Tiered Approaches for Educational Equity:

Modeling the Determinants of Special Education Disproportionality and Compliance

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Abstract

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For more than half a century, research on the disproportionate representation of ethnic and racial minority students in special education has redefined our understanding and pursuit of educational equity. Primarily focusing on overrepresentation and segregation of students from minority backgrounds, disproportionality has been raised as a complex and controversial issue, with far-reaching implications across school psychology literature, policy, practice, and law. Since the 1960s, the body of literature on disproportionality has lacked consensus on the determinants, consequences, and appropriate responses to address disproportionality and its inordinately negative outcomes for Black and Brown students of color.

Against this backdrop of disproportionality, school psychologists have grappled with the paradox of conferring educational opportunity and educational harm via special education identification. Whereas identification for special education services provides access to individualized educational services and programming, *disproportionate* identification has been implicated in widening and sustaining achievement and opportunity gaps over time. Moreover, educational policies and special education laws seem to create a "double bind," obligating states to identify all students eligible for special education services while simultaneously posing financial penalties for disproportionate identification by race or ethnicity (Sullivan & Osher, 2019).

Confronted with these realities, this study sought to disentangle the many interpretations of disproportionality research and its theoretical, legal, and practical implications for school psychologists. The literature review and data analysis specifically investigated Multi-Tiered Systems of Support (MTSS) as a means of identifying and addressing significant disproportionalities in special education. The first research question explored the extent to which racial or ethnic minority students disproportionately represented in special education. In order to understand the state of special education disproportionalities on a national scale, section 618 IDEIA data was disaggregated to compute risk ratios for under- or over-representation among special education eligibility determinations. The second research question investigated the extent to which compliance with special education regulations was predicted by variables purported to influence disproportionate outcomes among students of color, such as representativeness of the population receiving special education services, inclusion in general education settings, or exclusionary discipline practices. Results, limitations, and future directions are included

following the interpretation of results, adding to the literature on special education disproportionality research and equitable school psychology practice.

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Acknowledgements

At the outset of this study, and for the majority of my graduate career, I intended to adopt a measured, almost detached lens on educational injustice. I assumed my identity as an ethnic minority student would require a level of detachment in order to be persuasive - to be *credible* – within the hegemonic systems I hoped could change. In the last quarter of my doctorate coursework, however, it became impossible to hold my work at an arm's length. Most of this study was completed between Winter and Spring 2020, when the coronavirus pandemic and Black Lives Matter movements hit close to home in Seattle. Writing gave me a place to compartmentalize my anxieties in operationalized and quantifiable problems, with measured solutions. It also forced me to reckon with the kind of school psychologist and educator I want to be on the other side of this degree. The irony was not lost on me that I was hoping for an equitable and humanity-driven educational system, all the while denying my own humanity. I felt safe hiding behind statistics and hoped to present a polished product – no mention of feeling *lesser-than* or *other* in schools, or the simultaneous privilege and oppression often conferred with being Korean American. I acknowledge that writing and defending a dissertation about educational equity from a privileged vantage point is in no small part because I have benefitted from systems that disenfranchised others.

Still, I have hope in the promise of public education and what it has, and can, become. Each of the numbers presented in this study holds a life that matters, and an education that matters. I am grateful for the opportunity to write and present this study, with full admission of my complicity in these educational injustices, and to pass on the work of anti-oppressive education to others.

Faculty, colleagues, and friends at the University of Washington have shaped both this study and my personal and professional trajectories. I started this endeavor to learn from those who are doing the hard and honest work of restoring and healing, and Dr. Janine Jones, you've showed what it means to speak the truth, and to do so with love. Dr. Stephanie King, thank you for taking a chance on me and showing what it means to be courageously and relentlessly committed to public education and its potential to change communities. Drs. Roxanne Hudson, Chung Wang, and Jenn Stuber, my beloved reading committee, thank you for challenging me to pursue this work with integrity and eyes wide open for blind spots. To my cohortmates, especially Paul, Candace, and Salloni, you've made my graduate school journey all the more worthwhile. Thank you for not blocking my number after sending some really, really, *really* stupid memes. Special shoutout to Bon Iver, Kendrick Lamar, and the matcha lattes at Broadcast Coffee on Roosevelt – the real MVPs of my degree.

