BUILDING A FRAMEWORK TO UNDERSTAND AND ADDRESS VULNERABILITY TO READING DIFFICULTIES AMONG CHILDREN IN SCHOOLS IN THE UNITED STATES

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Abstract

This paper presents a vulnerability framework as a means to contextualize inequities in reading achievement among children who are vulnerable to poor reading outcomes. Models to understand vulnerability have been applied in the social sciences and public health to identify population disparities and design interventions to improve outcomes. Vulnerability is multifaceted and governed by context. Using a vulnerability framework for the science of reading provides an innovative approach for acknowledging multilevel factors contributing to disparities. The ecological considerations of both individual differences in learners and conditions within and outside of schools ensures that scientific advances are realized for learners who are more vulnerable to experiencing reading difficulty in school.

Key words: minority children, reading, risk, vulnerability

The United States (US) has long been perplexed by persistent inequities in educational experiences and outcomes among school-age children. Whether characterized as achievement gaps or opportunity gaps (Coleman, 1968; Ladson-Billings, 2006; Reardon, 2013), significant differences are routinely observed on most indicators of school achievement and success. In particular, students growing up in poverty and low-income households and students from historically and systemically marginalized by groups (commonly referred to as Black and Brown children) experience increased statistical risk for poorer outcomes when compared to their more affluent and White peers. It was not surprising, for example, to discover that only about 1 in 5 African American and Hispanic fourth-graders were reading at or above proficient levels, compared to 1 in 2 White students on the most recent administration of the National Assessment of Education Progress (NAEP)—the nation's biannually administered barometer for academic achievement (National Center for Education Statistics [NCES], 2019).

As one of the wealthiest democratic nations in the world, such a disparity in educational outcomes should be shocking because funding and accountability measures to address educational disparities have been foundational to federal education law and policy in the U.S. for over 50 years (Thomas & Brady, 2005; Black, 2021). However, the emphasis on equality and equity in the context of education has shifted over time. For example, the promise of equity implicit in the 13th and 14th amendments to the US constitution was hampered by legalized segregation and the notion of "separate but equal" as defined in the Plessy v. Ferguson Supreme Court ruling in 1896. Subsequent court rulings, like the Brown v. Board of Education Supreme Court decision in 1954, and federal laws, like the Elementary and Secondary Education Act of 1965 (now the Every Student Succeeds Act, ESSA, 2015), reflect the nation's growing uneasiness with the notion that equality leads to equitable outcomes. Today, education continues

to be touted as a primary strategy to reduce poverty, close achievement gaps, and ultimately, create equitable opportunities specifically for “minority” and “disadvantaged” children

However, educational equity is different from educational equality. In general, while equality involves making sure that everyone has the same thing to achieve a desired state, equity involves making sure that everyone has what they need to achieve it. Farrell et al. (2021) suggest considering education equity in terms of outcomes (e.g., reducing achievement gaps in reading performance or opportunity gaps in participation in advanced coursework), processes (e.g., including members of marginalized groups in the decision-making process about the adoption of a program or policy), and systems (e.g., naming and dismantling oppressive systems that disadvantage specific groups).

Meanwhile, the evidence-based movement has influenced the field of education greatly during this time period (Baron, 2018; Fein et al., 2021; Slavin, 2002). Like other public sectors, both education researchers and practitioners have increased their focus on discovering and implementing “what works” to improve student performance. Empirical research on the efficacy and effectiveness of educational programs and practices has increased steadily in the US and around the world (Fein et al., 2021; Slavin, 2008; Slavin & Madden, 2011). Consequently, the field has ever-increasing access to a wealth of scientific evidence upon which to make decisions to support student achievement. Yet, educational disparities remain, with poorer outcomes being observed among children growing up in poverty and Black and Brown children compared to their White and more affluent peers.

In many respects, the field of reading research exemplifies this paradox. Spurred in part by reports of *decreasing* NAEP reading scores in 2019 (National Center for Education Statistics [NCES], 2019), coupled with increasing popular media attention (e.g., Hanford, 2019), public

