

# Inequities in Public Library Branch Access and Children's Book Circulation in a Midwestern American City

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## Abstract

Literacy development is a complex process. It is well established that the Home Literacy Environment influences literacy development. To better understand the influence of the Neighborhood Literacy Environment, we examined the distribution of public library branches across neighborhoods in an American midwestern city and associations between book circulation rates and childhood poverty rates. This study used children's book circulation data provided by 40 branch locations of the Cincinnati and Hamilton County Public Library system in Ohio (USA). The primary outcome variable was the branch-specific, five-year mean circulation rate of books-per-child living within the branch neighborhood. The predictor variable was the childhood poverty rate of the neighborhood. There was a significant, moderate negative correlation between book circulation and childhood poverty rates (Spearman's  $r = -0.52$ ,  $p < 0.001$ ). Using data from a public library system in a large midwestern American city, this study found significant disparities between branch access and children's book circulation in high-poverty neighborhoods.

**Keywords:** children's books; equitable access; literacy; neighborhood literacy environment; public libraries

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## Introduction

Literacy is a vital asset that can and should be more effectively promoted. According to the most recent National Assessment of Educational Progress, 65% of fourth-graders in the United States (U.S.) read below a proficient level (Hussar et al., 2020), and globally, six out of ten children and adolescents fail to reach the minimum reading proficiency levels (UNESCO, 2017). Sub-optimal literacy is predictive of adverse health outcomes and decreased vocational potential (Braveman et al., 2011), with an estimated annual economic cost of over \$350 billion in the U.S. (Cree et al., 2015) and over \$1.2 trillion worldwide (Leitch, 2006).

Literacy development itself is a dynamic process, beginning in infancy and extending through formal instruction in school (Whitehurst & Lonigan, 1998). A child's reading and writing proficiency are heavily influenced by their home literacy environment (HLE). The HLE consists of modifiable factors, including access to books, parental attitudes toward reading, and literacy-centered routines, notably caregiver-child "shared" reading (Payne et al., 1994). Outside the U.S., low and middle-income countries have also affirmed the importance of the HLE and book-sharing on a child's receptive and expressive language development (Opel et al., 2009; Valdez-Menchaca & Whitehurst, 1992; Vally et al., 2015). The HLE is influenced by internal (e.g., income, parental education) and external factors, such as the neighborhood where a child is raised, the latter being the focus of this study.

A growing body of literature and theories has demonstrated how important a child's neighborhood is to their development and well-being (Minh et al., 2017). The Neighborhood Effects theory looks specifically at poverty's effects on human health and development. Evidenced by Galster's research (2012), the theory links different causal pathways between a neighborhood and a person's health: interactive social mechanisms (such as a person's social network), environmental (the built environment), geographical (social services), and institutional (local resources). These aspects outline potential impacts on children's health, well-being, and development. The Neighborhood Effects theory also considers areas for interventions, such as policy changes to support social services and investment in local resources.

Regarding the effect of a neighborhood's environment on academic achievement, neighborhood poverty is an economic disadvantage that has been shown to directly affect a child's literacy development (Vaden-Kiernan et al., 2010). Vaden-Kiernan and colleagues found that neighborhood characteristics, such as economic status, are associated with the literacy interactions between a parent and their children. However, the study calls for further research into what specifically about a neighborhood causes this influence and what daily literacy practices may have been overlooked. Similar findings were found in a study from Brazil, where students from state-run elementary schools in economically disadvantaged areas were found to have lower academic outcomes than more affluent areas (da Cunha et al., 2009). Froiland and colleagues found that the neighborhood's social network may predict literacy exposure within the home (Froiland et al., 2014). A study from Canada found similar effects, citing the importance of neighborhood cohesion and how its sociocultural dynamics may influence literacy outcomes (Kohen et al., 2008). While the literature has established a few mechanisms by which the neighborhood may influence a child's literacy development, the influence of local resources is largely unknown. This gap is the basis for what this study sought to explore, specifically what local resources exist within a neighborhood that may influence a child's literacy development.