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Chapter 1: Introduction

For more than half a century, research on the disproportionate representation of ethnic and racial minority students in special education has redefined our understanding and pursuit of educational equity (Artiles, Kozleski, Trent, Osher, & Ortiz, 2010; Dunn, 1968). Primarily focusing on overrepresentation and segregation of students from minority backgrounds, disproportionality has been raised as a complex and controversial issue, with far-reaching implications across school psychology literature, policy, practice, and law (Albrecht, Skiba, Losen, Chung, & Middelberg, 2012; Castro-Villarreal, Villarreal, & Sullivan, 2016). Since the 1960s, the body of literature on disproportionality has lacked consensus on the causes, consequences, and appropriate responses to address disproportionality and its inordinately negative outcomes for Black and Brown students of color (Skiba, Michael, Nardo, & Peterson, 2002; Waitoller, Artiles, & Cheney, 2010).

Against this backdrop of disproportionality, school psychologists have grappled with the paradox of conferring educational opportunity and educational harm via special education identification (Castro-Villarreal et al., 2016; National Research Council, 2002). Whereas identification for special education services provides access to individualized educational services and programming, *disproportionate* identification has been implicated in widening and sustaining achievement and opportunity gaps over time. The United States Department of Education's most recently published *Annual Report to Congress on the Implementation of the Individuals with Education Act* (2020) indicated that in the 2017 school year, despite decades of educational reform and intervention, Black or African American students were more than two times as likely to be served under the categories of emotional disturbance and intellectual disability than all other races combined. Similar patterns of disproportionality have been noted in

3.5 times higher out-of-school suspension rates among Black students than White students (Office of Civil Rights, 2012), lower graduation rates (27.5% among Black students and 48% among White students; Skiba et al., 2002), and office discipline referral rates two to four times higher for Black students than White students (Skiba, Horner, Chung, Rausch, May, & Tobin, 2011). Moreover, educational policies and special education laws seem to create a "double bind," obligating states to identify all students eligible for special education services while simultaneously posing financial penalties for disproportionate identification by race or ethnicity (Sullivan & Osher, 2019).

Confronted with these realities, this study seeks to disentangle the many interpretations of disproportionality research and its theoretical, legal, and practical implications for school psychologists. The literature review and data analysis specifically investigate Multi-Tiered Systems of Support (MTSS) as a means of identifying and addressing significant disproportionalities in special education.

Chapter 2: Literature Review

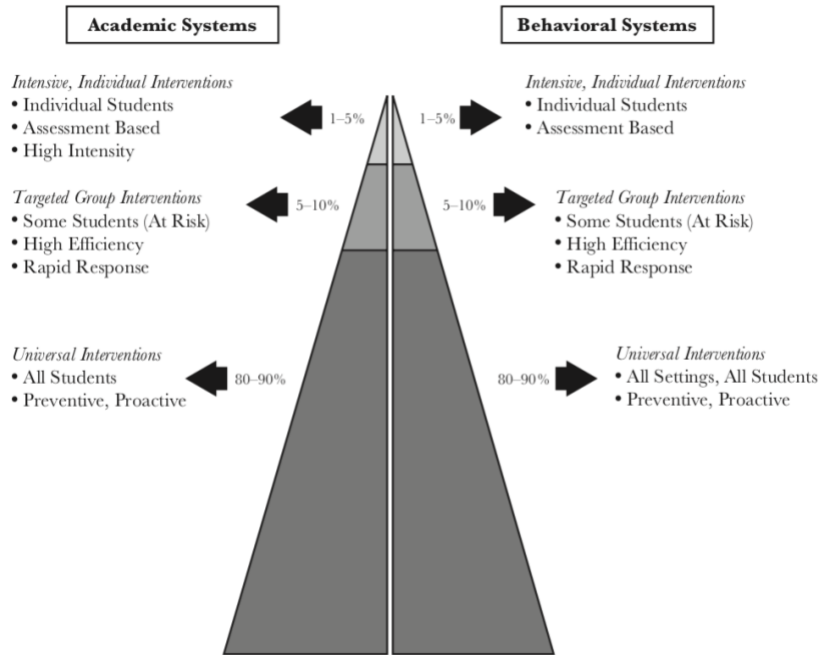
Defining Multi-Tiered Systems of Support

In special education and school psychology literature, Multi-Tiered Systems of Support (MTSS) and Response to Intervention (RTI) refer to service-delivery models focusing on early identification, prevention, progress monitoring, and systematic evaluation of interventions (Fuchs & Vaughn, 2012; Glover & DiPerna, 2007; Sugai, 2009). Nearly five decades of educational research have focused on tiered service delivery models to systematically disseminate, implement, and evaluate instructional services in K-12 public schools. Tiered service delivery systems rely on a continuum of increasingly tailored evidence-based interventions, with systematic progress monitoring of students' response to intervention driving service allocation. MTSS practices have been used in schools to (a) identify students' academic and social/behavioral challenges and (b) intervene at optimal times to produce optimal educational outcomes (Dunlap & Fox, 2014; Fuchs & Stecker, 2010; Gischlar, Keller-Margulis, & Faith, 2019; Glover & DiPerna, 2007; Sugai, 2009; Walker & Shinn, 2002).

