Neighborhood Effects in the 21st Century:

Disadvantage, Density, and the Spatial Distribution of Institutional Resources

Jared N. Schachner [1 2]

[1] Postdoctoral Scholar, Department of Sociology, University of Chicago, Chicago, IL

[2] Mansueto Fellow, Mansueto Institute for Urban Innovation, University of Chicago, Chicago, IL

Keywords

Neighborhood effects; urban inequality; cognitive development; segregation; population density; institutional resources

Corresponding Author

Jared N. Schachner, University of Chicago, 1126 East 59th Street, Chicago, IL 60637, (310) 422-6523, jschachner@uchicago.edu

Acknowledgments

I gratefully acknowledge Geoffrey Wodtke, Luis Bettencourt, Nicole Marwell, and Christopher Esposito for helpful comments on prior versions of this paper. I also thank the Mansueto Institute for Urban Innovation at the University of Chicago, as well as the National Science Foundation and Harvard's Joint Center for Housing Studies, Institute for Quantitative Social Science, and Center for Geographic Analysis for support.

ABSTRACT

Neighborhood effects research linking community sociodemographics to residents' life chances has become one of sociology's most vibrant lines of inquiry. Yet the concentrated disadvantage paradigm's success risks crowding out other plausible explanations of contextual effects. In this paper, I propose neighborhood population density as an underexamined but potentially important explanation that supplements neighborhood race/class composition in illuminating how contextual effects matter for children. In an era of welfare reform, government retrenchment, and educational privatization, neighborhood population density may fuel child development by fostering access to nonprofit organizations that have become central to social service provision and educational delivery in the twenty-first century city. To test these possibilities, I use Los Angeles Family and Neighborhood Survey data tracking nearly 700 children during the 2000s, and link these micro data to census and administrative data on population density and nonprofit density from the National Center for Charitable Statistics. Value-added models suggest neighborhood population density and neighborhood class composition each independently predict sizable gains to children's language skills. Congruent with my theoretical framework, density's cognitive dividends are concentrated among children from working class (versus upper/upper-middle class) families and are partially mediated by local nonprofits' organizational capacity. I conclude that a density-based account of neighborhood effects valuably complements the prevailing concentrated disadvantage paradigm and provides a richer picture of contemporary spatial inequalities.

For four decades, sociologists have considered contextual effects primarily through the prism of concentrated disadvantage and for good reason: the converging forces of deindustrialization, the Great Migration, and suburbanization of the mid-twentieth century generated staggeringly high levels of race and class segregation that persist well into the twenty-first. A vast and constantly-growing body of empirical work reinforces the intuition that Black and Brown inner-city neighborhoods depicted in canonical works like *The Truly Disadvantaged* (Wilson 1987) and *American Apartheid* (Massey and Denton 1993) remain financially divested, socially divided, and often dangerous, eroding residents' – especially children's – life chances and calcifying population-level race- and class-based inequities. As a testament to this research agenda's success, neighborhood effects have become synonymous in social science research with one particular type of neighborhood effect: concentrated race and class (dis)advantage on residents' outcomes (Sampson, Morenoff, and Gannon-Rowley 2002; Sharkey and Faber 2014).

Yet the concentrated disadvantage paradigm's success risks crowding out other plausible explanations of contextual effects. Prior to Wilson (1987), urban scholars conceived of neighborhood effects in broader terms, considering the impacts not only of spatial inequities in community *heterogeneity* (i.e., race and class composition), but also in *population size* and *population density* (Wirth 1938). Despite compelling historical arguments supporting the latter two factors' effects, contemporary sociologists pay minimal attention to whether and how they supplement the former in illuminating spatial inequality.

In this paper, I propose a return to this more inclusive conceptualization of neighborhood effects – one capable of explaining a greater proportion of the spatial variance in outcomes across time and place than the dominant neighborhood (dis)advantage proxies could alone. To this end, I revisit the Chicago school's argument regarding the importance of neighborhood population density and recast it in contemporary terms. Whereas the Chicago school's urban ecologists like Louis Wirth

(1938) predicted that density generates negative consequences for neighborhood residents by fomenting social disorder and isolation, I draw on a cross-disciplinary set of literatures to propose an alternative perspective. In an era of neoliberalism and government retrenchment, population density may foster access to non-governmental institutional resources that have become central to social service provision (Allard 2004) and the forging of social ties (Small 2006; Small and McDermott 2006) in the contemporary American city. Children may benefit in turn.

I then pose and empirically examine three questions that emerge from this theoretical account: (1) Does population density supplement community sociodemographics in explaining neighborhood differences in children's cognitive skill development? (2) Does the magnitude of density's effects vary by children's socioeconomic background?, and (3) Are density's effects on disadvantaged children mediated by local nonprofit capacity? To answer these questions, I link Los Angeles Family and Neighborhood Survey (L.A.FANS) panel data on nearly 700 children to census data on their neighborhoods' race and class compositions and population density, as well as administrative data on the density of institutional resources. Leveraging L.A.FANS' distinctive neighborhood-based sampling methods, I construct multilevel models estimating between-neighborhood variance in child respondents' cognitive skill growth (proxied using the Woodcock-Johnson Letter-Word Identification test) between the early and late 2000s. Inclusion of children's baseline language and math skills and a broad range of potential confounders enable me to generate plausibly causal estimates of neighborhood (dis)advantage and population density effects.

As predicted by prevailing accounts, neighborhood sociodemographic advantage predicts a considerable boost to children's cognitive skill scores and explains a nontrivial proportion of the between-neighborhood variance in the outcome. However, neighborhood population density generates similarly large boosts and appears to explain a greater share of the neighborhood variance in skill development. As expected, these density dividends appear to accrue disproportionately to

children of working class families, and subsequent analyses suggest local nonprofit capacity may mediate a quarter of these density effects.

Overall, the results suggest it is necessary but not sufficient for sociologists to examine spatial inequality through the prism of race- and class-based segregation. Other spatial factors, such as neighborhood population and organizational density, may exert direct and indirect effects on children's cognitive development and thus deserve more attention in urban stratification and child development research. Broadening our view of spatial inequities to encompass not only neighborhoods' sociodemographic compositions but also the spatial distributions of households and institutions may also help identify what interventions, beyond hollowing out disadvantaged neighborhoods via residential mobility programs, may be most effective in mitigating stubborn race- and class-based inequalities.