As established above, the literacy environment extends beyond the home into the local neighborhood. We propose the concept of the "neighborhood literacy environment (NLE)" to take the idea of the impacts of the neighborhood dynamic on childhood literacy a step further. We define a child's access to print materials, especially books, and pro-literacy programs within their neighborhood as the NLE. We posit that the NLE, alongside the HLE, influences literacy development and is a reasonable means through which literacy outcomes among children may be improved. It is well-documented that children living in economically disadvantaged neighborhoods have less access to books through bookstores (Neuman & Celano, 2001; Neuman & Moland, 2016). They are also more likely to live in areas that have been described as "book deserts", with limited access to all forms of print media (Neuman & Celano, 2001; Neuman & Moland, 2016). Neuman and colleagues also demonstrated that increasing neighborhood-level

economic segregation has further exposed this disparity (Neuman & Moland, 2016). Then, it stands to reason that this neighborhood-level determinant likely exacerbates risks of language delays and reading difficulties for children (Blair & Raver, 2016). However, public literacy resources as a means to reduce inequities within the NLE have not been studied beyond bookstores.

Public libraries have long been a vital public literacy resource capable of reducing inequities in children's access to books and literacy-promoting activities (e.g., storytime programs). Indeed, there are 406,491 public libraries worldwide, with 17,227 operating within the U.S. (IFLA, "Library map of the world", n.d.). Children that are taken to a public library regularly have better reading performance, more positive attitudes toward reading, and more books at home (Whitehead, 2004). In this sense, public libraries are a critical component of the NLE.

Our study sought to better understand the distribution of resources within NLEs, specifically publicly accessible library resources. We examined the distribution of library branches across neighborhoods and evaluated for associations between book circulation rates and childhood poverty. We conducted this study in Cincinnati, a large city in the Midwestern U.S. state of Ohio, which boasts 812,037 citizens, with 67.5% identifying as White, 25.7% Black or African American, and fewer than 5% of the population identifying as Hispanic or any other race. The demographic includes 184,817 children under 18 years of age, with 23.6 % living in poverty (U.S. Census, 2018).

The U.S. Department of Health and Human Services sets the federal poverty level (FPL) within the U.S. every year regarding household income to household size. For example, the federal poverty level for a family of four was \$25,701 in 2018. Given previous research, we hypothesized that neighborhoods with higher childhood poverty rates (percentage of children living in households meeting poverty criteria) would be less likely to have a public library branch. Additionally, we hypothesized that there would be a negative correlation between the circulation rate of children's books (how often books are checked out) and poverty rates. We hypothesized a negative correlation between the circulation rate of children's books and the percentage of individuals self-identifying as Black or African American within a neighborhood based on the following three factors: 1) the links that exist between economic and racial segregation within the U.S. (Williams & Collins, 2001), 2) the economic impact that segregation has on book distribution (Neuman & Moland, 2016), and, 3) because African Americans/Blacks are the largest community of color in Cincinnati (U.S. Census, 2018).

## Methods

This ecological study used existing data enumerating the circulation of children's books by the Cincinnati and Hamilton County Public Library (CHPL) from its 40 neighborhood branches from January 2014 to December 2018 (five years). An ecological study is one where the units of measure are populations or groups of people rather than individuals (Morgenstern, 1995). Ecological studies are often used when individual data are not available, as was the case for this study. Children's books were defined as books geared to readers between 0 and 18 years of age. All branch libraries were included in this study and shared data on the absolute numbers of books circulated during the study timeframe. We excluded the Downtown Main Library (i.e., the flagship location for the CHPL system) because its circulation numbers included automatic online renewals for every branch location and did not accurately reflect its unique distribution, a potential confounder. The Downtown Main Library is located in downtown Cincinnati which is

more business-focused and home to few children. We, therefore, saw the main library as substantively centralized rather than localized like the neighborhood branches.