discourse on what has been referred to as the *science of reading*, and its implementation in classrooms has hit a fever pitch. A Google search for the term results in over 7 million hits, with thousands of attempts to define and apply the term. Simply put, the science of reading can be defined as the accumulation of evidence on reading from decades of ongoing scientific research. Importantly, that research has a strong theoretical and multidisciplinary foundation, with important discoveries from scientists in multiple disciplines, including education, psychology, neuroscience, linguistics, communication sciences, and genetics (e.g., Cain et al., 2017). These discoveries are not limited to English and include comparable research evidence in languages with relatively more transparent (e.g., Italian, Finnish) and opaque (e.g., Chinese, English) orthographies (e.g., Joshi et al., 2012). They also include students with disabilities that may make reading difficult, including reading disabilities, specific learning disabilities, specific language impairments, hearing impairments, intellectual disabilities, attention disorders, and emotional disturbances (e.g., Connor et al., 2014). Collectively, findings from this basic and applied research, which has employed a variety of methodological approaches in diverse educational contexts with a variety of learners across the developmental lifespan, has produced a wealth of scientific evidence upon which to make decisions to support reading achievement for most children in school. Yet, on the 2019 NAEP Reading assessment, the percentage of fourth-graders reading at proficient levels was 35% (National Center for Education Statistics [NCES], 2019). A nation in which only a third of students are reading at grade-level expectations is problematic. However, subgroup comparisons reveal just how uneven reading performance is in the US, with 45% of White fourth-graders reading at proficient levels compared to18% of African American students, 23% of Hispanic students, 21% of students participating in federally subsidized lunch programs (an indicator of poverty), 12% of students with disabilities, and 10% of students who

are emerging bilinguals learning English (National Center for Education Statistics [NCES], 2019).

Achievement gaps like these, with lower performance amongst subgroups of students, are commonplace and have not narrowed enough to close the gap substantially over time (National Center for Education Statistics [NCES], 2019; Reardon, 2013). The root causes of these reading achievement gaps are complex and not easily addressed (Jencks & Phillips, 1998; National Research Council (U.S.) and Institute of Medicine (U.S.) Committee on Integrating the Science of Early Childhood Development, Shonkoff & Phillips, 2000). Socioeconomic status (SES) remains prominent among the many reasons that have been offered to explain and predict disparities. Race and poverty are confounded systematically in the US, such that children in race-minority groups are more likely to be growing up in poverty. For example, the National Center for Children in Poverty reported that 38% of US children under 18 years old lived in low-income families in 2019; however, the rates were 26% for White children, 25% for Asian children, 53% for Latino children, 55% for American Indian children, and 58% for African American children (Koball et al., 2021). Ample empirical evidence confirms that children growing up in poverty and low-income households tend to demonstrate lower performance on various measures of reading and reading-related skills (Hoff, 2012; Sirin, 2005; White, 1982), and this performance is associated with and predictive of poor reading achievement across the preschool and school-age years (e.g., Buckingham et al., 2014; Burchinal et al., 2011; Castles et al., 2018; National Institute of Child Health and Human Development [NICHD], 2000; National Early Literacy Panel (NELP), 2008; NICHD Early Child Care Research Network, 2005).

Thus, it is perhaps not surprising that 79% of fourth grade students in federally subsidized lunch programs were not reading at proficient levels on the 2019 NAEP (NCES,

2019). The sequelae of poverty increases their risk for poor reading achievement in school, and so, poverty is a likely culprit to be addressed in resolving these achievement gaps. Yet, research evidence suggests that poverty alone cannot explain why, on average, Black and Brown children continue to perform well below their White peers on measures of reading achievement in US schools. For example, Black students from middle-income households and in suburban high schools are often observed to experience disparities in academic performance compared to their White and equally affluent peers as indicated by grades, enrollment in advanced coursework, graduation rates, and college enrollment (Diamond et al., 2020; Lewis & Diamond, 2015). Meanwhile, research with primary-grade students indicates that gaps are present at kindergarten entry before students receive formal reading instruction in school and can widen as children advance through school (Burchinal et al., 2011; Entwisle et al., 2005; Fryer & Levitt, 2005; Magnuson et al., 2016; Reardon & Portilla, 2011). These studies, which often employ methodologies to examine average *group differences* in the contexts in which children learn and develop, have revealed numerous family, school, and neighborhood factors that influence school achievement, including peers, parenting practices, the proportion of students in the school that are growing up in poverty or demonstrating poor academic performance, the quantity and quality of formal and informal early learning experiences, the quality of classroom instruction, teacher knowledge, teacher and principal turnover, and residential segregation.

Meanwhile, many reading researchers have employed methodologies to examine *individual differences* in the genetic, neurobiological, behavioral, linguistic, and psychosocial processes that underlie typical and atypical reading development and performance. Importantly, a focus on these individual differences makes sense for reading research. Because reading is a ubiquitous behavior in the US and taught universally in US schools, it makes sense to study how

children are alike and different in their reading behaviors, identify behaviors that are malleable, and design instruction and interventions to respond effectively when reading goes awry. Encouraged by impressive discoveries with real implications for classroom application, this research has revealed numerous child-level factors that influence reading achievement, many of which are responsive to instruction, including morphosyntax, vocabulary, memory, attention, self-regulatory behaviors, phonological processing, alphabetic decoding, orthographic knowledge, inferencing, comprehension monitoring, and knowledge (Cain et al., 2017; Castle et al., 2018; Cervetti et al. 2020; Petscher et al., 2020).