THE CONCENTRATION OF – AND ON – STRUCTURAL DISADVANTAGE

For over a century, a vibrant sociological line of inquiry has centered on whether neighborhood context exerts a causal effect on city residents' wellbeing and long-term life outcomes. In the early 1900s, Chicago school scholars laid the groundwork for this research agenda, positing that city and neighborhood population size, density, and sociodemographics independently and interactively shaped a wide range of individual and social outcomes (Wirth 1938). Beginning in the 1980s, seminal studies like the *Truly Disadvantaged* by William Julius Wilson (Wilson 1987) and *American Apartheid* by (Massey and Denton 1993) deeply pursued one particular thread of this argument: the effects of neighborhood sociodemographics on residents' living conditions and life outcomes. These books documented the sharp rise in race- and class-based residential segregation that coincided with deindustrialization, the Great Migration and white flight to the suburbs and proposed that yawning

disparities in urban neighborhoods' race and class compositions likely explain why residents of some neighborhoods fare worse over the long-term than residents of others. Theorized mechanisms included disadvantaged neighborhoods' dearth of positive role models and institutional resources, as well as high levels of crime, disorder, and environmental toxicity. These hypotheses, often referred to as the concentrated disadvantage paradigm, have guided American scholarship on neighborhood effects ever since.

This theoretical account was so compelling that within two decades of Wilson's and Massey and Denton's canonical works, a "cottage industry" of studies on race- and class-based neighborhood effects emerged that generated strong empirical support for its core tenets (Sampson et al. 2002). Despite nagging concerns that neighborhood disadvantage effects might merely reflect selection bias (Jencks and Mayer 1990) and despite initially underwhelming results from the Moving to Opportunity experiment which provided low-income families with housing vouchers to move out of high-poverty neighborhoods (Sanbonmatsu et al. 2012), two sets of recent studies have largely muted these concerns. One set uses national panel surveys and increasingly sophisticated empirical methods to isolate effects of neighborhood race and class composition on children's cognitive development and educational outcomes (Harding 2003; Sampson, Sharkey, and Raudenbush 2008; Sharkey and Elwert 2011; Wodtke, Harding, and Elwert 2011). The other employs population data from U.S. tax returns to descriptively document large disparities in intergenerational income mobility prospects across neighborhoods and to isolate the causal effect of moving from a low-mobility to a high-mobility neighborhood on children's income mobility outcomes (Chetty, Hendren, et al. 2014; Chetty and Hendren 2018). Bringing the neighborhood effects debate full circle Chetty, Hendren, and Katz (2016) reexamined the MTO experiment's effects using more recent data and showed that the treatment of neighborhood poverty reduction via housing vouchers had in fact generated large positive effects on a wide range of outcomes, especially for young children.

Today, the concentrated disadvantage paradigm is on firmer empirical footing than at any time since Wilson and Massey introduced it. Having defanged all but the most stubborn skeptics, an increasingly cross-disciplinary group of social scientists have pivoted from the dichotomous question of *whether* neighborhoods matter – and more specifically, whether neighborhood race and class composition matters – to precisely *how* and *for whom* they matter (Sharkey and Faber 2014). Current theoretical accounts center on young children's cognitive and socioemotional development and implicate four key contextual mechanisms: environmental toxicity, crime/violence exposure, the presence of social control and positive role models, and institutional resources (Galster 2012). A burgeoning literature has taken up Sampson et al. (2002)'s charge to empirically test what has been essentially a "black box" of ecological mechanisms, leveraging quasi-experimental methods to provide support for neighborhood effects operating via exposure to environmental toxins and crime/violence (Manduca and Sampson 2019; Sharkey 2010; Wodtke, Ramaj, and Schachner 2020).

NEIGHBORHOOD EFFECTS: HETEREOGENEITY – AND DENSITY?

Yet the concentrated disadvantage paradigm's success risks fostering premature path dependency. Neighborhood sociodemographics and the ecological mechanisms with which they are associated provide a crucial but potentially incomplete account of why neighborhoods stratify residents' intra- and intergenerational mobility prospects. In other words, the total between-neighborhood variance in outcomes may not be fully explained by neighborhood race and class composition. Urban scholars risk ignoring this residual variance by failing to theorize supplementary explanations for neighborhood effects beyond the prevailing race- and class-based accounts.

Prior to Wilson and Massey honing in on neighborhood race and class composition, a more expansive set of theories on contextual effects percolated, and these theories may hold the key to

understanding what other neighborhood-level factors stratify residents' outcomes. These supplementary theories can be traced back to the Chicago school of the early twentieth century. For example, Wirth (1938) emphasized three factors that could explain contextual effects: (1) city and neighborhood *heterogeneity* (i.e., race and class composition) (which, as noted above, became central to contemporary urban sociology's orientation), as well as (2) city *population size* and (3) neighborhood *population density* (which became peripheral).

Observing pre-World War II Chicago, teeming with overcrowded tenements, toxic waste, and crime, Wirth and his University of Chicago colleagues took a generally grim view of city population size and neighborhood population density, suggesting that each eroded residents' wellbeing and socioeconomic trajectories. Wirth posited that city population size fostered competition, anonymity, and fragmented social interactions, while neighborhood population density spurred overstimulation that imposed steep psychological and social penalties – with the former taking the form of an "urban malaise" marked by isolation, loneliness, depression, and anxiety, and the latter manifesting as high rates of social problems like crime, welfare dependence, and out-of-wedlock childbirth (Wirth 1938; see also Simmel 1972).

Yet urban scholarship has largely veered away from Wirth's provocative contentions regarding city population size and neighborhood density in favor of focusing on heterogeneity – i.e., neighborhood sociodemographics – effects on urban life and residents' outcomes. Indeed, the most highly-cited sociological studies of neighborhood effects exclude population density from theoretical and empirical consideration, and a recent review of the literature makes no mention of it at all (Sharkey and Faber 2014). The virtual absence of population density from the contemporary neighborhood effects literature may reflect the assumption of strong associations between neighborhood race/class composition and population density, suggesting the latter's effects may be subsumed by the former. Another possibility is that the mechanisms theorized to constitute

neighborhood effects – i.e., environmental toxins, institutional resources, social dynamics, and crime – may be assumed to exhibit a stronger association with neighborhood sociodemographics than with neighborhood population density. But these propositions have only rarely been directly tested, and anecdotal evidence suggests similarly disadvantaged urban neighborhoods may vary sharply in both population density and social conditions, like crime (e.g., Harlem in New York City versus the South Side of Chicago). If between-neighborhood variance in residents' outcomes is not fully explained by communities' race and class compositions, then revisiting whether and why neighborhood population density exerts an independent effect on residents' trajectories in the contemporary American city emerges as a potentially fruitful line of inquiry.