The primary outcome variable was the branch-specific, 5-year mean circulation rate. This rate was measured as the number of books circulated per child living within the same neighborhood as the library branch. Our first predictor variable was the childhood poverty rate of the neighborhood where the branch library was located. For specific analyses, we kept this as a continuous variable. For other analyses, it was dichotomized. The U.S. Census defines "poverty areas" as census tracts with poverty rates of 20% or more (Bishaw, 2011). Using this definition, we considered neighborhoods with 20% of the child population living below the FPL to indicate higher poverty areas and those with <19.9% below the FPL as areas of lower poverty. Our second predictor variable was a measure of neighborhood racial composition. We focused on the proportion of the population within a given neighborhood who self-identified as Black or African American, measured on a continuous scale.

The American Community Survey is administered every year by the U.S. Census Bureau, providing area-level estimates for a range of sociodemographic measures (U.S. Census Bureau, 2017). For this study, neighborhood childhood poverty rates, population estimates of the number of children under 18 years of age, and information on the race for specific neighborhoods were obtained from the 2018 American Community Survey. All data elements were self-reported; individuals responded with their income and self-identified race (e.g., White, Black or African American, etc.). Data were then aggregated to estimate population rates at relevant geographies. Neighborhoods were defined according to locally generated boundaries.

Associations between neighborhood presence or absence of a library branch, a binary variable, and neighborhood child poverty (high or low) were assessed using a Chi-square test. Not every neighborhood within Metropolitan Cincinnati has a branch, the branch locations were based largely on land acquisition and available funding. Indeed, the first branch libraries, seven of which are still operating, were funded by the wealthy steel industrialist and philanthropist Andrew Carnegie between 1886 and 1919; library trustees were responsible for the choice of location of said branches (Tansey, 2016). Branch-specific circulation rates were calculated by dividing the five-year mean number of children's books in circulation per branch by the population of children <18 years of age living within the library's neighborhood. A Spearman's rank-order correlation coefficient ( $r_s$ ) was then calculated for the relationship between neighborhood-level rates of children's book circulation and child poverty. An  $r_s$  was also calculated for the relationship between book circulation rates and the proportion of individuals identifying as Black/African American in each neighborhood. We used the Spearman and not the Pearson correlation coefficient because of the non-parametric distribution of variables.

There are strong linkages between economic and racial segregation in the U.S., and structural classism and racism have long been intertwined (Williams & Collins, 2001). Because African Americans are the largest community of color in Cincinnati, we calculated  $r_s$  between neighborhood rates of childhood poverty and the concentration of Black or African American residents within a neighborhood. We focused on families identifying as Black/African American, given the U.S.'s long history of systemic racism and residential racial segregation (RSS) against the African American community (Williams & Collins, 2016). We did not assess for further ethnic concentration given the limited ethnic diversity within Metropolitan Cincinnati.

The Cincinnati Children's Hospital Institutional Review Board (IRB) approved this study prior to the commencement of field research.

## Results

The 40 library branches in Metropolitan Cincinnati were located within 38 neighborhoods (Figure 1). 38% of the 45 higher poverty neighborhoods had a library branch, compared to 58% of the 36 lower-poverty neighborhoods ( $p=0.06$ ). Accounting for population, 51% of children living in higher poverty neighborhoods had a library branch within their neighborhood as compared to 84% of children living in a lower-poverty neighborhood ( $p<0.001$ ).