Considered together, what emerges from both bodies of research is a nuanced and complex explanation for why so many Black and Brown children are not reading well in school and what might be done to address it in research, practice, and policy. Yet, these two different approaches to research on reading achievement are often not connected and do not inform each other well. For example, when applying an individual differences framework, an inherent assumption is that humans are complex organisms whose behaviors respond to their environments—an assumption shared among researchers who focus on contextual factors. However, one unintended consequence of a narrow focus on individual differences may have been relatively less scientific advancement within the field of reading research on how to observe, measure, design, and otherwise account for contextual influences on reading outcomes. For example, reading researchers rarely grapple with the inaccurate assumptions that arise from using race as a predictive variable in research (e.g., Black children perform poorly because of their race), a matter of both scientific and practical consequence (Bruno & Iruka, 2022; Helm et al., 2005). This oversight is particularly relevant for children who are disproportionately more likely to experience the negative consequences of some of these contextual factors on their

learning and performance in school. Thus, it is plausible that one reason why the extraordinary advances in reading research over the last several decades have not yet alleviated reading achievement gaps at scale is the field's relative inattention to other parts of the system in which we expect children to learn to read and how family-, school-, and community-level factors interact with child-level factors to influence reading development and achievement among children who are more likely to experience difficulty with reading in school.

The causes of disparities in reading achievement are not always obvious. Therefore, the field of reading research may benefit from a framework that can account for the child, family, school, and community factors that may operate independently and collectively to make children more vulnerable to experiencing reading difficulty in school. Individual children, school districts, neighborhoods, and housing are mutually constitutive entities that need to be modeled in an ecological framework to more accurately account for multilevel factors of reading achievement inequity. Such a framework would have the potential to inform theory and practice in reading and may lead to more scalable solutions to the challenges of ensuring reading achievement for all learners in US schools.

Defining Vulnerability for Reading Research

Conceptualizations of vulnerability are prominent in the social sciences, public health, and medical fields. Although definitions vary, in general, vulnerability is defined according to an individual's relative exposure to risks that threaten healthy development (Hoogeveen et al., 2004; Luthar et al., 2000; Masten, 2001; Shi et al., 2008). Considerable research has focused on vulnerability caused by disadvantage or adversity at the individual (e.g., lack of health insurance, poverty, mental health conditions, chronic medical conditions) and community levels (e.g., employment opportunities, access to physicians, early diagnosis and treatment), with modern

applications focusing on multiple explanatory factors and the interactions between them at the individual and the community levels.

Several common themes have emerged from this body of research that are relevant to investigating vulnerability to reading difficulty or disability. First, risks, and vulnerability to them, are varied, multi-faceted, often co-occur, and often are compounding. Second, risks are relative, and the level of acceptable or unacceptable risks, as well as responsiveness to the risk, is related to the individual and the environment. That is, factors and processes related to the individual and to their proximal and distal environments can moderate the effects of the risks, perception of the severity of the risks, and response to the risks. These effects are also sensitive to time and the social context; both can strengthen or weaken the effect of a risk making an individual more or less vulnerable at different points in time and in different social conditions. Third, risk is common in childhood and not reserved for specific subgroups of the general population. To the contrary, most children encounter conditions that may produce unacceptable or unexpected developmental outcomes and most children adapt in ways that diminish their vulnerability, especially when risks are encountered under conditions that can promote or protect development. In other words, strengths within individual children and within their environments can reduce vulnerability. As noted by Masten (2001), the greatest threats to development may be those that compromise systems capable of promoting or protecting development and preventing risk.

Given these insights from other disciplines, why should reading researchers focus on vulnerability in the study of reading difficulty and reading disability? The number and proportion of children who are vulnerable to poor reading achievement in school is large and increasing. The 2019 NAEP reading scores revealed that only about one-third of all US fourth-graders were

performing at or above basic levels (National Center for Education Statistics [NCES], 2019). Average reading performance declined for children performing at the lowest percentiles, many of whom were from minoritized groups, growing up in poverty or low-income households, who were receiving special education services, or who were English language learners (National Center for Education Statistics [NCES], 2019). Among these children, their risks were varied, multi-faceted, co-occurring, and compounding. However, because vulnerability is relative to risk exposure, addressing these risks effectively would require attending to characteristics within the individual and within the environment. Moreover, because levels of acceptable risk are subjective, a vulnerability framework would allow risks to be operationalized in the contexts in which they operate, placing issues of equity, access, and disparity at the forefront and not as abstract concepts that cannot be addressed.