POPULATION DENSITY AND CHILD DEVELOPMENT IN THE 21st CENTURY

Drawing on Wirth's account, one might expect neighborhood population density to exert negative effects on residents' outcomes due to its assumed association with social isolation, toxicity, and crime. However, predictions generated from the historical context of the Chicago school may not apply to the contemporary era. The key pitfalls associated with neighborhood population density in the early twentieth-century – overcrowded housing, air pollution and water contamination, and crime – have dramatically abated (if geographically unevenly) in the twenty-first (Glaeser 2020; Sharkey 2018). Today, neighborhood population density may not merely be neutral but may even confer nontrivial *benefits* to residents, particularly children, who have become a primary focus of contemporary neighborhood effects studies due to their unique sensitivity to environmental stimuli (Wodtke et al. 2020), their cognitive and socioemotional skills' malleability (Heckman and Mosso 2014), and the life course perspective's ascendance as a theoretical framework (Elder 1998).

Recall that four key ecological mechanisms are theorized to link neighborhood context to children's cognitive and socioemotional development: social dynamics (e.g., adult and child role models, peer groups), institutional resources (e.g., school and childcare options/quality), crime/violence, and environmental amenities (e.g., recreational opportunities like park access) and disamenities (e.g., lead toxicity) (Galster 2012). A vast body of scholarship assumes – and occasionally empirically demonstrates (De la Roca, Ellen, and O'Regan 2014; Sampson and Winter 2016) – that neighborhood race and class composition strongly correlate with each of these mechanisms in the contemporary American city. But what about neighborhood population density?

Criminology studies have generated conflicting findings regarding the contemporary link between neighborhood population density and crime (Hipp and Roussell 2013). Links between population density and environmental disamenities are similarly ambiguous. On one hand, population density may exacerbate environmental burdens (e.g., traffic pollution, water contamination) proven to compromise children's development. On the other hand, population density may foster access to valuable environmental amenities like parks and playgrounds. A small but growing body of literature suggests that the closer proximity of parks, playgrounds, and child residences and the increased walkability of dense urban neighborhoods foster better social dynamics for young children, by increasing their opportunities to forge social ties and engage in socially-interactive and physically-engaged forms of play time – both of which are crucial for their development (Singer, Golinkoff, and Hirsh-Pasek 2006). For example, a recent study based on eight year-olds finds that "higher population density and greater access to facilities, as well as park areas, promote participation in social activity with friends. [In short] living in densely populated neighborhoods increases children's possibilities to meet friends" (Nordbø et al. 2019).

Population Density, Institutional Resources, and Child Development

But the clearest predictions regarding population density's potential salutary effects on child development hinge on institutional resources, the contextual mechanism to which I now turn. Access to cultural amenities like public libraries, museums, and theaters is likely higher in dense, urban environments. A large literature proposes that these types of amenities foster child development though empirical evidence remains limited. A more empirically substantiated possibility is that dense, urban neighborhoods contain greater concentrations of social service providers, especially nonprofit organizations, than sparse, suburban neighborhoods – perhaps due to providers' preferences for access to a larger pool of potential clients and more efficient service delivery (Allard 2004, 2009). If true, then disadvantaged families in dense neighborhoods may benefit from access to a richer set of neighborhood institutions that preserve social order and reduce crime (Sharkey, Torrats-Espinosa, and Takyar 2017) and that foster valuable social ties for parents and children alike, such as childcare centers (Small 2006; Small and McDermott 2006).

In the past, the spatial imbalance in nonprofit organizations within a city may have been less directly material to child outcomes. The federal government primarily procured support via welfare checks, and local governments typically took a more direct, proactive role in service provision. But since the 1990s, the simultaneous forces of federal welfare reform shifting resources from checks to work-promoting social services, city budget tightening, and local government retrenchment and privatization has led local nonprofits and private organizations to take a much larger role in developing and delivering social service. Today, federal, state, and local governments finance a vast array of child care, counseling, referral, job training, and education services that are delivered by non-government entities (Allard 2004, 2009). In the context of a "services-based welfare system," families that live proximate to these increasingly important nonprofit service providers may gain access to more, and higher-quality services – all else equal. Allard (2004: 2) elaborates:

"…shorter distances reduce the burden of commuting, particularly among low-income populations who have less access to automobiles than the general public. Individuals and case managers are also less likely to have information about service providers outside of their immediate area, reducing the likelihood of seeking services from these less proximate, but potentially helpful providers… Individuals residing in neighborhoods with low levels of spatial access to services face a social welfare system that may effectively deny them aid for which they are eligible…"

More concretely, for disadvantaged families, denser neighborhoods with higher concentrations of nonprofits increase the likelihood of receiving WIC benefits, Earned Income Tax Credit preparation services, or medical treatment from a free, or highly discounted, high-quality provider. Access to these types of organizational resources are likely less material for more advantaged families. Taken together, the theoretical account outlined above suggests the following concrete hypotheses:

(1) *In contemporary U.S. cities, neighborhood population density predicts higher rates of child skill growth.*

(2) Neighborhood population density's benefits are larger for more disadvantaged children.

(3) Positive effects of neighborhood population density on disadvantaged children are mediated by access to institutional resources – specifically, the capacity of local nonprofit organizations.

RESEARCH DESIGN AND METHODS

The Case of Twenty-First Century Los Angeles County

To test my core hypotheses, I examine the patterns and predictors of child cognitive skill development in a theoretically strategic context: Los Angeles County during the 2000s. Los Angeles is not only the most populous – and arguably most diverse – county in the United States. It is also relatively underexamined in the neighborhood effects literature, especially for a metropolitan area of its size and stature. Understanding whether the concentrated disadvantage paradigm travels well from the Rust Belt to the Sun Belt and whether neighborhood factors rarely emphasized by that paradigm valuably supplement the traditional race and class proxies in explaining neighborhood effects is crucial to refining theories of spatial inequality (Sampson, Schachner, and Mare 2017).

Although it may seem counterintuitive to examine population density in the paradigmatic city of sprawl, Los Angeles County exhibits a remarkable degree of variance in both neighborhood population density and sociodemographics, providing valuable analytic leverage. A drive up Pacific Coast Highway takes you from the dense, high-income neighborhood of Manhattan Beach in the South Bay to Malibu which is similarly advantaged but nearly ten times less dense. Conversely, the East Hollywood neighborhood is nearly ten times as dense as a similarly disadvantaged neighborhood near East Los Angeles, El Monte. As the prior section suggested, these vast density disparities may have had more material effects on child development since the 1990s than they did before, as local services provided by non-government actors became increasingly important in an era of government retrenchment and welfare reform.

