barbarin et al., 2008; Tobin, Arzubiaga, & Adair, 2013).

Another important distinction between the K-12 and early childhood landscapes is that many states and districts, including New York City, use mixed-delivery systems that engage multiple settings to provide pre-K: public schools, charter schools, pre-K centers, and community-based organizations. These diverse settings offer different levels of health, mental health, employment, and nutrition services, as well as child care for extended days and the summer months (National Center on Early Childhood Quality Assurance, 2020). Households with low-incomes may understandably prefer programs that provide the most comprehensive services, typically found in sites that receive Head Start and/or child care funding in addition to their pre-K funding (Barbarin et al., 2006). While Head Start and child-care sites are allowed to enroll children of any income, they prioritize low-income families. Given the disproportionate poverty rates among children of color, this cycle of enrollment priorities and family preferences increases both poverty and racial/ethnic concentrations. These issues are all quite salient within

NYC's *Pre-K for All* initiative, and represent important context for understanding patterns of segregation across programs within mixed-delivery systems.

Why Pre-K Segregation Matters

Decades of research highlights the harms associated with K-12 school segregation (Clotfelter, 2004; Mahard & Crain, 1983; Mickelson, 2012, 2013; Reardon, 2016; San Miguel, 2005; Wells, Holme, Revilla, & Atanda, 2009). Recent empirical studies using nationally representative data report negative associations between the isolation of historically marginalized children and literacy development in kindergarten and first grade, and mathematics learning in first grade, even accounting for children's own socio-demographic backgrounds (Dumont & Ready, 2020). Longitudinal analyses further suggest that over time, school districts with increasing levels of segregation also experience increasing levels of racial/ethnic inequality in student outcomes (Matheny, Thompson, Flores, & Reardon, 2021).

Emerging findings from early childhood contexts suggest similar results. Children attending pre-K programs with higher proportions of low-income children and children of color have, on average, weaker mathematics, literacy, and executive function development (Miller, et al., 2017; Reid & Ready, 2013). Program demographic composition is also associated with teacher/instructional quality and with peer effects, which are particularly important for children who start pre-K with fewer early academic skills (Bassok & Galdo, 2016; Henry & Rickman, 2007; Mashburn, Justice, Downer, & Pianta, 2009; Justice, Petscher, Schatschneider, & Mashburn, 2011; Valentino, 2017; Weiland & Yoshikawa, 2014). Similar trends have been reported within NYC's PKA, where white children attend programs with higher average quality ratings than Black children, and communities with majority-Black populations are much less likely to be located in proximity to high-quality programs (Latham, et al., 2021). Importantly,

this spatial distribution of quality between Black and white communities was not found between white and Hispanic and white and Asian communities. Adding to this inequity, observed gains in PKA program quality since 2014 appear to have been concentrated in programs that serve predominantly white or Asian children (Fuller, Leibovitz, Chin, Du, Garcia, & Kim, 2020).

Pre-K for All **in New York City**

Pre-K for All is administered by the NYC Department of Education (DOE). Families can currently choose from a wide array of over 2,000 PKA programs. More than half of families select New York City Early Education Centers (NYCEECs), which are privately managed organizations that contract with the DOE to provide PKA, while offering multiple services to their communities. As noted, many NYCEECs receive Head Start and/or child-care funding in addition to their PKA funding. Over one-third of families choose pre-K programs housed within public elementary schools. Eight percent of families select stand-alone pre-K centers, also operated by the DOE, and a small number (under one percent) select pre-K programs hosted by charter schools.

The DOE provides an online system that families can use to identify, apply to, and enroll in these myriad options during a six-week application period that runs from January through March. Families can also apply via telephone or by visiting Family Welcome Centers located throughout the city. The PKA website offers basic information about program hours, what meals are offered, and the availability of outdoor play spaces. Importantly, the website also provides measures of program quality, including observational scores from the Early Childhood Environment Rating Scale (ECERS-R), which measures the learning environment, and from the Classroom Assessment Scoring System (CLASS), which measures teacher/child interactions. The website does not, however, indicate the racial/ethnic or socioeconomic composition of the

children served (although these data are publicly available). After reviewing this information, parents can choose up to 12 programs and rank them in order of preference.

At the end of the application period, the DOE algorithm simultaneously considers all applications (i.e., the process is not first-come, first-served) and determines which program to offer to each child. The DOE then makes offers to families in May, who can decide to accept the offer, remain on waitlists for other choices, or decline enrollment entirely. Families who miss the application period are still guaranteed a spot and can add themselves to a DOE-managed waitlist of programs using the same website or phone number, or with help from a Family Welcome Center. Individual programs can also add families to the same waitlist. Importantly, however, families who miss the application deadline are less likely to receive their top choices, as spots in oversubscribed programs are likely to have been filled.

As noted above, PKA sites vary in their selection rules and criteria. Programs in public schools typically give priority to children who live in the community school district or the local elementary school catchment area, and all programs give preference to families where an older sibling is already enrolled. In NYCEECs, if children have been enrolled for program services as 3-year-olds, they are automatically enrolled as 4-year-olds in the site's PKA program, with the family's consent. Some NYCEECs also offer a limited number of pre-K seats with extended days (10 hours per day) and extended years (12 months), which are reserved for children from low-income families. Responding to the City's call for greater diversity in program enrollment, a small number (about 42) of NYCEECs have voluntarily elected to give priority admission to groups of children, such as those who are low-income or emergent multi-language learners (EMLLs), with the purpose of increasing heterogeneity in the children who attend their PKA programs.

Pre-K Choice within New York City's Segregated Landscape

New York City's residential segregation has obvious implications for pre-K segregation. Taken as a whole, the extent of neighborhood segregation in NYC is comparable to that found in other major U.S. cities (Logan & Stults, 2021). But these estimates, which typically combine all five NYC boroughs, hide the stark segregation within NYC's three largest boroughs. For example, Black/white residential segregation in Brooklyn, Queens, and Manhattan is more severe than that found in any of the top 10 largest U.S. cities, except for Chicago (University of Wisconsin Public Health Institute, 2022; U.S. Census Bureau, 2022).