Finally, the field's understanding of how best to identify and treat reading disabilities and dyslexia is complicated by the varied risks that children from historically and systemically marginalized groups bring to learning environment. Although the definition varies in research and in practice settings, conventional definitions of reading disability require that the academic underperformance observed in students is unexpected and not due to learning problems that may be linked to environmental conditions, cultural differences, or economic disadvantage (Miciak & Fletcher, 2020). However, it can be difficult for children from specific marginalized groups to satisfy these exclusionary criteria even when a disability is present, including children from race- and ethnic-minority groups, children growing up in poverty or low-income households, and children who re English language learners. In sum, applying a vulnerability framework would encourage researchers and practitioners to focus both on individual differences and on systems-level solutions.

Theoretical Foundations of Accounting for Vulnerability in the Study of Reading and Reading Difficulty

Although not always named specifically, the notion of vulnerability is captured in existing theoretical models and frameworks for understanding child development.

Ecological Models. Ecological models of child development provide a framework for testing sources of individual differences on development over time (Bronfenbrenner & Ceci, 1994). Prominent among them, Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 2006) consisting of four dynamic and interactive primary components, proposes that development occurs through a series of interactions between individuals and environmental contexts. These interactions, termed proximal processes, are the primary mechanisms for development and are influenced over time by characteristics of the individual person (e.g., genes, temperament) and the contexts, or systems, in which development is happening (e.g., the home, family, school, and community). The influence of these contexts is hierarchal in degree of influence from the microsystem (most proximal) through to the macrosystem (most distal). The microsystem includes home, school, and neighborhood environments where the proximal processes pivotal to learning and development take place. The mesosystem defines the interactions between various microsystems (e.g., home and neighborhood), and the exosystem contains indirect influences on individuals such as social services, healthcare, and parent employment. Lastly, the macrosystem refers to the broader social and cultural contexts that sit outside the other systems. Specifically with regard to reading, the bioecological model suggests that acquiring proficiency in reading is impacted by a number of factors, including genetics and biological influences, behavioral influences, and environmental influences; therefore, examining

the impact of these factors, both individually and in concert, can serve to elucidate why some children struggle with learning to read (Keenan et al., 2006; Vukovic et al., 2013).

Integrative Model. García Coll's integrative model expands ecological models by making explicit the unique contextual factors that are meaningful for minoritized children but often overlooked or implicit in traditional child development models (García Coll et al., 1996; Marks & García Coll, 2018). In this model, SES factors (e.g., race, gender, social class) and their oppressive manifestation in environments (e.g., racism, discrimination, segregation) are considered first in minoritized children's development, as well as systems that may inhibit or promote academic development, including families, neighborhoods, schools, and health care. In this model, the effects of social position and oppressive systems shape how minoritized children and families respond to their environments, thereby shaping children's development. However, the outcomes need not always be negative, as these effects may be mitigated or enhanced by the forces within the environment, including family structure and resources, schools, neighborhoods, and the broader community. By integrating these features, the integrative model provides a multisystem framework for understanding the direct and indirect pathways that influence development for Black and Brown children in the US. Importantly, the definitions and operationalizations of developmental outcomes are differentiated from what may be considered typical or mainstream expectations and contextualized within more culturally appropriate conceptualizations of development. Specifically, with regard to reading, applying the integrative model involves placing the learning and educational system, both within and outside of schools, at the forefront rather than the periphery of developmental models and considering their direct and indirect influence on developmental and academic competencies related to reading achievement.

Risk and Resilience Models. Models of risk and resilience evolved initially from investigations of maladaptive behaviors among individuals with schizophrenia and, eventually, their children. Observations that some children thrived despite growing up in conditions that would be presumed to lead to risky behaviors led to investigation of child development under other adverse conditions, including poverty, abuse and maltreatment, violence, chronic illness, traumatic events. Modern models define resilience as a dynamic developmental process of adaptation to adversity related to characteristics of the individual, the family, and the broader social environment, and not a static trait (Krishnakumar & Black, 2002; Luthar et al., 2000). Required in these models is the presence of both a significant threat and a positive adaptation despite exposure to the threat. Accordingly, modern resilience models are strengths-based and seek to identify factors and mechanisms that both promote (i.e., improve) and protect (i.e., safeguard) positive developmental outcomes. Luthar (1993) further delineated these by describing resilience processes as existing on a continuum from protective to vulnerable, with factors acting within high- or low-risk conditions to produce stabilizing, enhancing, or reactive outcomes. Related approaches to study risk and resilience include cumulative risk models, which acknowledge that because many risks co-occur, it is the accumulation and combination of risks over time that is more important for child development than one type of risk (Burchinal et al., 2000; Roy & Raver, 2014). Specifically, with regard to reading, applying risk and resilience models involves considering combinations of multiple factors that may promote, protect, or prevent child competence in reading and reading-related skills, noting that although children and families may encounter similar risks, the processes through which they experience those risks may differ in substantive ways that can inform approaches to address achievement in schools.