Data Sources

For my core analyses, I link data from the 2000 U.S. Census on census tract-level population density and traditional sociodemographics within Los Angeles County (in 2000 census tract boundaries) to a fine-grained set of micro-level panel data drawn from the Los Angeles Family and Neighborhood Survey (L.A.FANS). A longitudinal study exploring the multilevel sources of inequality and wellbeing within Los Angeles County, L.A.FANS included an initial wave of data collection in 2000-2002 (wave 1). Participating households were selected from a probability sample of 65 county neighborhoods (census tracts). Within these households, researchers attempted to interview one randomly selected adult (RSA) and, if present, one randomly selected child (RSC) under age 18. They also interviewed the primary caregiver (PCG) of the child (who might or might not be the RSA but was almost always the child's mother) and a randomly selected sibling of the RSC (SIB). Ultimately, 2,306 RSCs, 1,378 SIBs, and 1,957 PCGs were included in wave 1 data collection.

Follow-up interviews were conducted with wave 1 respondents between 2006 and 2008 (wave 2) if they still resided within L.A. County and were deemed eligible (response rate: 63%).

Because this study examines neighborhood effects' on children's skill development, I specified my analytic sample to only include L.A.FANS randomly selected children (RSCs) and their randomly selected siblings (SIBs) (if applicable) who were under the age of 18 at both waves 1 and 2 of data collection and who completed the Woodcock-Johnson Letter-Word Identification assessment (more details on this test are provided below) at each wave. This initial specification yielded 778 unique child respondents. I excluded ~10% of the remaining observations (*N*=89) because they lacked valid data for some subset of the independent variables described below. 689 child respondents nested within 540 households remained. I linked these panel data on Angeleno children to census 2000-derived data on the population density and sociodemographics of their census tract of residence at baseline (wave 1). To test potential mechanisms mediating density effects, I added data on the spatial distribution of nonprofit organizations from the National Center for Charitable Services and the Urban Institute.

Operationalizing Cognitive Skill Growth

Congruent with the large neighborhood effects literature, my core outcome of interest is a proxy for the cognitive skill level of a given child L.A.FANS respondent (i.e., under age 18). Cognitive skills are theorized to be crucial surrogate measures of child development that strongly predict subsequent adult outcomes, such as employment, income, wealth, and criminal behavior (Chetty, Friedman, and Rockoff 2014; Duncan and Magnuson 2011). Some neighborhood effects studies track math skills, but most focus on language and reading skills (Sampson et al. 2008; Wodtke et al. 2020), due perhaps to the assumption that local residential context is more crucial to development of the latter than the former. In this vein, I employ measures of L.A.FANS child performance on the *Woodcock-*

Johnson Letter-Word Identification (LWI) test, which captures test-takers' ability to identify: various types of letters, words that diverge in meaning from other words, and low versus high frequency words. I select this Woodcock-Johnson assessment as my core outcome as opposed to alternative modules because it is available for a considerably larger portion of the L.A.FANS child sample. Moreover, scores on this assessment correlate highly (~0.7) with children's scores on other Woodcock-Johnson modules taken during the same wave.

To ensure I isolate plausibly causal effect estimates of neighborhood population density on children's cognitive skills, I follow the burgeoning education literature on school value-added effects (Jennings et al. 2015; Lloyd and Schachner 2020) and a growing number of neighborhood effects studies (Wodtke and Parbst 2017) by predicting a given child respondent's scores on the Woodcock-Johnson LWI assessment at wave 2 of L.A.FANS (measured in 2006 – 2008) as a function of her score on the same assessment at wave 1 (i.e., a lagged dependent variable), neighborhood population density and sociodemographics, and child-, parent-, and household-level controls. Below, I provide more details on the latter set of variables and on my execution of the first-difference model to partially mitigate the bias induced by confounders shaping cognitive skill levels aside from the neighborhood "treatment."

Note that I operationalize wave 2 cognitive (i.e., language) skills as the age-adjusted national percentile corresponding to each child's raw score: values can range from -99 to 99. I use this percentile-based measure rather than the raw score as the basis for my analyses because the results are more interpretable and because the percentile transformation considerably reduces the outcome distribution's skew. However, I run robustness checks using raw scores and generate virtually identical results.

Neighborhood Density and Sociodemographics

This study's core empirical objective is to assess whether neighborhood population density provides additional leverage in explaining neighborhood-level variance in children's cognitive skill development. To this end, I operationalize neighborhood population density in simple terms, closely aligned with extant research: the estimated *total number of residents per square mile* for each child respondent's census tract of residence at baseline (wave 1: 2000 – 2002), using census 2000 data.

I also use children's wave 1 census tract of residence as a basis for measuring neighborhood sociodemographics, which the vast majority of extant neighborhood effects studies employ as the core predictor of interest. Concretely, I estimate a *Neighborhood Disadvantage Index* for every respondent's wave 1 census tract by running a principal components analysis (PCA) using six census 2000-generated measures: % of census tract families in poverty, % of households that are female-headed, without a male present, % of households receiving some form of public assistance, % of civilian residents age 16+ who are unemployed, % of residents age 25+ with a bachelor's degree, and % of residents age 25+ in managerial or professional occupations. PCA is a data reduction strategy that creates composite indices capturing variation in each component variable. I extract the PCA-generated component with the highest factor loadings when run on all six component variables and label this the Neighborhood Disadvantage Index (factor loadings are available upon request). I also follow a handful of recent studies that capture not only proxies for neighborhood concentrated disadvantage but also concentrated affluence (Howell 2019). To this end, I use the PCA-generated component with the second highest factor loadings as a *Neighborhood Advantage Index*. Note that the neighborhood advantage and disadvantage indices are mechanically orthogonal to one another. Bivariate correlations between each index and the six component variables (available upon request) suggest they each effectively capture structural (dis)advantage among neighborhoods' residents.

Neighborhood-level Measures of Institutional Resource Capacity

To test whether neighborhood population density effects on child skill development operate, in part, via access to a higher degree of local nonprofit capacity, I create a novel contextual measure: the number of local nonprofit organizations, adjusted for the size of the local population. Constructing this proxy requires first selecting a proper spatial unit of analysis. The census tract is likely too small a spatial aggregation to provide meaningful information on local nonprofit capacity because it is implausible that families only consider interfacing with nonprofit organizations within their tract, especially since so many census tracts contain no organizations, and a small subset of tracts (e.g., those in central business districts) include high concentrations of organizations.

For these reasons, I use the Sampson et al. (2017)-defined eight Los Angeles County regions as the focal spatial unit of analysis for this variable. The regions are identified as Central Los Angeles, San Fernando Valley, San Gabriel Valley, Gateway Cities, South Bay, Westside Cities, Santa Clarita Valley, and Antelope Valley (see also Bruch and Swait 2019). These meso-structures are larger than a neighborhood but typically smaller than the city of Los Angeles. It is highly likely that Angelenos' physical activity spaces are largely structured *within* rather than *between* these county regions. Empirical analyses suggest ~90% of L.A.FANS elementary school-aged children attend a school within the region in which they reside. A similar percentage of adults work within the county region in which they reside.