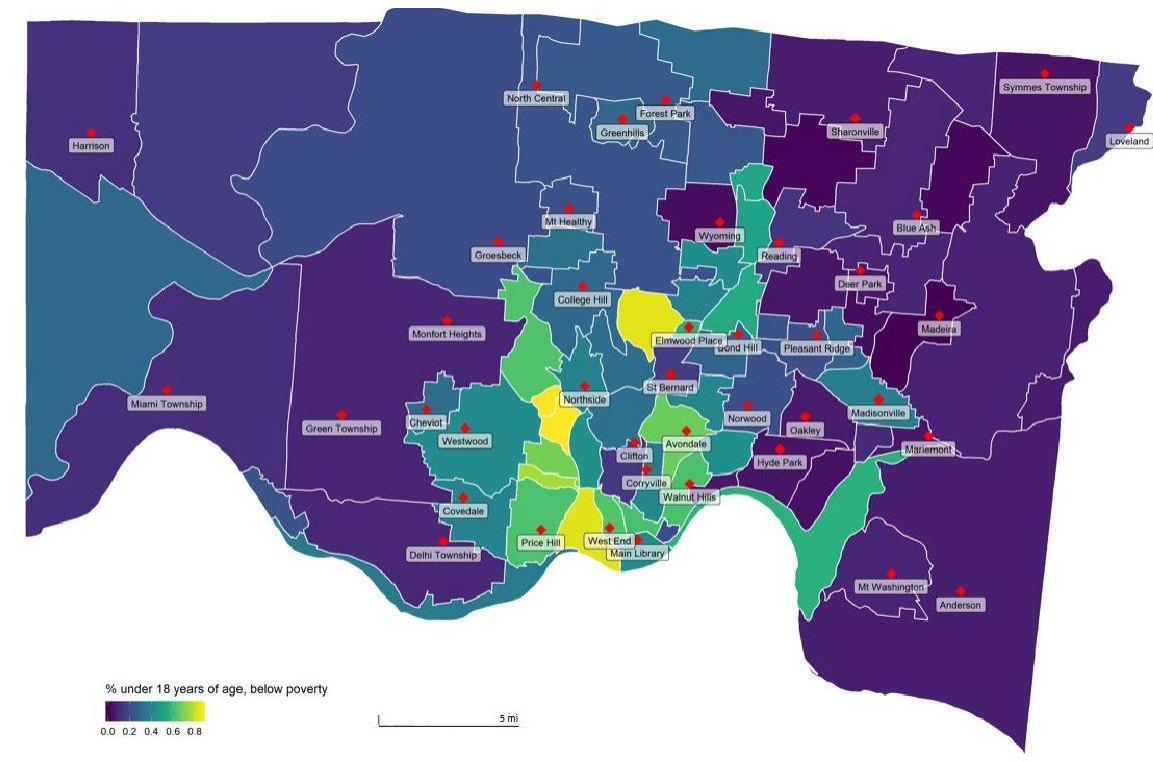


Figure 1. Map of neighborhoods of Hamilton County with a color scale to measure childhood poverty rates and red diamonds to indicate the location of library branches (including the main library).

Across all 40 library branch locations, approximately 24 million children's books were circulated over the five-year study period. In absolute numbers, circulation varied by branch from 9,116 to 284,534 books per year (mean  $73,196 \pm 63,514$ ). The median circulation rate, normalized by neighborhood child population, was 22 books per neighborhood child per year (IQR 25.8). This circulation rate varied considerably across branches and ranged from 3 to 98 books per neighborhood child per year, a more than 30-fold difference.

There was a moderate negative correlation between neighborhood-level children's book circulation rates and child poverty ( $r_s = -0.52$ ,  $p < 0.001$ ). That is, as the poverty rate increased, the circulation rate decreased. There was a similar moderate negative correlation between the

circulation rate and the proportion of the neighborhood population identifying as Black or African American ( $r_s = -0.47$ ,  $p < 0.001$ ). Again, as the proportion of the population identifying as Black/African American increased, the circulation rate decreased. There was a high, positive correlation between the child poverty rate and the proportion of the population identifying as Black or African American ( $r_s = 0.79$ ,  $p < 0.001$ ), consistent with the long-term, persistent linkage between economic and racial segregation in the U.S.

## Discussion

In the U.S., public libraries are the only government-funded educational resource available to all children starting at birth (Becker, 2012; Gerbig, 2009). This study involves components of what we have identified as the Neighborhood Literacy Environment (NLE) and found substantial disparities in access to and utilization of the public library system on the neighborhood level in a large, Midwestern U.S. city. Our research showed that there was also a 30-fold disparity in children's book circulation rate across library branches. This finding points to the correlation that children living in higher poverty neighborhoods were less likely to have access to a library branch than those living in lower-poverty areas. These findings suggest that besides "book deserts" (Neuman & Celano, 2001) in higher poverty neighborhoods, having a library within these neighborhoods does not necessarily equate to an equitable circulation of books.