In sum, the study of child development has evolved from focusing on any single factor operating in isolation (main effects studies) to identifying and examining a multitude of dynamic factors and processes that interact within contextual frameworks. These interactions are not static across the population, however. One set of conditions can present challenges for one student, but have a null influence on the achievement of another student (e.g., Van Horn et al., 2009). As a developmental behavior, it seems plausible that similar interactions may be observed in reading. While previous reading research has focused primarily on children's cognitive and non-cognitive component skills, engagement with parents and teachers during reading activities, home and classroom literacy environments, and instructional factors, studies informed by these dynamic and integrated models of child development have the potential to expand reading research theoretically and methodologically.

Moreover, increasing demand for research with diverse samples and framed from a strengths-based, and not deficit-based, perspective has pushed fields dependent upon developmental theoretical models to consider why minoritized children always appear to underachieve compared to their peers and how systemic processes outside of the individual may transpire to produce negative outcomes for some children and not others (Bruno & Iruka, 2022; Cabrera and SRCD Ethnic & Racial Issues Committee, 2013; Marks & García Coll, 2018). Once the ecology in which children are expected to learn and develop is centered, the educational achievement and opportunity gaps observed between White and Black and Brown children are no longer surprising and may be accounted for by examining social, political, and economic processes that disproportionately impact groups negatively rather than being attributed intrinsically to the child or the family. It may also push the field to begin examining what cognitive and non-cognitive strengths Black and Brown children bring to the reading process

despite encountering conditions that may make them more vulnerable to experiencing reading difficulty.

Sources of Vulnerability: Studies Examining the Relations between Reading and the Environment

A very large and well-established literature on the relation between children's reading and their environments has focused primarily on the family and the classroom and has generally revealed significant concurrent and predictive relations between factors within these two contexts and child reading and reading-related outcomes (Becker et al., 2017; Mascheretti, et al., 2018; Nye et al., 2004). Although robust and informative both theoretically and practically, the variance in reading achievement accounted for in these studies is typically small to moderate, leaving substantial room for uncovering factors and processes that may be particularly relevant to the reading achievement of Black and Brown children (Little et al., 2019). Keeping in mind that minoritized children are often underrepresented in reading intervention research studies (Lindo, 2006; Artiles et al., 1997; Reed et al., 2012; Sorrells & Shih Dennis, 2022) and yet disproportionately underperforming in reading in school, discovering sources of variability in performance above and beyond the child interactions in the family and classroom seems particularly important. Research evidence on the relations between reading and other contextual sources of variability is emerging, but often lost to the field of reading research because it is located in other academic disciplines, like social work, public health, economics, and sociology. This literature is expansive and well beyond the scope of this review. However, a brief review of this work suggests that there are several factors and processes worthy of further investigation in concert with the field of reading research.

***Reading and Health*.** Reading is a public health concern that is considered a determinant of health, educational attainment, income, and overall life success (DeWalt et al., 2004; McLaughlin et al., 2014). For example, early life experiences in the context of the prenatal environment impact later child development. Poor maternal and child health outcomes have been identified as risk factors and predispose children to negative physical, cognitive, and behavioral outcomes throughout development that may require long-term treatment or intervention (Bhutta et al., 2002; Boulet et al., 2011; Hack et al., 1995). Specifically, prenatal indicators—preterm birth, lower birth weights, maternal smoking, and access to care during pregnancy—have been associated negatively with later measures of reading performance in childhood. For example, a small meta-analysis found that children (aged 6 to 13 years) born preterm with lower birth weights performed significantly lower than the study control group born at term, noting moderate effect sizes on reading comprehension and decoding skills (Kovachy et al., 2015). Moreover, in a longitudinal evaluation of student reading performance on the National Assessment of Educational Progress, Chay et al. (2009) found that narrowing Black-White opportunity gaps during the 1980s was partly due to policy and investments in health access to improve birth outcomes. More casual evidence from behavior genetics identifies birthweight as an environmental risk factor predictive of early reading skills and reading disability and indirectly affecting lexical knowledge (Mascheretti et al., 2018). The literature on breastfeeding and associations with measures of reading is mixed because maternal behavior is commonly correlated with factors related to the mother's SES, education, and occupation (Geoffroy et al., 2010; Jackson, 2010, 2015). Breastfeeding has been found to positively predict speaking, writing, spelling, and math skills even after other accounting for variables related to gestation and SES; however, maternal I.Q. does mediate the indirect effects of breastfeeding (Kim et al.,

2017). These prenatal factors are complex individually, often related to one another, and likely best understood in developmental models that consider multiple factors and processes collectively.