MTSS hinges on data-based decision-making and systematic evaluation of educational interventions and their outcomes. Student data obtained from MTSS practices serves as the basis for decision-making around intervention planning, rather than haphazardly providing services in response to students' needs (Fuchs & Stecker, 2010; Glover & DiPerna, 2007). In a traditional, three-tiered approach, each tier has a targeted population, screening measures, and expectations for the percentage of students whose needs are met by instruction or intervention within each tier.

Figure 1

Three-tier model for school-based service delivery (Tilly, 2008)



Tier I universal supports encompass foundational, general education instruction provided to meet the needs of 80-85% of a student population. Tier II secondary prevention supports provide targeted and intensified intervention to 10-15% of students requiring supports beyond Tier I. Tier III targets the top 5% of students who need the most intensive, individualized interventions (Fuchs & Stecker, 2010; Walker & Shinn, 2002).

Glover and DiPerna (2007) outlined five core components of tiered service delivery systems: (1) a continuum of instructional and behavioral supports provided to students, (2) assessment and data-based decision-making to increase the fit between educational needs and appropriate interventions, (3) increasingly intensive, evidence-based interventions provided in response to student performance on progress monitoring measures, (4) procedural integrity and

monitoring the adherence to and fidelity of implementation, (5) development and sustainability of systems-level capacity, focuses on systems-level change variables that facilitate or impede dissemination and implementation.

Theoretical Frameworks and Principles of MTSS

Several terms are used interchangeably throughout educational literature to describe tiered approaches to service delivery. Educational services are commonly conceptualized as focusing on either academic or social/behavioral development, and this delineation is reflected in MTSS terminology. Academic Response-to-Intervention has historically referred to systematic reading intervention and evaluation, with standardized approaches to identify and support students who are not responding to intervention. The 2004 federal reauthorization of the Individuals with Disabilities Education Improvement Act (IDEIA; 2004) included provisions allowing school districts to identify students with Specific Learning Disabilities based on "response to scientific, research-based intervention". RTI has been extended to other academic areas such as math (Forbringer & Fuchs, 2014) and science (Marino & Beecher, 2010).

MTSS approaches focusing on social/behavioral supports, on the other hand, may refer to Positive Behavioral Interventions and Supports (PBIS), which standardizes school-wide structures to identify prosocial and behavioral needs and systematically provide intervention (Dunlap & Fox, 2014). With growing emphasis on the interconnected relationships between academic and social/behavioral difficulties and the promise of cascading improvement effects in both areas (McIntosh, Chard, Boland & Horner, 2006; Nelson, Benner, Lane, & Smith, 2004), integrated MTSS models address academic and behavioral needs, separately or simultaneously. This literature review adopts Gamm et al. (2012)'s definition of MTSS as "an evidence-based

model of education that employs data-based problem-solving techniques to integrate academic and behavioral instruction and intervention."

Among others, three main theoretical frameworks in the reviewed literature were found to undergird MTSS processes and adaptations, including (1) problem-solving frameworks, (2) public health frameworks, and (3) inclusion frameworks. Each framework and its contribution to the MTSS literature are described below.

Problem-Solving Frameworks

MTSS has been described as a problem-solving framework applied systematically in school settings (Avant, 2016; Eagle, Dowd-Eagle, Snyder, & Holtzman, 2015; Fuchs & Fuchs, 2006; Gischlar et al., 2019). Rather than providing interventions in response to crises, which has been criticized as a reactive and haphazard approach, MTSS services provide a framework to allocate services in response to progress monitoring procedures and data-based decision-making. Conceptualized as an iterative process to identify and analyze problems, develop and implement solutions, and evaluate the solution's efficacy in resolving the original problem, MTSS procedures guide intentional, systematic service delivery in schools. MTSS relies on data to systematically identify areas for support and to evaluate whether interventions are appropriate solutions for academic or behavioral challenges.