A significant finding of this study involves inequitable access to children's books for families living in higher-poverty neighborhoods. Our findings are consistent with established evidence that economically disadvantaged or higher poverty areas are often under-resourced (Bray et al., 2019; Wilson, 1999). This outcome extends to access to books. Indeed, while it has been shown that book deserts are commonplace, generally, such studies focus on bookstores and other private literacy resources (Neuman & Celano, 2001; Neuman & Moland, 2016). We found that these deserts extend to publicly funded resources, with wide disparities regarding public libraries. We found that, while many higher poverty neighborhoods had library branches, rates of book circulation were significantly lower in such areas. This discrepancy suggests that libraries in higher poverty areas may be less resourced or that the in-library use of children's books is less documented than those in lower-poverty areas. Further studies are needed to delineate how literacy-enhancing resources may be more equitably allocated and learn more about the rates and impacts of in-library use as an embedded literacy practice.

Notwithstanding the limitations above, this study found a moderate negative correlation between neighborhood-level book circulation and the proportion of Black or African American citizens, similar to the relationship we identified between book circulation and child poverty. Race as a social construct has been defined as "distinct from ethnicity, genetic ancestry, or biology" (Keeyes, Baca, & Maybank, 2021). Our finding is consistent with long-term linkages in the U.S. between economic and racial segregation. This finding also complements previous work demonstrating a link between income segregation and access to books (Neuman & Moland, 2016).

As librarians and literacy partners work to increase access to and distribution of books throughout their communities, historical drivers like segregation and discrimination should be acknowledged and challenged. Like many U.S. cities, metropolitan Cincinnati, where our research is located, is highly segregated (Kent & Frohlich, 2015). We hypothesize that RSS drives the correlations we identified between race, poverty, and book circulation.

The physical separation by race in urban communities within the U.S. disproportionately affects non-White identifying people (Williams & Collins, 2001). Historically, redlining, a practice established in the 1930s when the U.S. Federal Home Owners' Loan Corporation assessed the relative risk of mortgage lending (Aaronson et al., 2020). Assessments were calculated using non-housing factors such as race, ethnicity, and immigration status. Neighborhoods deemed "higher risk" were drawn in red on maps. So-called "red-lined" maps were disproportionately composed of non-White individuals, leading to the highly segregated neighborhoods of today (Aaronson et al., 2020). Though the exact mechanisms by which segregation occurs may differ across nations, racial segregation and multi-generational divestment are not solely a Cincinnati or U.S. issue. These inequities permeate the Global North (Andersson et al., 2018; Fésüs et al., 2012; Musterd, 2005) and should be considered when understanding and improving literacy.

In the practice of reading and writing, access to books is essential. Case in point, one UNICEF early childhood development study of 35 low, middle, and high-income countries found that having at least one children's book in the home almost doubled the likelihood that a child was on track for effective literacy practices (Manu et al., 2019). Countries throughout the world have sought to improve access to books to heighten reading and writing literacy practices. For example, during the 1960s, Taiwan created an Editorial Task Force for Children's books to improve access to children's books within their country (Wu, 2019). Both New Zealand and the United Kingdom had national literacy strategies to improve literacy outcomes in their respective countries (Beard, 2000; Tunmer et al., 2013). In the U.S., there are national programs like "Reach Out and Read" that provide books for children when they visit a pediatrician's office (Klass et al., 2009). Also, the U.S. entertainer and philanthropist Dolly Parton founded the globally outreached Imagination Library, which mails books to children's homes during their early childhood years (Waldron, 2018). These programs are examples of successful outcomes in positively affecting children's literacy via access to books, literature, and literacy events. Our study aimed to look at one aspect of book access at the micro-neighborhood level, and our findings easily translate into potential policy changes and interventions.