To estimate the total number of nonprofit organizations per county region at wave 1 of L.A.FANS data collection, I use the National Center for Charitable Statistics' data archives housed at the Urban Institute. I extract the addresses of every nonprofit organization registered with the Internal Revenue Service as a 501(c)3 public charity entity that was operational and reported to be located in Los Angeles County in the year 2000 (N=5,782). I assign each of these addresses to one of the eight county regions. To create a parsimonious local capacity measure, I divide the total count

of organizations (regardless of revenue size) by the total number of estimated neighborhood residents in each region in 2000 and multiply by 1,000 to facilitate interpretation. Thus, the final measure estimates *the total number of active, registered 501(c)3 public charities per thousand neighborhood residents* in the year 2000. Adjusting for population is crucial to capture service delivery capacity, given that two otherwise-similar nonprofits are likely to face different degrees of strain– and thus offer different amounts of support and resources– based on the number of residents they are expected to serve in their local jurisdictions.

Controls

I employ a wide range of controls commonly used in neighborhood effects analyses to reduce bias in neighborhood effect estimates. First, as mentioned above, I use baseline (wave 1) scores of the child's Woodcock-Johnson LWI (the module upon which the outcome variable is based), scored in age-adjusted percentiles. The inclusion of this lagged dependent variable partially mitigates the bias induced by confounders that shape variation in cognitive skill levels. I also control for the age-adjusted percentile score based on their Woodcock-Johnson Math Reasoning module performance, again at baseline. The latter is included based on recent evidence suggesting adding in math assessment-based controls reduces bias when estimating school effects on English/Language Arts achievement and vice versa (Deming 2014).

Congruent with other neighborhood and school effects studies, I include controls for the child's *age* at the time the outcome was measured (wave 2), as well as categorical measures of the child's *gender* (reference: male) and *race/ethnicity* (i.e., reference: white, black, Latino/Hispanic, Asian/Pacific Islander, Other/Multiracial). I also add a binary indicator of whether the child's primary caregiver is a *first-generation immigrant* (i.e., not born in the United States), a binary indicator of whether the child's *home is owned* (versus rented), and a continuous measure of the child's *household*

income (logged). The latter encompasses all income sources reported by the head of household at wave 1. This estimate is standardized to year 1999 dollars and then logged to reduce the distribution's skew. For missing household income values, L.A.FANS provides estimated imputed values (Peterson et al. 2012).

I supplement these core structural predictors with others that are occasionally missing from neighborhood and school effects analyses. I construct a set of binary variables gauging the primary caregiver's *educational attainment* at wave 1 (reference: did not complete high school, completed high school but no college, completed some college, or obtained a bachelor's degree). Because this sample contains a high proportion of immigrants and because parents' facility with English is likely to be crucial to children's skills using the language, I incorporate a binary measure of whether the household's *roster was completed in English* (versus Spanish).

I also incorporate two proxies for household structure, which is also believed to shape child development, measured at wave 1. They include a dichotomous variable indicating whether the primary caregiver reports to be *married* or *cohabiting* (reference: single) and a continuous measure gauging the *number of children* in the household.

Note too that I add a rarely-included parental cognitive skill measure based on results from the Woodcock-Johnson *Passage Comprehension* assessment, conducted in either English or Spanish, and converted into age-adjusted national percentile rankings. I use the score from the earliest wave of data available for a given primary caregiver because L.A.FANS typically only fielded the test to PCGs once, even if they were panel respondents. The test captures individuals' ability to process written information by asking test takers to identify missing key words from short passages of increasing complexity, and parents with stronger language skills are more likely to raise children with stronger language skills (Sastry and Pebley 2010). Because this measure is missing values for a

nontrivial portion of my analytic sample (~10%), I estimate imputed values for these respondents (details available upon request).

I also include a socioemotional health control – the *probability of depression*, ranging from 0 to 1 – exhibited by each child's primary caregiver because research suggests this factor independently predicts child skill development (Kiernan and Huerta 2008). This metric is based on respondents' answers to the Composite International Diagnostic Interview-Short Form (Kessler et al. 1998), which was developed by the World Health Organization, based on the Diagnostic and Statistical Manual of Mental Disorders, and used in the U.S. National Health Interview Survey. I average the probabilities across waves for which they are available.

Descriptive statistics capturing the means and standard deviations for all of the above variables are presented in Table 1 for the full sample, as well as for two class-stratified subsamples. The working class subsample is operationalized parsimoniously: as children whose primary caregivers have no college education. Conversely, middle/upper-middle class is operationalized as children whose primary caregivers have completed some college or completed a bachelor's degree or higher. As I describe below, I use this stratification scheme in my final analyses to assess whether local nonprofit density mediates neighborhood population density's effects on skill development among children of lower class, but not upper class, parents (Hypotheses #2 and #3).

Table 1 about here

ANALYTIC STRATEGY

To lay the groundwork for assessing whether neighborhood population density provides valuable leverage in explaining between-neighborhood variance in children's cognitive skill development, I begin with an unconditional random intercept model:

(**Equation 1)**

Level 1: $Y_{ijk} = \pi_{0jk} + e_{ijk}$

Level 2: $\pi_{0jk} = \beta_{00k} + r_{0jk}$

Level 3: $\beta_{00k} = \gamma_{000} + u_{00k}$

where the outcome is Woodcock-Johnson LWI age-adjusted percentile score in wave 2 for child *i* (level-1), nested within household *j* (level-2), and census tract *k* (level-3). γ_{000} represents the tract-level intercept's fixed component (the average tract outcome for the full sample), u_{00k} is the tract-level intercept's random error (the tract-specific average's deviation from the full sample's average tract), r_{0jk} is the household-level error term (the household-specific average's deviation from the full sample's average household), and e_{ij} is the child-level error term (the deviation between the child's outcome and its household-specific average). This model and all that follow assume the tract intercept's random component, and the household- and child-level residuals are normally distributed with means of 0 and variances of τ_3^2, τ_2^2, and σ^2, respectively. By dividing the tract intercept's variance (τ_3^2) by the model's total variance, I estimate what proportion of the total variance is attributable to tract-level (versus household- or child-level) factors. Drawing on the large body of neighborhood effects research, I expect that the tract-level variance – regardless of whether it is accounted for by population density, sociodemographics or some other set of factors – to constitute a meaningfully large share of the total variance in the outcome.