New York City's segregation stems from a vast web of intentional legislative and judicial actions, and other social and economic manifestations of the deep-seated structural racism endemic to the U.S. (Hannah-Jones, 2016; Massey & Denton, 1993). The practice of "redlining" during the 1930s and 40s, whereby the federal government refused to insure mortgages within predominantly non-white neighborhoods (Aaronson, Hartley, & Mazumder, 2020; Rothstein, 2017), combined with mid-century "slum clearance" (Caro, 1974; Jackson, 1985; Plunz, 2016) and restrictive covenants limiting the ability of non-white families to move into burgeoning suburban communities (Jackson, 1985; Rothstein, 2017), left hundreds of thousands of New York City families with limited housing options.

New York City segregation is also sustained by its dense concentrations of public housing. Compared to other metropolitan areas, a larger proportion of New York City low-income families live in high-rise public housing buildings rather than low-rise garden style apartments (Rothstein, 2017). While other cities have demolished large public housing projects over the past decades, as Chicago did with Cabrini-Green and St. Louis with the Pruitt-Igoe towers (Austen, 2018), New York City has continued to cluster public housing residents in large

developments. For example, the City now operates the largest public housing complex in the U.S.—the Queensbridge Homes—a development in Queens consisting of over 3,400 apartments and 6,000 residents built on only 50 acres (Kilgannon, 2018). One result of these dense concentrations is that half of the children living in NYC public housing are clustered within only 10% of the City's elementary schools (Furman Center, 2008).

In contrast to these segregating forces, much has been written about New York City's gentrification (Freeman, 2006; Moskowitz, 2018; Osman, 2011; Sutton, 2020), which has contributed to some reduction in neighborhood segregation over the past decade. Between 2009 and 2019 Black/white segregation in Manhattan and Brooklyn decreased by over 10 percent (U.S. Census Bureau, 2022). However, there is a growing disconnect between neighborhood racial/ethnic composition and the racial/ethnic composition of schools in the same neighborhood. Many white families in gentrifying neighborhoods select public schools and programs outside their neighborhood (Hemphill & Mader, 2015; Stillman, 2012), including gifted and talented programs (Roda, 2015) and dual-language immersion options (Kim, 2020). Indeed, over the past decade, despite a slight decrease in neighborhood segregation, Black/white *school* segregation in New York City increased somewhat (Ready & Bretas, 2018). Moreover, many socioeconomically advantaged families in gentrifying neighborhoods, who are disproportionately white, enroll their children in private schools. Remarkably, half of the white school-aged population living in New York City attends private schools (Domonico, 2020). In total, the implications of New York City's stark residential segregation for our exploration of pre-K segregation are clear.

Research Focus

Our current study explores racial/ethnic segregation across NYC universal pre-K programs during the 2017-18 academic year. We begin by describing the participating children and the characteristics of the programs they attend. We then explore the nature of racial/ethnic segregation across pre-K programs and the extent to which segregation differs among specific racial/ethnic groups and program types. For example, we contrast the degree of segregation between Black and Hispanic children with that found between Black and white children, and the segregation among programs sponsored by community organizations versus that found among programs located in public (non-charter) schools. We then compare segregation patterns across NYC's five boroughs and 32 community school districts (CSDs; see Figure 1), and examine how these patterns relate to the particular racial/ethnic composition of each CSD and borough. We assume, for instance, that segregation patterns in the Bronx, where white children constitute roughly five percent of all PKA enrollees, will differ from those in Staten Island, where almost half of PKA children are identified as white. Finally, we more closely examine the roll of family pre-K choices in program segregation. We estimate segregation among families that do and do not participate in the regular PKA application process and then estimate how segregation would have been exacerbated or ameliorated had all families been provided their first choice pre-K program. We are particularly interested in whether the links between choice and segregation depend on the racial/ethnic identities of the families doing the choosing.

Data and Methods

The New York City Department of Education (DOE) provided restricted-use data on PKA applications and enrollment for the 2017-18, 2018-19, and 2019-20 academic years. Given that findings were virtually identical across years, we report results here only for 2017-18. In

addition to child demographic information and residential census tract, the data include family PKA choices, the specific PKA program subsequently offered to families, and the program in which the child ultimately enrolled. Our application data also indicate whether a child's family applied to a PKA program during the six-week application process (referred to here as "choosers") or after the conclusion of the application period ("non-choosers"). Again, recall that families who miss the application period are still guaranteed a spot in a program, but only in programs with available seats. For each PKA program, we have information on site type (NYCEEC, public school, pre-K center, or charter school), enrollment demographics, services provided, census tract, CSD, and borough. In addition, we linked child residential census tracts with the median income for each tract, drawn from the American Community Survey 2014-19 data (five-year-estimates).

Analytic Samples

After excluding programs that exclusively serve children with special needs, our sample includes 1,787 pre-K sites. With our analyses of family pre-K choices, the sample is slightly smaller (n=1,769), as some sites enrolled no families who participated in the choice process during the regular application period, and other programs were not in operation for the 2017-18 academic year, even though they were listed as options during the application process. Similarly, the analyses of first-choice pre-K sites is somewhat smaller (n=1,779), as some pre-K sites were listed as the first choice by no families. Note that the number of pre-K sites in 2017-18 is somewhat smaller compared to today. As the program has expanded in recent years, so has the number of sites. Our child-level analytic sample includes 66,327 children with full demographic data whose home addresses the DOE could match to census tracts and CSDs. Fortunately, these restrictions resulted in the loss of virtually no children (less than 0.1%).