Reading and Violence. The safety of the environment and exposure to violence in households, neighborhoods, and communities is critical to overall child well-being. Factors related to violence are conceptualized and measured in various ways; some definitions are more interpersonal (e.g., physical abuse), while others as more intrapersonal (e.g., witnessing violence). For example, in a recent systematic review focused on the family, Supol et al. (2020) found significant negative direct effects for exposure to family violence on adolescent achievement. Other important factors included the family's socioeconomic status, timing of the exposure, and type of violence. Meanwhile, in a study focused on the community, Bergen-Cico et al. (2018) found that community gun violence significantly predicted 28% of the variance in third-grade reading performance across 19 elementary schools and that schools in communities with higher rates of gun violence were associated with academic failure. Finally, Schneider (2020) found that exposure to community violence at five years old was associated negatively and independently with academic performance at nine years old, while physical abuse was associated negatively but not independently. Taken together, these results suggest that violence in the home and in the community has negative consequences for academic performance in school. Because Black and Brown children are disproportionately exposed to violence at very high rates (Frazer et al., 2018; Sharkey, 2018; Spano et al., 2018), findings like these may be particularly relevant to their reading achievement in school.

Reading and Neighborhoods. Neighborhoods provide physical and social contextual frameworks where family members and community members interact with each other and their

collective surroundings (Jencks & Mayer, 1990; Sharkey, 2018). Conditions within the neighborhood provide context for another level of the environment that may promote, protect, or prevent reading achievement and overall development. However, like violence, neighborhoods are conceptualized and measured in various ways, so it can be challenging to differentiate how neighborhood factors influence achievement independently or in combination with other factors and processes within the environment. Protective or promotive factors within a community (e.g., libraries, museums, medical facilities, parks) can potentially increase learning opportunities and stimulate achievement-related behaviors in individuals with access to these resources. Alternatively, risk factors (e.g., crime, pollution, economic disinvestment) could lead to encumbered learning opportunities, learning behaviors or physical and emotional health outcomes. These potential influences may act directly on the individual or indirectly through the family or school.

Researchers have observed that social, economic, and physical resources available within neighborhoods are related to reading achievement. For example, residing in a neighborhood with a high level of crime is related to lower reading achievement, and this relation is related to poverty levels (Lord & Mahoney, 2007; Ruiz et al., 2018). Wodtke and Parbst (2017) found significant direct effects of neighborhood context (measured at the census tract level as a composite of factors like unemployment rate, household income, poverty rate, and education and occupation level) on standardized measures of decoding and applied problem-solving for a sample of elementary school-aged children (N = 2,208) that was not related to the mediating effects of school poverty. Little et al. (2019) found small but significant effects for household distance to homeless shelter and reading comprehension performance, even after accounting for neighborhood and family socioeconomic status. Finally, evidence from the Moving to

Opportunity study, a large scale longitudinal randomized experiment where families in low-income households moved from public housing to less distressed neighborhoods, indicates that children who moved to more stable neighborhoods at a young age experienced stronger academic outcomes than children who moved later in life or who did not move at all (Chetty et al., 2016; Katz, 2015). Findings like these suggest that both factors and processes within neighborhoods may be particularly important to understand young children's school achievement, especially for children growing up in poverty.

Reading and Child Welfare. Early exposure to adverse experiences, defined as abuse, maltreatment, and neglect in the home of biological caregivers or alternative living arrangements (e.g., foster care, group homes) through state child protection services, can have negative consequences for children's well-being, safety, and overall development (Jones et al. 2015; Shonkoff et al., 2012). The effects of abuse and neglect are generally associated with emotional, behavioral, cognitive, and social difficulty, with consequences for academic skills in many domains (Maguire et al., 2015; Romano et al., 2015). For example, in a population-based study of children enrolled in Michigan's public schools from 2000-2006 (N = 732,838), Ryan et al.(2018) found that students involved in maltreatment investigations by third grade scored significantly lower on reading and math assessments, were more likely to be receiving special education services, and were more likely to be retained at least one grade in school. Both African American children and children growing up in poverty were more likely to be involved in maltreatment investigations, with some districts having as many as 50% of students involved in an investigation by third grade. Similarly, in a study of second-graders in public schools in a large urban area (N = 11,835; 67% African American), Fantuzzo et al. (2011) found that children experiencing neglect and abuse before entering kindergarten were 31% more likely to score

lower standardized reading assessments than unexposed peers. In this study, child neglect was associated with poorer academic outcomes but not physical abuse; however, both were associated with social and behavior problems in school (e.g., poor attendance, low engagement, behavior referrals). After accounting for SES and race, Piescher et al.(2014) found significant achievement gaps in reading and math achievement between school-aged children in Minnesota who were involved with child protective services and children who were not involved. These findings are compelling and suggest not only that abuse, maltreatment, and neglect are frequently occurring events for many young children (especially minoritized children) but also that the consequences of these traumatic experiences for academic performance are dire if left unattended by school personnel.