The potential for MTSS to guide school decision-making has been framed through the *standard protocol model* and the *problem-solving model* (which differs from problem-solving *frameworks* discussed in educational literature). In the *standard protocol model*, MTSS teams develop and choose from a set menu of research-based interventions among each tier, limiting options to a *standard* set of instructional or intervention services rather than individualized services that vary from student to student (Fuchs and Fuchs, 2006). The standard protocol model

emphasizes a small number of empirically validated interventions, allowing for greater procedural integrity and evaluation of implementation factors. In both the standard and problem-solving models of MTSS, student performance on progress monitoring measures drives intervention decision-making, given the basic assumption that effectively implemented instruction and interventions should be ruled out as a cause for low performance (Fuchs & Fuchs, 2006; Eagle et al., 2015).

The *problem-solving model* differs from the standard protocol model by taking into account individual and contextual factors impacting student performance (Eagle et al., 2015; Fuchs & Fuchs, 2006; Gischlar et al., 2019). Given student data, MTSS teams employing a problem-solving approach flexibly make service delivery decisions based on the student's needs rather than choosing from a set menu of options. The problem-solving approach allows teams to identify and deliver interventions most closely aligned to students' specific needs. While individualized interventions would ideally include empirically-validated interventions, the flexibility inherent in problem-solving approaches introduces a margin of error and bias in the selection, provision, and implementation of said services (Eagle et al., 2015).

The literature suggests MTSS implementation takes different shapes in practice in response to the ecology of school settings and student variables, such as the availability of intervention resources, organizational climate and decision-making processes, and student or community needs. However, the overall MTSS approach to identifying problems and finding solutions in a systematic manner provides structure to intervention delivery and the evaluation of educational solutions most relevant to a school's needs.

Public Health and Prevention Frameworks

Another key theoretical framework that serves as a foundation for MTSS principles is the public health approach to prevention. In MTSS, the percentages of students and supports in each tier represents estimates of intervention resources that are publicly accessible and sustainable. For example, with effectively implemented tier I curricula, 80% of the school population should reach proficiency based solely on general education. The remaining 20% of the population should theoretically reach proficiency with resources allocated to supplementary tier II and III interventions (Horner & Sugai, 2002; Tilly, 2008). The population, resource, and proficiency estimates in MTSS models are based on public health approximations of sustainable intervention delivery. In schools with fewer students demonstrating proficiency with tier I services (e.g., 65%), more resources must be allocated to sustain tier I proficiency (65%) in addition to proportionally higher expenditures for tier II and III intervention services (35% rather than 20% in the 80-20-10 model).

More recent prevention science literature has focused on linkages between early identification and *meaningful* intervention, underscoring the importance of making intervention decisions based on student and school data rather than by subjective perceptions or intervention-as-usual (McMahon & Sembiante, 2019; Moreno & Gaytán, 2013; NRC, 2002). MTSS frameworks rely on early identification systems with universal screening measures to detect populations at risk for requiring more intensive services (Erickson, Noonan, & Jenson, 2012; VanDerHeyden, 2011). Jenkins, Hudson, & Johnson (2007) noted that early identification of student needs is essential for appropriately allocating interventions to address targeted, rather than globalized, needs. By proactively screening the general population for susceptibilities associated with poorer outcomes and by monitoring intervention progress, schools can divert

costly intervention resources toward preventative measures, relieving the current overburdened and unsustainable special education identification and service delivery model (Stecker, Fuchs, & Fuchs, 2017).

Inclusion Frameworks

MTSS has been characterized as a dynamic system that adapts to school and implementer characteristics. As such, students' needs and supports cycle fluidly among tiers (Fuchs & Fuchs, 2006; VanDerHeyden, 2011), with some models conceptualizing special education services as Tier III, individualized services provided to children and adolescents with disabilities (Cook et al., 2015). With regular screening, data-based progress monitoring, and appropriate goal setting, MTSS and RTI procedures facilitate school inclusion goals. Conceptually, inclusion refers to the degree to which students receiving special education services also access less restrictive environments – i.e., the degree of access to general education tier I instruction or settings (Skiba et al., 2002).

In their study on inclusive educational practices, Barrett, Stevenson, and Burns (2019) contend that, among students eligible for special education, greater inclusion is associated with greater reading and math performance. Students who spend more time in the general education setting have more exposure to the core curriculum, and exclusionary practices that systematically withhold tiered services are consistently associated with worse academic, behavioral, school engagement, drop out, and even juvenile justice contact (Skiba et al., 2002). MTSS is implicated as a means of flexibly providing supplementary services to students in addition to, *not instead of*, tier I instruction (Barrett et al., 2019).

Preliminary evaluations of MTSS implementation in district- and state-level studies boast promising outcomes for students and schools (VanDerHeyden et al., 2007). MTSS has been

associated with better academic performance, improved behavior, fewer overall special education placements, fewer SLD eligibility determinations, and "prevents the misclassification, overidentification, and disproportionality in special education (Peterson et al., 2007; VanDerHeyden et al., 2007) of special education students.