Measures

Our data include child-level information on race/ethnicity (Asian, Black, Hispanic, white, and multiracial/Native American) as indicated by the child's family. We use the terms Black and Hispanic throughout to be consistent with the NYC DOE data collection and reporting conventions, and the questions to which families responded during the pre-K application process. We aggregate these child-level characteristics to the pre-K site level in our discussion of both site characteristics and racial/ethnic composition. Our descriptive analyses employ child-level measures of sex, and EMLL and Individualized Education Plan (IEP) status, which we also aggregate to the site level. Our poverty indicator was drawn by the DOE from site reports on child-level participation in the Free and Reduced Price Lunch (FRPL) program as well as family eligibility for public assistance as identified by the NYC Human Resources Administration (HRA). Because many NYCEECs provide meals to all enrolled children and do not participate in the FRPL program, this measure likely undercounts child poverty rates. Even under the best conditions, FRPL measures are relatively blunt indicators of family income (Domina et al., 2018). In response, our child-level descriptive analyses include the median census tract income of each child, which we also aggregate to the pre-K site to better understand program-level characteristics.

Although not a central analytic focus, we were interested in the distance children traveled from home to their pre-K program. Rather than home address, the DOE provided the census tract of each child's residence. Participating children lived in one of 2,093 census tracts. Given New York City's dense housing concentrations, census tracts are geographically smaller than in virtually any other part of the U.S. Specifically, the average NYC census tract is only about 90 acres, or 0.14 square miles (0.07 square miles in Manhattan). We do have the specific address of

each PKA site. To provide a rough estimate of how far children travel to their pre-K program, we calculated the distance from the geographic center of their census tracts, which again are quite small, to the pre-K site in which they enrolled.

Measuring Segregation

To capture segregation among PKA programs we employ Theil's *H*, an index of unevenness that measures the extent to which racial/ethnic groups are evenly distributed across sites (Theil, 1972; Reardon, Eitle, & Yun, 2000; Reardon & Yun, 2001). Importantly, in contrast to measures of exposure, *H* is not dependent on the overall racial/ethnic composition of a given population, but instead compares the diversity of each site to the total diversity of a given population (An & Gamoran, 2009; Reardon & Owens, 2014). In the context of our current study, *H* indicates the extent to which the racial/ethnic composition of individual PKA programs diverges from the overall composition of children enrolled in *Pre-K for All* programs. *H* is easily interpreted, with values ranging from 0 to 1, where 0 indicates that racial/ethnic enrollments are perfectly balanced across sites (i.e., no segregation), and 1 indicating complete segregation (e.g., no within-site diversity).

Theil's *H* is similar to other measures of segregation such as the Dissimilarly and Gini indices. Indeed, the correlations between *H* and these other indices are quite high (roughly 0.9; Reardon & Yun, 2001). Borrowing from Reardon, Yun, & Eitle (2000), with *H* we first calculate an entropy score (*E*), a measure of diversity, defined as:

$$E = \sum_{r=1}^{n} Q_r \, ln \frac{1}{Q_r}$$

where Q is the proportion of all NYC pre-K students identified as members of racial/ethnic group r. E is at its maximum when each racial/ethnic group is equally present in the population, and at its minimum when only a single group is present (p. 353). H then compares the diversity of each pre-K program to the diversity of all participants, taking the form:

$$H = \frac{\sum_{i=1}^{k} \frac{t_i}{T}(E - E_i)}{E}$$

where T is the total number of NYC pre-K children and t_i is the total enrollment of pre-K site i. $E - E_i$ then indicates the weighted average difference between the racial/ethnic diversity of NYC pre-K participants versus the diversity found in program i (p. 354). It is important to again stress that segregation and population diversity here are independent measures.

A key benefit of H compared to other indices is that it can partition segregation into the proportion that lies within and between contexts (Reardon & Yun, 2001). This is central to our analyses, as we aim to identify the "location" of segregation, particularly the extent to which segregation occurs between pre-K sites *within* each of New York City's 32 school districts, versus the proportion that lies *between* school districts. The policy relevance of this is clear: to the degree that segregation is more localized (e.g., within district), the potential efficacy of desegregation efforts is likely enhanced.

Results

Descriptive Results

Table 1 describes the children attending New York City PKA programs during the 2017-18 academic year. Note first the stark racial/ethnic differences in poverty rates. Two out of three Black and Hispanic children live in low-income families, compared to under 30% of white

children. The links between child race/ethnicity and neighborhood income segregation are also quite clear, with Black and Hispanic children living in census tracts where the median income is more than $30,000 below that of the average white child's census tract. Asian children were far more likely than any other group to be EMLLs, while white children were far more likely to receive special education services. Important to our discussion of choice, only two out of three Black and Hispanic families participated in the PKA choice process during the six-week application period, compared to over 82% of other families. This has important implications for the types and locations of programs to which Black and Hispanic families had access. Interestingly, among choosers, Asian families were the least likely to be provided their first-choice pre-K program.

Table 1 also indicates the estimated distance from each child's immediate neighborhood to their pre-K program. Most children attend a PKA program within one mile from home. The median distance, which is resistant to large outliers among children who travel long distances, is considerably smaller (0.38 miles), highlighting the links between neighborhood and PKA site racial/ethnic composition. The mean distance traveled was smallest for Asian children and largest for Black children. A surprising finding here is the relatively weak relationship between child race/ethnicity and PKA site type. Bear in mind, however, that patterns of segregation might differ among programs of the same type. For instance, there is considerable variability in program focus and admissions criteria *among* NYCEECs, while programs in public elementary schools are more uniform. We explore this issue in detail below.