Challenges and Opportunities to Studying Vulnerability in Reading Research: Implications for Research and Practice

Although researchers may not be well-versed in this literature, it is important to note that many who study reading and reading disability acknowledge multiple factors beyond the individual child, the family, and the classroom. For example, in their componential model of reading, Joshi and Aaron (2000) proposed a framework for the reading process that consists of three independent but interrelated domains: cognitive (i.e., word recognition, linguistic comprehension), psychological (i.e., motivation, attitudes, teacher expectations and perceptions gender), and ecological (i.e., home literacy environment, classroom instructional practices, dialect variation). Empirical studies have provided support for the componential model in English and in other languages, in bilingual students, in students with disabilities, and in more and less affluent student populations and home and school contexts (Aaron et al., 2008; Joshi, 2019; Joshi & Aaron, 2012; Li et al., 2020; Ortiz et al., 2012). However, the ecological domain

only considers the home and classroom environment; thereby, not yet capturing many factors and processes in homes, neighborhoods, and communities that appear to be relevant to reading performance in school.

It is also important to reiterate that the relatively lesser focus on factors and processes in homes, neighborhoods, and communities makes sense for much of reading research thus far—the available evidence to date suggests that these factors are outside of the reading process itself. Therefore, these place-based factors have not been prioritized as potential predictors of reading difficulty and disability. Without such an association between place-based factors and outcomes, it is difficult to tailor instruction and design effective interventions. Calls to consider factors and processes that may make children more vulnerable to reading difficulty and disability are not intended to replace prominent theories and frameworks for the reading process—they are meant to expand upon them in ways that are only possible because of how far the field has advanced in its understanding of how reading develops and what to do when it goes awry. Like other scholars who have examined and critiqued this incredible body of work from new frames and perspectives (e.g., Bruno & Iruka, 2022; Cervetti et al., 2020; Elliott & Grigorenko, 2014; Petscher et al., 2020; Milner, 2020), it seems plausible that the field has reached a level of readiness to tackle the complexities associated with understanding and responding to reading difficulty and disability among children who are more likely to encounter experiences in their homes, neighborhoods, and communities that make them vulnerable to experiencing difficulty in school.

The opportunity to consider context is not without substantial challenge. In addition to the theoretical limitations already discussed, there are methodological, statistical, and practical concerns. For example, as noted previously, it remains difficult to define and measure constructs

associated with factors and processes within homes, neighborhoods, and communities. Children and families are also dynamic and they engage within and outside of their neighborhoods. Children may attend schools, participate in enrichment programming, and engage in social networks that exist outside of their physical neighborhoods. This kind of movement creates challenges for both describing and gathering relevant data. In the US, many indicators of child welfare, health, economic vitality, education, and safety are captured at the zip code or census track levels, allowing for population-level examination of many relevant outcomes. However, zip codes and census tracts do not always correspond to each other or to a specific neighborhood or community. Moreover, these data are often housed in separate systems governed by different agencies and agreements. Data on student achievement may be housed in the department of education, while health data may be housed in the department of health, and child welfare data may be housed in the department of children and families. Even when these agencies seek to capture the same construct (e.g., family SES), they may measure it differently (e.g., child's participation in free and reduced lunch programs; mother's education; parent occupation; family participation in subsidy programs for health insurance, food, and nutrition). These issues make the kind of data integration required to consider context outside of schools difficult.

Despite the sheer abundance of data available, there are few examples of longitudinal integrated data systems that would allow for an examination of vulnerability to poor school achievement. One notable exception is the Kids Integrated Data System (KIDS, Fantuzzo & Culhane, 2009), a collaboration between the University of Pennsylvania, City of Philadelphia, and School District of Philadelphia. With child-level, longitudinal data from 1990-2008 from multiple public agencies, KIDS was designed to conduct research and evaluation studies to inform educational services, public health, and social policy for children and youth from infancy

through high school in Philadelphia. The integrated database has allowed the partnership team to conduct empirical research and evaluation studies on various targeted issues, including early childhood education and school readiness, risks for academic underachievement, and coordination of services from birth to kindergarten entry and between child health and public school programs (e.g., Fantuzzo et al., 2011, 2005, 2013; Rouse & Fantuzzo, 2009). While the findings from KIDS certainly inform education outcomes, it is less clear how this information is translated into practice. That is, it is not always clear how school district administrators, classroom teachers, or families understand the research findings nor how they use them to make decisions and change practices used in the classroom (Cherney et al., 2012; Finnigan & Daly, 2014; Penuel et al., 2017, 2018).