Legal and Practical Applications of MTSS in Schools

Legal Applications of MTSS: IDEIA

The current literature on MTSS in educational service delivery broadly addresses two applications: (1) legal interpretations in special education law and (2) special education eligibility identification processes. The first explicit integration of MTSS frameworks in legal settings is documented in the 2004 reauthorization of IDEA, which outlined procedures, protections, and regulations for identifying and providing special education services to qualifying students with disabilities (IDEIA, 2004).

Most students receiving special education services were found eligible under the category of Specific Learning Disability (SLD), accounting for nearly half of all qualifying disabilities warranting special education services. Historically, SLD has been conceptualized in school psychology practice as a severe discrepancy between cognitive abilities and academic performance (Ihori & Olvera, 2014). However, IDEIA authorized three approaches to identify students with SLD: (a) the existing severe discrepancy model, (b) "a process based on the child's response to scientific, research-based intervention", and (c) patterns of strengths and weaknesses (U.S. Department of Education, 2004, 300/D/300.37/a). MTSS was included in legislation as an alternative conceptualization of SLD as failure to respond to systematically scaled, empirically-supported interventions (Ihori & Olvera, 2014; O'Connor, Bocian, Beach, Sanchez, & Flynn, 2013; VanDerHeyden, Witt, & Gilbertson, 2007).

Due to the focus on early intervention, treatment validity and integrity, and improved accuracy in SLD identification, MTSS procedures demonstrated particular promise against a parallel branch of special education study in the last five decades: ethnic proportionality in access to high quality tiered services (O'Connor et al., 2013; VanDerHeyden et al., 2007). Regional and national studies demonstrate long-standing significant differences in the rates of special education identification, service allocation, placement in restrictive environments, and disciplinary practices in racial or ethnic minority student populations compared to Caucasian students (Office for Civil Rights, 2014; U.S. Office of Special Education and Rehabilitation Services, 2016). Through IDEIA, federal legislation charged states with implementing and enforcing "policies and procedures designed to prevent the inappropriate over-identification or disproportionate representation by race and ethnicity of children with disabilities" (§300.173, U.S. Department of Education, 2004).

Though federal legislation mandated that students may not be determined eligible for special education services due to cultural or linguistic differences (U.S. Department of Education, 2004), school psychology practice has nevertheless grappled with disproportionate rates of special education referral and eligibility rates by demographic factors such as race and English language proficiency. In addition, students from racial or ethnic minority backgrounds have continuously been overrepresented among SLD eligibility determinations, particularly so in urban school districts (Klingner et al., 2005). As a result, MTSS procedures were codified in special education procedural law as a promising practice for reducing disproportionate outcomes for students of color (Abou-Rjaily & Stoddard, 2017; Cook et al., 2015).

Practical Applications of MTSS: Evaluation and Intervention

While best practices in special education eligibility determinations include multi-disciplinary, team-based decision-making, traditional assessment for SLD typically distills decision-making to two standardized assessment scores, obtained from school psychological evaluations to determine whether there is a severe discrepancy between cognitive and academic performance. Professional associations and the literature have continued to advocate for alternative methods of identification as students from minority backgrounds are disproportionately disadvantaged by traditional paradigms (Barrett & Newman, 2018; Gischlar et al., 2019) Governing bodies such as the National Association of School Psychologists have released position statements in support of MTSS and the potential for school psychologists to engage consultation training to facilitate MTSS processes as an alternative method for identifying SLD. School psychology training in data collection and analysis, identification of academic and behavioral risk and resilience factors, and case conceptualization of student- and system-level needs and intervention directions highlight the potential for school psychology practice to both contribute to and benefit from integration in MTSS.

In addition to professional imperatives by governing bodies such as NASP to reduce and prevent ethnic disproportionality, several practices outlined in IDEIA were mandated by the federal government to reduce ethnic disproportionality in special education. Most explicitly, IDEIA 2004 requires local education agencies to monitor disproportionality in areas of identification, placement, and discipline. Local educational agencies (LEAs) found to be out of compliance with “significant disproportionality” thresholds face financial consequences that require the district to divert funds to early intervening services solely to reduce disproportionality.