Table 2 displays the characteristics of PKA sites attended by children across racial/ethnic groups, providing our first indication of the extent of PKA segregation. Remarkably, Asian, Black, Hispanic, and white children all attend pre-K programs where their own racial/ethnic

group is, on average, in the majority. For example, Asian children attend PKA sites where average enrollments are predominantly (50.3%) Asian, astonishing given that Asian children represent only 17.3% of PKA attendees. Similarly, white children, who constitute less than 20 percent of the sample, are enrolled in PKA sites that are on average 57.2% white. The results in Table 2 indicate severe economic segregation as well. The average poverty rate of the sites Black and Hispanic children attend is almost 30 percentage points higher than those of programs attended by white children. Reflecting the child-level patterns from Table 1, a majority of children in the PKA programs Asian children attend are EMLLs, compared to under one-quarter of the children in PKA programs attended by white children.

Segregation Indices

Our primary analyses of pre-K segregation are displayed in Table 3. Recall that with Theil's *H*, a value of 1 indicates complete segregation and a value of 0 indicates no segregation. We first examine segregation across PKAs, evidenced in the first column. The value of .429, the total extent of segregation across all racial/ethnic groups, indicates that almost 43% of children would have to move to a different pre-K for segregation to be eliminated—obviously a very tall order. We then partition this segregation into two components: 1) segregation within CSDs, and; 2) segregation between CSDs. Importantly, a majority (55%) of PKA segregation is within CSDs. In other words, of all the segregation between all racial/ethnic groups, more than half exists between PKA sites located in the same CSD. This is somewhat hopeful news, as this suggests that reducing segregation would not necessarily require that families opt for programs that are far from home, given the relatively small geographic areas covered by many CSDs in New York City.

The remainder of the first column in Table 3 displays *H* between specific sub-groups. Notable is the stark Black/white segregation (.741), indicating that eliminating segregation would require that almost three out of four Black and white children move to different pre-K sites. Black/Asian segregation is almost equally high (.699). Conversely, Hispanic segregation with all other racial/ethnic groups is considerably lower, although still at high levels, as is multiracial segregation with all other racial/ethnic groups. The second column in Table 3 indicates the degree of segregation across census tracts, which we interpret as a measure of neighborhood segregation among PKA children. Although not directly comparable, the results indicate that the overall level of pre-K program segregation is even higher than the level of neighborhood segregation (.429 vs. .391).

We have thus far treated pre-Ks as programmatically homogenous, when in fact they vary in terms of their admissions priorities and program offerings. To explore the extent to which segregation varies across pre-K settings, columns 3 and 4 in Table 3 organize pre-K programs into the two major types: NYCEECs and public elementary schools, which serve 55.3% and 36.4% of all children, respectively. We find that segregation is considerably more severe across NYCEECs (.482) than public schools (.371). Note in particular Black/white (.800) and Hispanic/white segregation (.580) in NYCEECs compared to that found among public schools (.668 and .448, respectively). What might explain this? A small portion of the difference is due simply to the larger number of NYCEECs compared to public school pre-Ks, which creates more opportunities to sort across sites. However, a more substantive explanation relates to the nature of NYCEECs themselves. First, many NYCEECs adopt cultural orientations that may differentially appeal to families. For example, one pre-K in central Queens with a 100% Black enrollment is sponsored by an African American community center, while a nearby Jewish

academy pre-K in the same CSD is 100% white. Indeed, across the city, many pre-Ks sponsored by groups such as Hispanic associations or Islamic centers are racially and ethnically quite homogenous, often within an otherwise diverse neighborhood. A second reason for the more severe NYCEEC segregation is that many NYCEECs target low-income children and reserve some or all of their spots for those from economically disadvantaged families. As indicated above in Table 1, the dramatically lower poverty rates among white children will necessarily reduce the number of white families attending such programs.

Examining Spatial Segregation

Table 4 highlights the tremendous variability in racial/ethnic composition and segregation across New York City's five boroughs. Overall segregation in Brooklyn is almost twice that found in the Bronx and Staten Island, and substantially more severe than in either Manhattan or Queens. As we consider potential explanations, note that Brooklyn is organized into twelve CSDs, double the number in the Bronx, Manhattan, or even Queens, which has a comparable pre-K enrollment. These 12 Brooklyn districts may represent increased opportunities for families with financial options to select housing based on K-12 (and pre-K) schools. There is also evidence here of a link between racial/ethnic diversity and segregation. Brooklyn is remarkably diverse, with a pre-K enrollment that is 29% Black, 35% Hispanic, and almost 30% Asian. Conversely, the Bronx and Staten Island, which are the least segregated, are also the least racially/ethnically diverse. The location of pre-K segregation further differs within boroughs, with the vast majority of the Bronx's more limited segregation located within CSDs and almost half of the segregation in Brooklyn and Manhattan found between CSDs, suggesting that families in Brooklyn and Manhattan are selecting housing and CSDs in ways that increase pre-K

segregation between school districts, while the patterns of program enrollment in the Bronx are more likely to increase segregation between neighborhoods within districts.

Table 5 digs deeper into the potential relationship between racial/ethnic diversity and pre-K segregation. The far right column indicates whether each CSD has a racial/ethnic majority versus a racial/ethnic plurality. The salient finding here is that the nine least segregated CSDs—Districts 4 and 5 in Manhattan; 7, 9, and 12 in the Bronx; 16, 18 and 23 in Brooklyn; and District 26 in Queens—are also among the least diverse. Each district has a racial/ethnic majority, and many have super majorities. Conversely, the most segregated CSDs are more likely to be racially/ethnically diverse. Note especially Districts 15 and 19 through 22 in Brooklyn, the City's most segregated borough. These are among the most segregated CSDs in the city, and also the most diverse—not one has a racial/ethnic majority in its pre-K enrollment. Note further that these CSDs are among the largest, in terms of both child enrollments and the number of pre-K sites, providing increased opportunity for segregation.