If it does, I will pivot to my second research question and attempt to explain the tract intercept's variance by adding tract-level proxies for neighborhood sociodemographics and population density to the three-level random intercept model. I will first add in a set of basic child- and household-level race, nativity, and income controls, and the commonly-emphasized Neighborhood Disadvantage Index to the unconditional model. This generates a random intercept, fixed slope model:

(Equation 2)

Level 1: $Y_{ijk} = \pi_{0jk} + \pi_{1jk}X_{1ijk} + \pi_{2jk}X_{2ijk} + e_{ijk}$

Level 2: $\pi_{0jk} = \beta_{00k} + \beta_{01k}X_{1jk} + \beta_{02k}X_{2jk} + r_{0jk}$

Level 3: $\beta_{00k} = \gamma_{000} + \gamma_{001}X_{1k} + \gamma_{002}X_{2k} + u_{00k}$

γ_{001} represents the fixed slope quantifying the relationship between the child's cognitive skill change in percentile units and the Neighborhood Disadvantage Index (X_{1k}), which – like all continuous predictors – is grand mean centered (mean = 0) and normalized (S.D. = 1) to facilitate interpretation. I will then assess the extent to which the tract-level random intercept's variance attenuates toward 0 to gauge what portion of the total neighborhood effect on children's cognitive skills is explained by this traditional sociodemographic proxy. I then use the same analytic framework but replace the disadvantage index variable with the Neighborhood Advantage Index to assess whether this measure of concentrated affluence provides more (or less) explanatory power than the disadvantage index.

Next, I replace the advantage index with my theoretically-central tract population density variable to assess whether it exerts an independent effect on children's skills, and whether the tract-level variance declines accordingly. If tract population density does independently predict the outcome as I expect, I will run a model that includes it and a proxy for neighborhood sociodemographics simultaneously, followed by a model that adds in all child- and household-level controls to assess whether the neighborhood variables remain significantly predictive of children's language skills after accounting for a wide range potential confounding explanations.

My final set of analyses run essentially identical models but specify them on class-stratified samples to gauge whether the strength of neighborhood sociodemographics and population density effects vary based on families' structural positions. Recall that I expect population density to be more material to disadvantaged children's language development than to the more advantaged

(Hypothesis #2), given the disproportionate reliance of less-resourced families on local nonprofit organizations for a wide range of services (e.g., childcare, food stamps/WIC) in the twenty-first century city (Hypothesis #3). I test this specific possibility by adding in a proxy for local nonprofit capacity and assessing whether it appears to mediate the population density effect on skills for the disadvantaged stratum of the sample.

RESULTS

Before assessing the size and sources of neighborhood variance in children's skill trajectories, I descriptively examine the total variance in tract structural (dis)advantage and population density, and the bivariate relationship between the two. If the two exhibit similar spreads and very highly correlations in twenty-first century Los Angeles – as they appeared to in Chicago during Wirth's time – then my proposition that neighborhood effects on child development may be better explained by incorporating both explanations is unlikely to be borne out. However, they are not.

The top half of Figure 1 presents kernel density plots capturing the entire Los Angeles County tract distributions of the Neighborhood Disadvantage Index (Panel A) and the Neighborhood Advantage Index (Panel B) over the tract population density distribution in the year 2000 (N=2,031). All three variables are standardized so their means are 0, and standard deviations are 1. These visualizations suggest the population density distribution is tightly clustered around the center of the distribution with a long right-tail suggesting a small number of tracts are nearly eight times as dense (~40,000 people per square mile) as the median Los Angeles County tract (~5,000 people per square mile). The Neighborhood Disadvantage Index distribution is flatter and more broadly distributed than the population density distribution. Thus, tracts similarly average population density may meaningfully diverge in structural disadvantage (e.g., tracts in the North Hollywood and

Compton areas both have ~5,000 people per square mile but the latter are over three standard deviations more disadvantaged than the former).

Although the Neighborhood Advantage Index's distribution shape broadly mirrors that of the population density's distribution, with clustering near 0 and a long right-tail, the tracts within this tail – such as those within tony Westside neighborhoods like Brentwood, Westwood, and Pacific Palisades – are not the same as those in the population density tail, which include low-income tracts near downtown Los Angeles, Koreatown, and Westlake areas.

Figure 1 about here

The intuition that high population density does not necessarily equate with high (dis)advantage is confirmed by scatterplots (see bottom-half of Figure 1) and bivariate correlations suggesting relatively modest associations. Tract population density is, as Wirth might predict, positively associated with the Neighborhood Disadvantage Index (~0.5). It is also modestly associated with the Neighborhood Advantage Index (~0.2). Overall then, neighborhood population density and sociodemographics are distinct, only partially overlapping constructs in twenty-first century Los Angeles County. Analyses in this context could conceivably benefit from incorporating both axes of variation to explain neighborhood differences in children's trajectories.

Multilevel and Multivariate Analyses Predicting Child Skill Growth

To assess whether neighborhoods plausibly matter in stratifying child skill development— via neighborhood sociodemographics, population density, or some other pathway— I start with a three-level HLM (results not shown) that merely decomposes the total variance in the outcome by child-, household-, and tract levels after adjusting for baseline (wave 1) Woodcock-Johnson LWI and math reasoning scores. If the level-3 (i.e., tract-level) variance in this model is trivial then neighborhood-level factors (i.e., neighborhood effects) are unlikely to materially shape child skill development.

However, this is not case. The unconditional model generates a tract-level random intercept variance of 0.079, which significantly greater than 0, and implies that the standard deviation of tract-level averages in skill growth is nearly 0.3 standard deviations. In other words, a child who resided in a tract one standard deviation *above* average in the tract-level distribution of skill growth is predicted to grow a third of a standard deviation more over the 6-8 year timeframe than a child with similar baseline skills who resided in a tract near the average of the distribution.

Are these initially-observed neighborhood effects confounded by basic child- and household-level factors that predict skill development and are nonrandomly distributed across tracts? To test this possibility, I preserve the baseline skill predictors and add in a small set of core controls, including child age, gender, and race, parent nativity, as well as household income and homeownership status, and then recalculate the tract-level random intercept variance. Results (not shown) suggest this variance reduces by more than half, from 0.079 in the skills-only model to 0.037 here. Thus, it appears that neighborhood skill trajectory disparities are indeed partially – but not fully – explained by sorting among families (e.g., Jencks and Mayer 1990). Yet even after accounting for these traditional covariates, which are included in most neighborhood effects studies, a one standard deviation increase in tract-level value-added (i.e., demographically-adjusted) skill growth predicts a nearly 0.2 standard deviation boost to LWI scores – almost identical to the cognitive skill effects generated by a one standard deviation increase in school value-added quality (Deutsch 2013; Jennings et al. 2015; Lloyd and Schachner 2020).