More passively, IDEIA stipulates referral prior to evaluation for special education services in hopes that multi-disciplinary student support teams would seek early assessment and intervention rather than special education services. Knotek's (2003) study gave legs to the argument for a more objective and fairer referral process. Moreover, IDEIA 2004 provides detailed inclusionary and exclusionary criteria for eligibility under the Emotional Disturbance category. In addition to a thorough observation of behavior in different environments and an in-depth social history, eligible students must exhibit the challenging behavior to a marked degree (from two to nine months) and in such a way that adversely affects the student's educational performance (U.S. Department of Education, 2004). Although these guidelines might theoretically reduce ethnic disproportionality with well-implemented execution, broad interpretations of federal law and incomplete translations of the law to school psychology practice have not resulted in racial parity.

MTSS and Disproportionality in Special Education

The persistence of MTSS models in educational service delivery reflects both positive outcomes and unintended consequences, mediated by implementation and demographic factors. One of the more promising outcomes evidenced in school psychology literature is reflected in differential rates of SLD eligibility determinations for racial or ethnic minority students. Traditional evaluation methods have been criticized in school psychology literature for its disproportionately adverse impact on students of color. Standardized assessments used to establish discrepancies have been documented as culturally, linguistically, and psychometrically biased, producing mean score differences based on ethnic or linguistic backgrounds rather than the presence of "true" processing or learning needs (VanDerHeyden et al., 2007). Whereas the discrepancy model has been found to contribute to ethnic disproportionality, MTSS has been

found to reduce rates of biased or inappropriate special education referrals and eligibility determinations for minority students (Ihori et al., 2014; O'Connor et al., 2013; VanDerHeyden et al., 2007). Preliminary studies on the effects of MTSS implementation demonstrated promising increases in ethnic proportionality due to factors such as the focus on early intervention, treatment validity and integrity, and improved accuracy in SLD identification in comparison to the discrepancy model (O'Connor et al., 2013; VanDerHeyden et al., 2007).

Technical Adequacy of Decision-Making Based on MTSS Outputs

Despite the potential of MTSS theoretical frameworks and evaluation studies to address disproportionality, a growing body of research concurrently documents criticisms and caveats for translating MTSS theory to practice. One such criticism is the technical adequacy and clinical applicability of data obtained from MTSS procedures in high-stakes decision-making, such as special education eligibility determinations and schoolwide instructional reform efforts (Petscher, Kim, & Foorman, 2011; Reynolds and Shaywitz, 2009; VanDerHeyden, 2011). Since MTSS utilizes a dynamic series of recurrent measurements and decision-making rather than any singular measure of performance, using static datapoints obtained from MTSS procedures to drive eligibility decisions presents measurement challenges.

VanDerHeyden (2011) presented RTI as a decision framework and diagnostic classification system, subsequently requiring systematic evaluation of how accurately and efficiently RTI data drives decision-making compared to traditional eligibility determination methods. Classification agreement analyses were used to determine the degree to which intervention decisions produced intended outcomes, benefitting both students and school systems. The technical adequacy of diagnostic systems such as MTSS can be quantified along two dimensions: (a) the accurate identification of "true" disabilities (*sensitivity* to detect "true

positives") and (b) the accurate identification of individuals "truly without" disabilities (*specificity* to detect "true negatives") compared to accurate identification by chance (VanDerHeyden, 2011; Walker, 2009). Data from assessments demonstrating adequate sensitivity, specificity, and positive and negative predictive power characteristics theoretically lead to consistent decision-making across various settings with varying disability prevalence rates.

Additionally, Jenkins et al. (2007) identified three sources of sensitivity and specificity variation in RTI processes: selection of assessments appropriate for local needs and resources, criterion cut scores to identify students requiring further intervention, and the demographic representativeness and spread of scores in the norming population used to derive cut scores. Regional or localized differences in student populations may differ from the idealized 85-10-5 ratio of students requiring Tier I, II, and III supports, and Reynolds and Shaywitz (2009) argue the lack of accepted criteria for identifying responders vs. non-responders may disproportionately disadvantage students from backgrounds not reflected in the literature.

Although the reliability of static datapoints obtained through MTSS procedures can be quantified through comparable measures across assessors and time (VanDerHeyden, 2011), classification agreement analyses can be extended to broader MTSS implementation factors. Schools may aspire to employ "gold standard" MTSS assessments with adequate sensitivity, specificity, and predictive power, but the multitude of implementation and organizational influences in schools may serve as limiting factors in diagnostic and intervention decision-making. VanDerHeyden (2011) posited that school MTSS teams may need to negotiate which technical adequacy characteristics are most relevant and least costly to schools, as a high

proportion of "false positives" may differentially impact a school's resources compared to a high proportion of "false negatives".