Choice and Segregation

The analyses above include families that participated in the PKA application process during the six-week application period as well as those that did not. This potentially obscures the links between segregation, family choices, and program assignments. As a reference, the first column in Table 6 duplicates the findings regarding overall segregation from the first column of Table 3, which includes all pre-K families. The remaining columns in Table 6 include only families who participated in the PKA choice process during the six-week application period. We find that segregation among "choosers" (.463) is somewhat more pronounced than among all children (.429), although the portion of segregation that lies within CSDs versus the portion that lies between CSDs is virtually identical. Group-specific segregation is also relatively consistent.

The third column indicates that overall, segregation would not be different from current conditions (.429) if all families who participated in the choice process were given their first choice (.428). This is not surprising, as the PKA algorithm provided almost three out of four families their first choice. Importantly, however, if all first choices had been honored, segregation *among* choosers (.428) would be somewhat *less* than it currently is (.463). Surprised by this finding, we were curious whether the effects of choice on segregation might depend on who is doing the choosing, and specifically on family racial/ethnic background. We are fortunate that our data contain the full list of rank-ordered pre-K sites families submitted during the application process.

Table 7 captures the choices of the more than 14,000 families that participated in the application process during the suggested six-week period, but whose first choice of pre-K was denied by the PKA algorithm for whatever reason. The table indicates the racial/ethnic composition of the pre-K program listed by the family as their first choice, as well as the racial/ethnic composition of the pre-K program where the child enrolled. Note that for every racial/ethnic group, the racial/ethnic composition of their first-choice pre-K has lower average Black and Hispanic enrollments compared to the pre-K in which their child enrolled. For example, the pre-Ks chosen first by Black families had enrollments that were on average 48% Black, but the pre-Ks in which their children enrolled were almost 53% Black. At the same time, the first-choice programs identified by Asian, Black, and Hispanic families had higher proportions of Asian and white children compared to the programs offered to them by the DOE (although the difference among Asian families is not statistically significant). White families also sought programs with higher Asian enrollments compared to what was provided, but also programs with statistically comparable white enrollments.

These results suggest that the effects of choice on segregation may vary somewhat depending on who is doing the choosing, and that overall, the City's process of program assignment among the sub-group of families who did not receive their first choice has a segregating effect. Recall from Table 2 that Asian, Black, Hispanic, and white children attend programs where, on average, their own racial/ethnic group is in the majority. Providing Black and Hispanic families *their* first choice pre-K program would thus reduce segregation somewhat, as their preferences would place them in programs where their own racial/ethnic group is less predominant. Conversely, providing Asian and white families their first choice would exacerbate segregation.

Discussion and Policy Implications

The results indicate the steep challenge of fostering racial/ethnic diversity in pre-K programs that are located within a highly segregated residential landscape that includes sites that prioritize the enrollment of economically disadvantaged children and the provision of robust services to their families. For each measure of program segregation that we estimated, we found high levels of segregation—even higher than the degree of neighborhood segregation—despite the fact that families can choose programs across a vast system that, in theory, offers wider access to high-quality and potentially more diverse programs than those close to home.

First, we found that Asian, Black, Hispanic, and white children all attend pre-K programs where their own racial/ethnic group is, on average, in the majority. Moreover, Black and Hispanic children attend programs where the poverty rate is almost 30 percentage points higher than those of programs attended by white children. The extent of racial/ethnic segregation varies by pre-K site type, with programs located in NYCEECs more segregated than those located in public schools. Indeed, Black/white and Hispanic/white segregation is much higher in NYCEEC-

based programs than in school-based programs, suggesting that these racial/ethnic sub-groups are differentially selecting programs that provide the services they prefer or need, and perhaps the ease of automatic PKA enrollment that is offered to them if they are already using the program's services.

The degree of segregation across the City's five boroughs underline the challenge of promoting racial/ethnic diversity in program enrollment. Overall segregation in Brooklyn is almost twice that found in the Bronx and Staten Island, and substantially more severe than in either Manhattan or Queens. Brooklyn's relatively high number of CSDs may create more opportunities for higher income families to segregate by selecting housing based on K-12 (and pre-K) schools. Other research indicates that an increased number of jurisdictional boundaries typically increases segregation (Bischoff, 2008). The results also suggest a link between racial/ethnic diversity in the PKA population and program segregation. Brooklyn is home to a remarkably diverse population of children, which could in turn support racial/ethnic diversity in pre-K programs. Yet, we found that within Brooklyn, the CSDs with the highest levels of PKA segregation also serve the most diverse groups of PKA children. They are also among the largest in number of pre-K sites, which might offer families greater opportunities to select programs with enrollment that matches their own race/ethnicity.

Importantly, such decisions are made within the PKA choice architecture, which we posit influences where families enroll and the consequent levels of segregation across programs. To explore this possibility, we compared segregation among the full population of families who enrolled in PKA and the sub-group who participated in the online application process. We found that segregation is somewhat more pronounced among "choosers" than among all families, which suggests that the choice process aggravates, rather than ameliorates, segregation. We then

simulated how giving all families their first-choice program, an aspiration included in the DOE's algorithm for PKA assignment, would affect levels of segregation. The results here suggest that the DOE could reduce segregation, an explicit goal of *Pre-K for All* policy, by giving more Black and Hispanic families their first choice, which would place them in sites where their own racial/ethnic group is less predominant—an option that the courts have increasingly frowned upon. Importantly, this finding indicates that family choices alone do not fully explain the high levels of segregation found here.

Overall, the findings are consistent with other research that has focused on racial/ethnic inequities in the spatial distribution of high-quality PKA programs (Latham et al., 2020), disparities in observed gains in PKA quality that have favored programs serving mostly white or Asian children (Fuller et al., 2020), and the overall segregation of children across PKA programs (Potter, 2016; Potter, 2019). While our findings indicate high levels of segregation, they simultaneously suggest opportunities to counter such segregation. When we disaggregated overall segregation, we found that more exists between PKA sites *within* CSDs than *between* CSDs. This is encouraging from a policy perspective because it means that policy measures could reduce segregation by affecting enrollment patterns within community school districts, rather than moving families across district lines, a much tougher route. Moreover, although segregation is highest in the most demographically diverse districts in the City, designing the choice process to encourage families in these contexts to consider alternative options within their districts could exploit such opportunities.