Thus, neighborhoods appear to shape child skill development to a considerable degree in twenty-first century Los Angeles, even after accounting for selection. Drawing on the rich concentrated disadvantage literature, we might expect tract-level sociodemographics to explain a large portion, if not all of, this residual tract-level variance. To test this possibility, I predict Woodcock-Johnson LWI score in wave 2 as a function of child performance on the same test at

wave 1, the traditional controls noted above, and, crucially, the Neighborhood Disadvantage Index (see Table 2, Model 1). The results suggest that although this measure significantly predicts lower rates of child skill development in Chicago-based studies and some national studies, it does not significantly predict a similar outcome in twenty-first century Los Angeles. The tract-level variance remains virtually unchanged compared to the analogous estimate generated from a model that excluded any measure of neighborhood sociodempgrahics.

Table 2 about here

Does this finding suggest neighborhood sociodemographics provide minimal leverage in explaining neighborhood effects in Los Angeles? Not necessarily. Perhaps neighborhood affluence and its correlates, rather than concentrated disadvantage proxies, provide more explanatory leverage in Los Angeles County compared to places like Chicago. Model 2 suggests this may be the case, as the Neighborhood Advantage Index's generates the expected positive and significant coefficient: a one standard deviation in the index is associated with a 0.15 standard deviation increase in wave 2 language skills, net of baseline skills in basic demographic controls. The tract-level variance reduces to 0.016 from 0.036 in the previous model, suggesting 56% of the tract-level variance in child skill growth (net of basic demographics) is explained by this sociodemographic index alone.

If this percentage were close to 100%, my core hypothesis (#1) that neighborhood population density helps illuminate tract-level variance in child skill growth – over and above neighborhood sociodemographics – would be highly unlikely to be supported. However, nearly half of the tract-level variance is not explained even in a model that includes traditional race, class, and nativity controls and a commonly-employed measure of neighborhood affluence, leaving room for potential alternative explanations of neighborhood effects.

I begin probing my core argument – that neighborhood density effects explain some of this tract-level variance – by replacing the Neighborhood Advantage Index with my tract population

density measure (Model 3). Indeed, the model suggests children residing in denser neighborhoods tend to achieve much greater skill growth. A one standard deviation increase in tract density is associated with a 0.19 SD in the Woodcock-Johnson LWI national distribution. This magnitude is larger than the previously-estimated neighborhood affluence effect in an otherwise identical model. Crucially, the inclusion of population density as the only tract-level predictor appears to eliminate the residual tract-level random intercept variance, suggesting *all* of the variance is now explained.

Perhaps surprisingly, neighborhood population density appears to provide considerably more explanatory leverage than neighborhood affluence when both contextual measures are included separately. However, a more rigorous test of the relative importance of each entails including both simultaneously in the same model, as I do in Model 4. Here, it appears that both neighborhood affluence and neighborhood population density exert fairly large, independent effects of similar magnitudes on children's language skill development. A one standard deviation increase in the former is associated with a 0.12 SD increase in the outcome, whereas a comparable increase in the latter is associated with a 0.15 SD boost. Thus, neighborhood affluence and population density appear to be complements, rather than substitutes, in explaining contextual effects on children's language development. Model 5, which incorporates a richer set of parent- and household-level controls to further allay concerns of sorting-based confounding, tells the same general story. Even after accounting for parents' educational attainment, cognitive skills, and socioemotional health, the magnitude of neighborhood affluence and population density effects barely budges. The left-hand side of Figure 2 visualizes the magnitude of these neighborhood effects, with both basic and extended controls accounted for. Overall, Hypothesis #1 appears to be strongly supported.

Figure 2 about here

Institutional Resources as a Potential Mediator of Density Effects?

What might explain the large and robust neighborhood density effects I have reported thus far? A burgeoning literature theorizes potential ecological mechanisms accounting for neighborhood sociodemographics' effects on child skill development (e.g., Galster 2012) but very few studies theorize why density might matter. Earlier I proposed that population density may confer crucial benefits for children via better access to institutional resources. Specifically, I argued that nonprofit organizations play increasingly important roles in delivering valuable services to children in an era of federal welfare reform, local government retrenchment, and educational privatization. If denser neighborhoods facilitate access to these crucial institutional resources, then neighborhood differences in the latter may partially explain the positive effects of the former (Hypothesis #2).

To test this possibility, I return to the most complete model in Table 2 and add in a variable that proxies spatial differences in nonprofit capacity. Hypothesis #2 implies that the focal coefficient on tract population density should attenuate in magnitude relative to the prior model once the proxy is included, and perhaps the nonprofit capacity variable will exert a positive, independent effect on the outcome. Indeed, both expectations are borne out in Table 3A, Model 1. The tract population density coefficient diminishes in magnitude from 0.15 in the prior model to 0.11 here – a reduction of about 25% (the Neighborhood Advantage Index coefficient diminishes by about 10%). It is also important to note that a one standard deviation increase in the local nonprofit capacity measure independently predicts a nearly 0.10 SD increase in child skill growth. The estimated magnitudes of the tract population and local nonprofit capacity index coefficients for the full sample are visualized via the black bars in Figure 3.

Table 3 about here

Figure 3 about here

Although the tract population density effect does not appear to be fully explained, the model suggests neighborhood affluence, population density, and institutional resources (in the form of nonprofit capacity) exhibit independent and comparably large effects on children's skills; all else equal, a one standard deviation increase in each of these measures would be predicted to collectively boost children's skills by nearly a third of a standard deviation.

My final hypothesis (#3) stipulates that neighborhood density in general, and local nonprofit capacity in particular, are likely to exert larger effects on children within disadvantaged versus advantaged families because the former group is more reliant on non-household resources and support. Table 3A's remaining models test this possibility of class-based heterogeneity in neighborhood effects by estimating fully-specified models with the neighborhood affluence, population density, and local nonprofit capacity measures for children with primary caregivers who have not attended any college ("Working Class") versus children with primary caregivers who have ("Middle/Upper-Middle Class").

Starting with working class children, Model 2 presents a fully-specified model that only excludes the hypothesized nonprofit capacity mediator. The partial output reveals that the tract population density coefficient's magnitude is considerably larger for this disadvantaged subsample than it is for the sample as a whole (0.20 versus 0.15 in the analogous full-sample model). Model 3 adds in the local nonprofit capacity measure and reveals considerable attenuation in the previously-estimated population density effect (from 0.20 to 0.14). Moreover, the nonprofit capacity measure is strongly and independently predictive of child skill development for this subsample (β=0.17). This magnitude is nearly twice that generated for the same variable when the sample as a whole was examined (Model 1) (see gray bars in Figure 3).

Thus, Models 2 and 3 provide support for Hypothesis #3's contention that neighborhood population density and local nonprofit capacity are disproportionately salient to disadvantaged

children. The proposition is further reinforced by models with identical specifications applied to the middle/middle-upper class subsample (Models 4 and 5). These models suggest population density and local nonprofit capacity are not significantly predictive of advantaged children's cognitive development, though neighborhood affluence is.