Follow-up assessments may be used to append initial screening or progress monitoring measures to limit inappropriate provision of services to "false positive" students who do not truly require intervention, or to proactively identify "false negative" students who truly require intervention but were not identified through given criterion cut scores. Although these follow-up procedures require manpower, time, and financial resources, in order to support the prevention and inclusion frameworks highlighting early identification, MTSS teams are encouraged to compare the costs and benefits of investing in further classification analysis verification systems such as recursively comparing screening data to outcome data post-intervention, utilizing measures with cut scores that adequately reflect the school's population, and multi-gated decision models relying on multiple sources of data to drive intervention.

Variability in MTSS Implementation

Related to the technical adequacy of MTSS data, various implementation factors have been found to impact clinical accuracy of decisions based on MTSS processes. VanDerHeyden (2011) highlighted the importance of evaluating the consistency of decision rules among various student populations, accurate selection of interventions, and implementation of subsequent interventions. Longitudinal studies on MTSS and the technical adequacy of identification and intervention decisions indicate a bidirectional relationship between student/school factors and subsequent MTSS implementation (VanDerHeyden, 2011). Nevertheless, treatment fidelity across tiers and diverse settings has been difficult to measure (Sanetti & Kratochwill, 2009).

The success of MTSS systems has been found to depend largely on effective implementation of interventions (Erikson, Noonan, & Jenson, 2012). Implementation measures

have been developed to assess the degree to which essential (a) content, (b) process, (c) quality, and (d) quantity dimensions of interventions in MTSS are delivered as consistently and comprehensively as originally designed (Sanetti & Kratochwill, 2009). (a) Content measures provide evidence of procedural integrity through MTSS planning artifacts such as needs assessments, process checklists, and templated action plans. (b) Process measures typically include yes/no rating scales to determine the percentage of MTSS components in place. Lastly, measures of the (c) quality and (d) quantity of interventions delivered as intended include interviews, observations, and self-assessments from educators providing tiered interventions (Erikson et al., 2012).

By nature, MTSS processes are designed to be self-sustaining and responsive to localized student populations and needs. Given the variability in how schools interpret MTSS frameworks and implement MTSS practices, evaluating each of the four dimensions of implementation fidelity is imperative to determine effectiveness of interventions within and comprising MTSS (Balu et al., 2015). MTSS implementation factors were found to have a neutral or negative impact on student outcomes, even across sites that claimed "full implementation" with widely varying practices (Balu et al., 2015). Implementation fidelity is directly related to schools' abilities to produce positive outcomes, accurately identify needs and provide services, and continually re-define improvement as students respond to interventions - or not (Erikson et al., 2012). Furthermore, evaluating implementation data allows for targeted professional development and increased adoption of intervention components among educators, subsequently leading to greater academic and behavioral gains (Barrett & Newman, 2018; Erikson et al., 2012).

In their systematic review of academic RTI trends in the last decade of school psychology literature, Gischlar et al. (2019) evaluated 108 peer-reviewed publications according to the aforementioned five core components of RTI implementation: (1) multi-tier implementation, (2) assessment and decision-making, (3) evidence-based intervention, (4) procedural integrity, and (5) systems-level capacity (Glover & DiPerna, 2007). The most frequently addressed domain was (2) assessment and decision-making, discussed in approximately two-thirds of all articles (68%). In contrast, the least frequently addressed domain was (4) procedural integrity (about 19% of all articles). Technically adequate and valid conclusions about MTSS efficacy are dependent on data demonstrating treatment integrity and fidelity, underscoring the difficulty of empirically supporting and scaling up MTSS service delivery models (Gischlar et al., 2018; Sanetti & Kratochwill, 2009).

Unintended Consequences for Minority Students and Schools

In addition to criticisms of questionable technical adequacy in MTSS decision-making and wide variability in MTSS implementation, a third and final caveat in MTSS literature concerns unintended outcomes for ethnic minority students and schools. Although the prevention and inclusion frameworks in MTSS are purported to particularly benefit students from diverse or marginalized racial/ethnic, linguistic, and sociocultural backgrounds, the literature lacks empirically-based data to support these claims (Garcia & Ortiz, 2004; Klingner & Edwards, 2006). These underlying demographic and ecological variables are often underrepresented or overlooked in MTSS studies, limiting generalizability of claims about RTI's potential to close achievement gaps and equitably identify students requiring intervention and special education (Garcia & Ortiz, 2008).