Concurrently, the City could require that programs set aside pre-K seats for sub-groups of children to increase heterogeneity, a strategy that, as noted above, a small number of pre-K programs are pursuing voluntarily and that has similarly been employed in Washington, DC

(Coffin, 2020). Such "controlled choice" measures have been implemented in K-12 settings, generally using students' economic characteristics rather than their race/ethnicity, but to our knowledge, have not been used comprehensively in pre-K settings (Ashley, 2014). The results further suggest that Black and Hispanic families, who endure disproportionately high rates of poverty, are choosing NYCEECs that provide the comprehensive services they need. Policies to offer comparably robust services at sites that are not focused narrowly on low-income families could foster greater diversity in their program enrollment. The City's own experiment with community schools, which emphasized such services, provides a model for this approach (Johnston et al., 2020). Finally, the PKA application process could be designed to highlight geographically dispersed program options, including those close to where parents work, while subsidizing the transportation to reach them. Making it easier for families to identify and access such programs, rather than relying on them to conduct a thorough search and assume all travel costs, could increase enrollment diversity.

In each of these ways, New York City could move closer to its goal of promoting socio-demographic diversity in its PKA programs. Certainly, the population of PKA children, which is predominantly children of color from low-income families who often reside in segregated neighborhoods, poses steep challenges to the pursuit of program diversity. Yet the analyses here suggest that opportunities to foster greater program diversity are available to City policymakers.

While we can speculate on what might be motivating family pre-K choices, the results here cannot reveal the true nature and multiple considerations inherent in such decisions, whether segregating in effect or not. Further research is needed to understand the full range of preferences and demands—and the feasible program options—that determine family choices. For example, quantitative research could investigate the relationship between family preferences and program

quality, variously defined, while qualitative research could explore how cultural values and beliefs affect family perceptions of program quality and diversity, and to what extent these perspectives tend to segregate families by income and race/ethnicity.

We still have much to learn about how families navigate pre-K systems, which are notoriously fragmented and complex. As systemic inequities in child outcomes gain belated attention, the need to promote the quality of pre-K options *and* the user-friendly choice processes to access them grows ever more urgent. This research is intended to inform such efforts.

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Figure 1. New York City's 32 Community School Districts (CSDs) and Five Boroughs

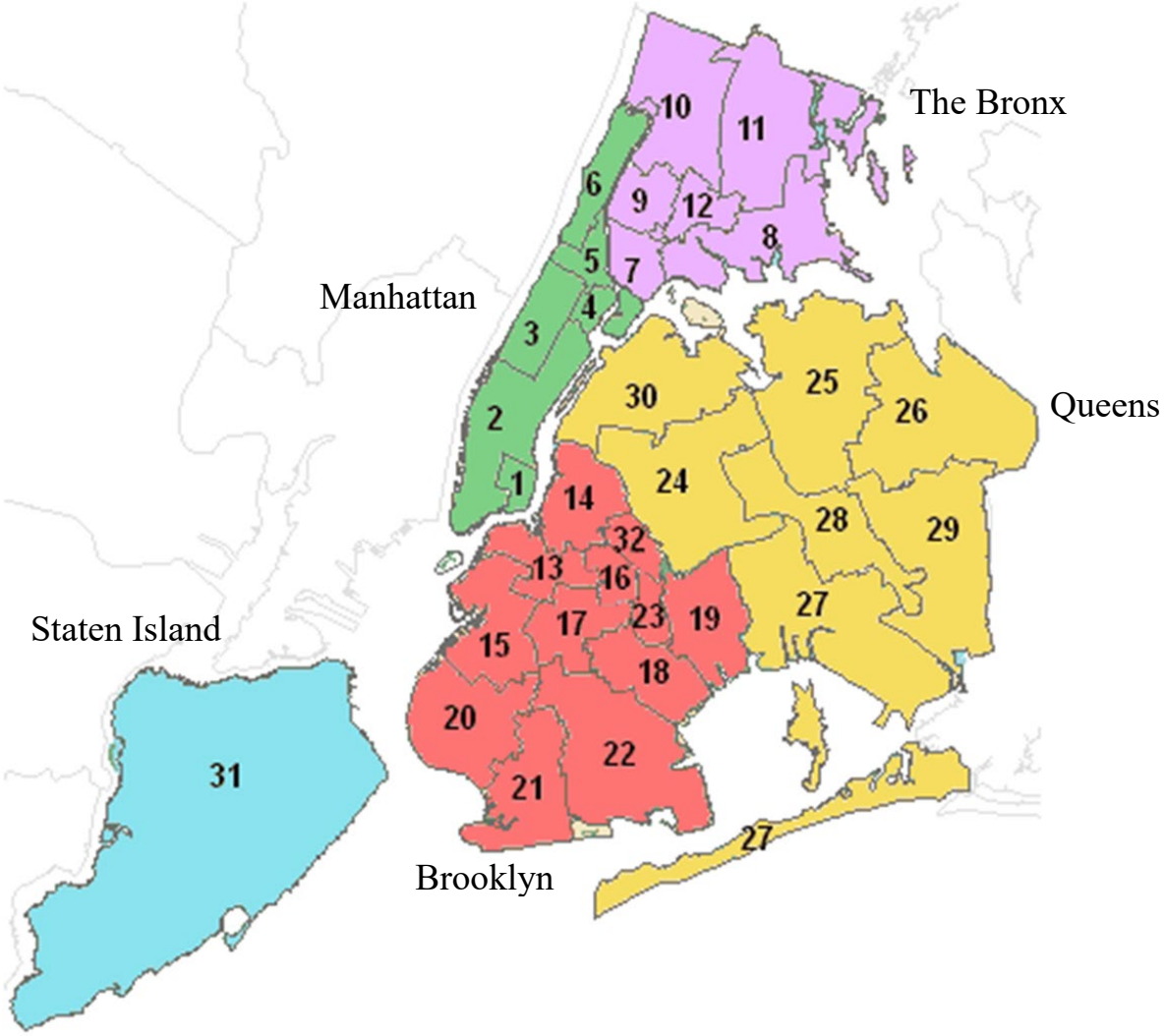

Table 1. Sociodemographic Backgrounds of *Pre-K for All* Children by Race/Ethnicity (*n*=66,327)