This study is also an essential step toward conceptualizing the Neighborhood Literacy Environment (NLE) construct and uncovering potential areas for interventions to heighten literacy outcomes. We see the NLE as including a child's access to print materials and literacy programs within their local neighborhoods. Public libraries have the unique potential to enhance and improve the NLE. Indeed, the International Federation of Library Associations and Institutions (IFLA) noted that "libraries serve all people" and provide "support to vulnerable and marginalized populations" ("IFLA Statement on Libraries and Development", 2013). Our study suggests that in addition to libraries in Cincinnati and Hamilton County, Ohio, library systems across the U.S. and worldwide may develop strategies to leverage literacy resources more equitably to foster healthy child development. Indeed, literacy has been considered a separate domain of development, given its neurobiological basis, influence by modifiable environmental factors, and high relevance to myriad positive health outcomes (Klass et al., 2020).

Libraries have a significant opportunity to build an asset-oriented framework centered on neighborhood resources and strengths. Assessing library locations within a system to ensure equitable distribution of library locations in neighborhoods may be an essential first step. As our study shows, library systems could map branch locations within the context of neighborhood characteristics and educational metrics, such as kindergarten readiness and third-grade reading scores, which are major educational benchmarks in the U.S.

Additionally, public library systems could assess other literacy sources within neighborhoods, such as school libraries. One study in the United Kingdom found that economically disadvantaged children (i.e., those receiving free school meals) who used libraries within their school reported a higher proficiency in reading and writing a wider variety of texts. Students also exhibited higher confidence in their reading and writing abilities than children who received free school meals but did not regularly use their school library (Wood et al., 2020). Neighborhood libraries could partner with local schools that lack a school library to help supplement literacy resources. Collaboration with neighborhood residents and other stakeholders to identify gap areas within the NLE could also be a step forward. Public library systems could better identify neighborhoods that may benefit from additional library support and information services in such a collaborative context. Some examples of enhanced, responsive services include knowledge-based programming, technology-based literacy events, and bookmobiles to distribute books where transportation is a barrier.

International community libraries that are not associated with a national network of public libraries ("IFLA Statement on Libraries and Development", 2013; Stranger-Johannessen et al., 2015) also represent important nodes of literacy networks. Community libraries are often regarded as vital local community resources. As such, they could represent a key partner for a more extensive library network to work with and support, increasing access for all patrons. Furthermore, interventions to expand library membership, decrease fines, and increase representative books represent potential strategies for literacy improvement. Working to remove barriers to library use, such as transportation or location of branches near public transportation, expanding hours, and ensuring the safety of patrons, are important strategies to consider.

### Limitations

This study has limitations that are important to note. As with every ecological study, reliance on population-level data limited our analyses. Given that public libraries collect no personal information, we could not confirm each branch's catchment areas and could not precisely characterize the populations served. We excluded the main library given its circulation data contained all automatic renewals for the system and was, therefore, not an accurate representation of the books circulated. This limitation also made it impossible to use circulation data for book renewals within the analysis. Furthermore, we could not determine the degree to which lower circulation rates were related to branch accessibility (e.g., hours open, proximity to public transportation), book selection, in-house book use, or other factors influencing library usage.

### Significance

This study also has important strengths. It introduces the novel concept of the NLE, which applies to diverse cultural and global contexts. The research involves a large dataset obtained over five years in a large Midwestern city in the U.S., generating generalizable insights with the potential to positively impact child literacy outcomes (Frijters et al., 2000; Payne et al., 1994), both in the U.S. (Hussar et al., 2020) and globally (UNESCO, 2017), where effective interventions are needed. This work employs an innovative mapping approach that helps convey findings to a broad audience clearly and intuitively. Altogether, this study is essential to understand children's NLE better.



## Conclusion

Public libraries are uniquely positioned to affect positive change. With other localized programs and resources, public libraries help overcome impediments to equity in child literacy and health. This study demonstrated that neighborhoods with higher childhood poverty rates were less likely to have a public library branch. Higher poverty was associated with lower book circulation rates for those communities with a branch. We suggest that public libraries throughout the U.S. and internationally build and create relationships within neighborhoods of economic disadvantage. Then, leveraging these relationships, the libraries and the communities can build upon existing neighborhood resources and strengths to improve literacy outcomes for all children.

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