Anticipating these kinds of challenges, it seems apparent that the field will benefit both from an interdisciplinary approach and from robust partnerships to advance a research agenda that considers vulnerability. Researchers in social work, public health, economics, sociology, and other fields have learned much about how to account for factors and processes within homes, neighborhoods, and communities, and the field of reading research could benefit substantially from that knowledge base. Leveraging inter- and intradisciplinary knowledge in a conceptual and methodological context generates a new conceptual framework, which may validate the generalizability of the originating one (Beckmann, 2015). Also, progressing rapidly and strategically does not require reading researchers to become economists or public health experts, for example. Scientific competence is not represented by “a continuous texture of narrow specialties that overlap with other narrow specialties” (Campbell, 1969). Rather, Solari et al. (2020) have suggested applying a translational team science approach whereby researchers and practitioners from different disciplines (e.g., reading, sociology) and with different strengths

(e.g., methodological design, communications) work collaboratively and collectively to address transformative issues. Given that practitioners in various agencies will likely be both stewards of the necessary data and responsible for the practical and policy implementation of the research findings, the field would also benefit from applying principles of effective research practice partnerships (Farrell et al., 2021). These partnerships are long-term, mutual collaborations with diverse education stakeholders that can serve as a vehicle for applying research to solve problems of practice.

Even if the complex methodological, infrastructure, and capacity building issues were resolved through team science and partnership, changes to the ways in which the research process is incentivized, funded, shared, and utilized will also be required to make transformative progress (e.g., Chicago Beyond, 2019). Without question, enacting this kind of research agenda will be messy and wrought with challenges to the science itself. The outcomes we seek to achieve on behalf of vulnerable children will not be possible without scientific discovery, so buffers must be in place to protect the process. The kind of intentional, interdisciplinary engagement between reading researchers, researchers in other disciplines concerned with child development, and practitioners and other experts within the field can help safeguard the scientific process.

Conclusion

In a recent special issue of *Socius*, Gamoran (2021), Nalani et al., (2021), and DiPrete and Fox-Williams (2021) offered critiques on the field of sociology's response to inequality in the US, observing relative excellence in understanding inequality coupled with relative mediocrity in reducing inequality. Importantly, this collection was not wrought with impossibility and condemnation; rather, these scholars see potential in how social scientists can

act as change-agents through their science. Likewise, by applying a vulnerability framework, we confront the field of reading research with a similar challenge: to apply its concepts and tools to not only understand reading difficulty and disability but also to reduce it for Black and Brown children and children growing up in poverty. The paradox we must recognize and respond to is simple: Black and Brown children and children growing up in poverty are often underrepresented in reading intervention research studies (e.g., Lindo, 2006) but disproportionately more likely to be underperforming in reading in school. As a field, dismissing assumptions of deficiency and atypical development *and* understanding sources of variability in performance above and beyond child interactions in the family and classroom *and* developing effective scalable solutions to reduce that variability is a scientific endeavor worthy of urgent attention.

To be clear, this is a call to center equity in reading research, including research with students with reading disabilities like dyslexia. Whether equity is central to the process of the research or to the outcomes of the research, it is non-negotiable when working to improve reading in these student populations. Changing the course of disparities in reading will require deep disciplinary knowledge of reading situated within interdisciplinary approaches of inquiry. That is, we are simply asking reading researchers to imagine studying processes involved in the adoption of evidence-based reading practices or programs in schools with a large number of students growing up in poverty; developing interventions that are robust enough to respond to reading difficulty and trauma exposure in violent neighborhoods; developing professional learning opportunities to increase knowledge and use of evidence-based reading practices in schools with high teacher turnover-rates; working alongside local churches to develop evidence-informed materials that can be used by families and caregivers in under-resourced communities;

designing statistical models that account for the effects of school poverty levels *and* school resegregation or family income *and* intergenerational poverty or teacher knowledge *and* human, social, and fiscal resources in schools to impart that knowledge; and informing policies that require improved instructional practices *and* improved leadership to support implementation. In other words, enact a research agenda that acknowledges the system in which we expect reading to develop and develop solutions to respond those most in need in that system. Doing so will not eliminate reading difficulties, but it may help the field ensure that the science benefits all learners. And that would be good.

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