	Asian (*n*=11,512)	Black (*n*=14,560)	Hispanic (*n*=25,200)	White (*n*=12,878)	Multiracial/ Nat. Am. (*n*=2,177)
% Poverty	51.3***	67.7***	69.8	29.1***	42.7***
Med. Census Tract Household Inc. ($)	66,320***	52,855	53,309	84,936***	75,546***
% EMLL	61.2***	5.7	47.1	21.1***	9.9***
% IEP	5.1***	6.7***	8.0	12.3***	5.5***
% Choosers	85.6***	69.7	69.9	87.4***	82.1***
% Received First Choice	67.9***	73.4**	71.7	74.9***	70.9
Mean distance to PKA (miles)	0.72*	1.02***	0.77	0.89***	0.87*
PKA Type					
NYCEEC	55.3***	57.2***	53.3	57.1***	53.5
School	33.1***	38.5	37.6	33.7***	41.3**
Pre-K Center	11.4***	2.6***	8.2	9.0*	4.5***
Charter	0.2***	1.7***	0.8	0.2***	0.8

*p<.05; **p<.01; ***p<.001. All statistical comparisons to Hispanic children.

Table 2. *Pre-K for All* Program Characteristics by Child Race/Ethnicity (*n*=66,327)

	Asian (*n*=11,512)	Black (*n*=14,560)	Hispanic (*n*=25,200)	White (*n*=12,878)	Multiracial/ Nat. Am. (*n*=2,177)
% Asian	**50.3*****	5.4***	11.4	12.8***	19.1***
% Black	6.9***	**57.1*****	17.0	5.9***	18.4*
% Hispanic	25.0***	29.5***	**58.6**	20.7***	29.2***
% White	14.3***	5.2***	10.5	**57.2*****	20.9***
% Multi	3.6***	2.8*	2.5	3.5***	**12.4*****
% Poverty	52.2***	66.9**	66.0	36.2***	47.5***
% EMLL	51.7***	18.3***	41.3	24.2***	24.7***
% IEP	6.3***	6.8***	7.7	11.8***	6.7***
Med. Census Tract Inc. ($)	66,320***	52,855	53,309	84,936***	75,546***

**p*<.05; ***p*<.01; ****p*<.001. All statistical comparisons to Hispanic children.

Table 3. *Pre-K for All* Program Segregation and Neighborhood Segregation

	Across PKAs (*n*=1,787)	Across Census Tracts (*n*=2,093)	Across NYCEECs (*n*=1,078)	Across Schools (*n*=620)
Overall *H*	.429	.391	.482	.371
Between CSDs	.193 (45.0%)	.189 (48.3%)	.217 (45.0%)	.193 (52.0%)
Within CSDs	.236 (55.0%)	.202 (51.7%)	.265 (55.0%)	.178 (48.0%)
Groups-Specific *H*				
Black/Hispanic	.386	.372	.406	.356
Black/White	.741	.731	.800	.668
Black/Asian	.699	.698	.736	.654
Black/Multiracial	.506	.472	.520	.500
Hispanic/White	.520	.474	.580	.448
Hispanic/Asian	.444	.411	.512	.385
Hispanic/Multiracial	.366	.346	.359	.385
White/Asian	.514	.427	.615	.411
White/Multiracial	.462	.440	.466	.458
Asian/Multiracial	.427	.404	.425	.425
Children	66,327	66,327	36,649	24,079
CSDs	32	32	32	32

Note: Segregation index is Theil's *H*, where values range from 0 to 1, with 0 indicating that program racial/ethnic enrollments are perfectly balanced and 1 indicating complete segregation.

Table 4. *Pre-K for All* Program Segregation by Borough (*n*=66,327 children in five boroughs)

	Bronx	Brooklyn	Manhattan	Queens	Staten Island
CSDs	*n*=6	*n*=12	*n*=6	*n*=7	*n*=1
PKA Programs	*n*=339	*n*=571	*n*=258	*n*=512	*n*=107
PKA Children	*n*=13,542	*n*=20,976	*n*=7,944	*n*=20,080	*n*=3,785
			All children		
Overall segregation	.252	.480	.389	.399	.249
Between districts	.052	.216	.180	.121	--
	(20.6%)	(45.0%)	(46.3%)	(30.3%)	
Within districts	.200	0.264	.209	.278	--
	(79.4%)	(55.0%)	(53.7%)	(69.7%)	
			Black/White segregation		
Overall Black/White	.604	.755	.641	.782	.584
Between districts	.102	.472	.311	.350	--
	(16.9%)	(62.5%)	(48.5%)	(44.8%)	
Within districts	.502	.283	0.330	.432	--
	(83.1%)	(37.5%)	(51.5%)	(55.2%)	
			Hispanic/White segregation		
Overall Hispanic/White	.406	.526	.506	.435	.285
Between districts	.081	.187	.252	.064	--
	(20.0%)	(35.6%)	(49.8%)	(14.7%)	
Within districts	.325	.339	.254	.371	--
	(80.0%)	(64.4%)	(50.2%)	(85.3%)	
			Asian/White segregation		
Overall Asian/White	.504	.512	.395	.502	.197
Between districts	.030	.050	.071	.046	--
	(5.9%)	(9.8%)	(18.0%)	(9.2%)	
Within districts	.474	.462	.324	.456	--
	(94.0%)	(90.2%)	(82.0%)	(90.8%)	
			Black/Hispanic Segregation		
Overall Black/Hispanic	.172	.454	.300	.545	.187
Between districts	.048	.293	.174	.301	--
	(27.9%)	(64.5%)	(58.0%)	(55.2%)	
Within districts	.124	.161	.126.	.244	--
	(72.1%)	(35.5%)	(42.0%)	(44.8%)	
			Black/Asian Segregation		
Overall Black/Asian	.498	.738	.640	.655	.540
Between districts	.066	.513	.393	.288	--
	(13.3%)	(69.5%)	(61.4%)	(44.0%)	
Within districts	.432	.225	.247	.367	--
	(86.7%)	(30.5%)	(38.6%)	(56.0%)	
			Hispanic/Asian Segregation		
Overall Hispanic/Asian	.346	.448	.552	.314	.224
Between districts	.106	.188	.311	.113	--
	(30.6%)	(42.0%)	(56.3%)	(36.0%)	
Within districts	.240	.260	.241	.201	--
	(69.4%)	(58.0%)	(43.7%)	(64.0%)	