Although Table 3A provides strong support for my core theoretical argument, one might counter that other neighborhood factors theorized to shape child development may confound my estimated neighborhood population density and local nonprofit capacity effects on disadvantaged children's development. A final set of robustness checks are presented in Table 3B to assess this possibility. Concretely, I return to the most complete model for the disadvantaged child subsample and add in rarely-employed proxies for other contextual mechanisms proposed to shape children's development, such as institutional resources related to job accessibility (Model 1) and non-traditional school options (Model 2), neighborhood social capital/control (Model 3), neighborhood crime (Model 4), and environmental hazards (Model 5). Even after controlling for all five of these potential confounders, the same story emerges: neighborhood population density, local nonprofit accessibility, and – to a slightly lesser extent potentially, neighborhood affluence – are strongly predictive of disadvantaged children's cognitive development.

DISCUSSION & CONCLUSION

The neighborhood effects literature is at an inflection point. Its central contentions are on firmer empirical footing than ever before and have garnered support even from what were once the most skeptical corners of the social sciences. This success has naturally generated momentum for stratification scholars to pivot from the largely settled question of whether neighborhood

sociodemographics matter to precisely how they matter – especially for children. A burgeoning body of work is deploying rigorous empirical strategies to do so.

Yet, in this paper I sound a note of caution. By constraining our view of neighborhood effects to structural (dis)advantage, proxied using neighborhood race and class composition, we may obscure other explanations of neighborhood-level variance in residents' outcomes that supplement the prevailing sociodemographic-oriented view. If urban sociologists' goal is not only to explain one particular type of neighborhood effect but to maximize the proportion of the neighborhood-level variance in outcomes we can explain, then we should continue considering what additional neighborhood factors may help us do so.

The Chicago school left us with some potentially valuable hints. Classic works by Wirth not only implicate neighborhood sociodemographics (what he called heterogeneity) as a key driver of residents' outcomes but also city population size and neighborhood population density. This paper draws on the latter to develop a novel account of how neighborhood density may affect children's cognitive development. Although Wirth cast density in a negative light and assumed crime, social isolation, and environmental toxicity came bundled with it, I argue that population density may confer important benefits in the contemporary American city, to the extent it comes with higher concentrations of institutional resources – like nonprofit organizations – that now play crucial roles, especially for disadvantaged families.

My empirical analyses broadly support this novel density-based account of neighborhood effects. Using L.A.FANS panel data tracking language skill growth during the 2000s for nearly 700 children and multilevel models, I find that population density exerts large, positive, and highly robust effects on children's cognitive development. Neighborhood advantage also appears to exert strong skill growth effects. This latter finding suggests the prevailing paradigm still has salience in the contemporary context of Los Angeles County. Yet it is crucial for urban and stratification

scholars to consider that for the full sample, and especially for the most disadvantaged households, large population density effects remain, net of neighborhood sociodemographics. These effects appear to reflect, in part, neighborhood differences in institutional resources' availability, specifically the capacity of local nonprofit organizations.

The study as a whole has two key implications – one broad, the other narrow – for the booming neighborhood effects literature. The broad implication, as proposed above, is that the concentrated disadvantage lens is necessary but not sufficient to illuminate the full scope of neighborhood effects in the twenty-first century. Although momentum is building for understanding the ecological mechanisms that link neighborhood sociodemographics to child outcomes, urban scholars should not lose sight of the possibility that rarely-considered spatial factors, such as population density, may also underlie observed neighborhood effects.

This proposed project is as much theoretical as it is empirical. Researchers should continue developing and refining supplementary explanations that identify potentially salient spatial factors and that clarify how they both interact with neighborhood race and class and independently affect children's outcomes. Although here I sketch and test population density's effects, hopefully future research will propose other non-sociodemographic neighborhood factors that may matter. Ideally, the field will eventually generate an integrative neighborhood effects model incorporating both sociodemographic and non-sociodemographic factors that maximizes the proportion of between-neighborhood variance in important outcomes we can explain not just in canonical sites like twentieth-century Chicago but also twenty-first century Los Angeles and other geographic and temporal contexts.

The more narrow implication of this study is that population density, specifically, deserves much more attention from stratification-minded urban scholars than it has received since the concentrated disadvantage paradigm emerged in the 1980s and 1990s. A large literature in urban

planning and economics considers the effects of population density, but the spatial scale of analysis is typically the city or metro rather than the neighborhood (cf. Glaeser 2020) and the outcomes of interest are often related to commuting patterns or worker productivity and wage growth (Abel, Dey, and Gabe 2012; Rosenthal and Strange 2004). Sociologists have a valuable role to play in understanding how neighborhood-level population density also shapes inequality insofar as it potentially attracts valuable institutional resources that propel children's development and potentially mediate race- and class-based skill and status inequities. This study intends to contribute to the relatively nascent sociological literature focusing on the connections between the built environment, institutional fabric, and the spatial distribution of the population – and the implications of these dynamics for social stratification.

Limitations, Extensions, and Policy Implications

Before pursuing this more expansive neighborhood effects agenda that places population density closer to its center, it is important to confirm that this study's findings hold up in larger samples that employ other skill outcomes and generalize to other geographic and temporal contexts. This study is admittedly limited in terms of its sample size and age range, its emphasis on one particular type of cognitive skill, and its narrow focus on one distinctive urban ecology over the course of less than a decade. Valuable next steps might include testing whether similar patterns emerge when predicting math and socioemotional skills both of which appear to independently predict later-life outcomes.

This study can only speak to neighborhood effects' size and sources in one county during one decade. While the study helped generate empirically-plausible theories of density-based neighborhood effects, using similar analytic frameworks but different data sources that cover samples in other cities and eras is crucial. Researchers should theorize and test why neighborhood population density may or may not boost cognitive development in some contexts than others. I

believe neighborhood density may be most beneficial in places and times where its historical correlates – crime, environmental toxicity, and housing overcrowding – are attenuated and where families are most reliant on institutional resources and non-traditional school options.

Finally, and importantly, a key question this paper could only begin to answer is *why* neighborhood population density appears to accrue benefits to children. Institutional resources appears to be a plausible, but only partial, explanation. My mediation analyses were admittedly cursory. Future analyses should leverage causal mediation methods to validate or refute my findings and propose alternative explanations that could account for the documented population density effect. Perhaps dense neighborhoods provide more favorable social capital dynamics (e.g., larger potential peer groups for children) and more recreational activities that fuel their development. Clarifying these mediating mechanisms is crucial to extracting policy implications that could reshape how governments approach redressing spatial inequities. This agenda may shift the emphasis from person-based interventions that depopulate disadvantaged neighborhoods via mobility vouchers to place-based interventions that create the most cognitively stimulating environments possible for all residents.

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