Note: Segregation index is Theil's *H*, where values range from 0 to 1, with 0 indicating that program racial/ethnic enrollments are perfectly balanced and 1 indicating complete segregation. Segregation cannot be computed across school districts in Staten Island, which has a single district.

Table 5. *Pre-K for All* Program Segregation by Borough and Community School District (*n*=66,327 children in five boroughs and 32 community school districts)

CSD	# PKA sites	# Children	*H*	Racial/Ethnic Majority in PKA Child Population
Manhattan	**258**	**7,944**	**.388**	
1	31	789	.289	None
2	70	2,428	.255	None
3	40	1,154	.276	None
4	40	956	.151	Hispanic (60%)
5	38	970	.191	Black (57%)
6	39	1,647	.330	Hispanic (82%)
Bronx	**339**	**13,542**	**.252**	
7	41	1,307	.144	Hispanic (66%)
8	50	2,016	.247	Hispanic (62%)
9	66	2,402	.156	Hispanic (66%)
10	81	3,372	.227	Hispanic (70%)
11	64	3,079	.246	None
12	37	1,366	.136	Hispanic (69%)
Brooklyn	**571**	**20,976**	**.480**	
13	37	1,184	.247	None
14	40	1,226	.296	Hispanic (53%)
15	59	2,560	.352	None
16	25	593	.158	Black (75%)
17	55	1,706	.337	Black (72%)
18	34	1,256	.201	Black (87%)
19	48	1,789	.343	None
20	80	3,854	.398	None
21	64	2,458	.349	None
22	72	2,616	.376	None
23	25	751	.167	Black (74%)
32	32	983	.257	Hispanic (81%)
Queens	**512**	**20,080**	**.399**	
24	85	3,884	.334	Hispanic (61%)
25	75	3,002	.345	Asian (55%)
26	52	1,713	.206	Asian (56%)
27	78	2,894	.339	None
28	84	3,247	.359	None
29	59	2,232	.321	Black (58%)
30	79	3,108	.251	None
Staten Island	**107**	**3,785**	**.249**	
31	107	3,785	.249	None

Table 6. *Pre-K for All* Program Segregation and the Choice Process (*n*=66,327 children in 1,787 programs)

	All PKA Children	Choosers Only		
	Across PKAs (*n*=1,787)	Across PKAs (*n*=1,769)	Across First Choice PKAs (*n*=1,779)	Across Census Tracts (no choice) (*n*=2,088)
Overall *H*	.429	.463	.428	.405
Between CSDs	.193 (45.0%)	.209 (45.1%)	.188 (43.9%)	.187 (46.2%)
Within CSDs	.236 (55.0%)	.254 (54.9%)	.240 (56.1%)	.218 (53.8%)
Groups-Specific *H*				
Black/Hispanic	.386	.414	.404	.399
Black/White	.741	.754	.733	.750
Black/Asian	.699	.720	.696	.719
Black/Multiracial	.506	.479	.523	.533
Hispanic/White	.520	.513	.504	.473
Hispanic/Asian	.444	.448	.437	.417
Hispanic/Multiracial	.366	.329	.373	.383
White/Asian	.514	.519	.503	.439
White/Multiracial	.462	.447	.438	.459
Asian/Multiracial	.427	.430	.412	.438
Children	66,327	50,685	50,673	50,685
CSDs	32	32	32	32

Table 7. Racial/Ethnic Composition of First Choice Programs and Enrolled Programs among Families Denied Their First Choice *Pre-K for All* Program (*n*=14,202 children)

	PKA First Choice	PKA Enrolled
Asian (*n*=3,162)		
% Asian	49.5	49.0
% Black***	5.7	6.4
% Hispanic***	23.3	25.3
% White***	17.8	15.8
% Multiracial/Other*	3.8	3.5
Black (*n*=2,705)		
% Asian***	8.8	6.5
% Black***	48.0	52.9
% Hispanic	29.5	30.3
% White***	10.1	7.2
% Multiracial/Other***	3.6	3.1
Hispanic (*n*=4,994)		
% Asian***	14.6	13.0
% Black***	13.5	14.9
% Hispanic***	54.7	56.5
% White***	14.5	12.9
% Multiracial/Other	2.8	2.7
White (*n*=2,821)		
% Asian***	18.4	15.9
% Black	6.5	6.9
% Hispanic***	21.8	23.6
% White	49.0	49.8
% Multiracial/Other**	4.3	3.9
Multiracial/Other (*n*=520)		
% Asian***	23.4	19.3
% Black*	15.1	17.0
% Hispanic***	27.2	30.5
% White**	24.7	21.9
% Multiracial/Other**	9.6	11.3

*$p<.05$; **$p<.01$; ***$p<.001$