Among racial and ethnic minority populations, language considerations and acculturation variables may differentially impact MTSS efficacy. The majority of academic MTSS literature fails to address dual language development. Beyond the superficial features of language, culturally-based nonverbal behaviors and communication patterns impact educator perceptions of performance (Acevedo-Polakovich et al., 2007) but are not often accounted for in MTSS studies (Artiles et al., 2010). Acculturation and the multidirectional processes by which individuals integrate new cultural beliefs and behaviors while maintaining cultural heritages and values also differentially impact the applicability of MTSS procedures in identifying and providing tiered academic and behavioral interventions to students of color (Padilla & Perez, 2003). By failing to account for and adapt to these cultural implementation factors, educational service delivery systems continue to neglect and marginalize minority populations from the benefits of MTSS.

Several authors have also raised concerns about the lack of ethnic and racial minority strengths and needs represented in MTSS literature (Artiles et al., 2010; Klingner & Edwards, 2006). Differential sampling procedures disadvantage minority populations from accessing or being reflected in MTSS research (Artiles et al., 2010; Balu et al., 2015). Currently, far less empirical support exists for MTSS intervention efficacy among diverse populations. Moreover, conflating or underestimating relationships between culture, language, academic or behavioral performance, and response to intervention disproportionately disadvantages minority students from accessing or benefitting from MTSS research as their majority peers. Although the wealth of research on developmental and linguistic trajectories of students of color is beyond the scope of this review, the literature surveyed thus far paints a picture of inequitably limited access to the benefits of MTSS research and implementation.

Disproportionalities in Special Education

Against the backdrop of MTSS's inclusion frameworks, the field of school psychology has historically grappled with the disproportionate representation of ethnic minority students receiving special education services in relation to their representation in the general population. Studies from regional and national samples have demonstrated significant differences in the rates of special education identification, service allocation, and placement in restrictive environments among ethnic minority groups (NRC, 2002; Moreno & Gaytán, 2013). While both the National Association for School Psychologists' (2010) Principles for Professional Ethics and the jointly produced Standards for Educational and Psychological Testing (American Educational Research Association et al., 1999) include statements in regards to culturally appropriate and fair evaluation measures and procedures such as MTSS, ethnic disproportionalities continue to persist and are projected to worsen with the exponentially increasing ethnic minority population (Knotek, 2003). Without systematic changes to the processes contributing to ethnic disproportionality, school psychological practice and the special education system faces an overburdened and untenable identification and service delivery model.

Evidence of Disproportionate ***Access*** to Educational Interventions

Despite charges to provide culturally responsive MTSS, evaluation studies document statistically and clinically significant differential rates of access and response to tiered services by race and socioeconomic status from 1968 onward (Dunn, 1968; U.S. Department of Education, Office of Civil Rights; 1994). Population studies from Medicaid claims data, national longitudinal surveys, and local studies document ethnic differences in special education representation and access to tiered services. Grounding the need for cultural adaptations in data on ethnic disproportionalities in intervention also provides guidance for the types of systematic

cultural adaptations to MTSS procedures to address both protective and risk factors among racial and ethnic minority populations.

Among other MTSS procedures susceptible to producing inequitable outcomes, teacher referrals for special education evaluations have been found to contribute to ethnic disproportionality. Highly subjective and biased educator reports in the referral for intervention process may lead to false-positive overidentification of minority students eligible for special education services, in addition to documented differences in instructional opportunities, teacher education, and achievement expectations among students of color (Knotek, 2003; Moreno & Gaytán, 2013). Knotek's (2003) ethnographic study on how members of pre-referral multidisciplinary student study teams (MDTs) conceptualized and discussed students' functioning and challenges demonstrated confirmation bias for students with behavioral challenges, a profound lack of objectivity in student evaluations, and failure to operationalize challenging student behaviors and areas for evaluation and intervention.

Moreover, Guo, Kataoka, Bear, and Lau's (2014) study on differential rates in referrals for and barriers to school-based mental health (SBMH) services in Asian American and Latino students indicated disproportionate identification for further services. Findings indicated Latino youth were referred for SBMH more than four times more often as Asian American students, replicating previous literature citing disproportionate referrals by racial group (Hosp & Reschly, 2003). Fourteen percent of Asian American students in the sample self-reported elevated ratings on the Strengths and Difficulties Questionnaire, and 3% of those students were ultimately referred for SBMH services. Of the 20% of Latino students who provided similarly elevated ratings, 13% were referred for SBMH services. Even after controlling for variables such as externalizing problems, academic performance, school bonding, and impairment, referral rates

were significantly different between the two ethnicities. Guo et al. (2014) argued that the identification of challenging behaviors and subsequent help-seeking behaviors are mediated by "adult gatekeepers" – i.e., teachers, school psychologists, parents, and MTSS leadership teams that monitor access to intervention. The authors suggested that personal biases and stereotypes about ethnic groups played a role in the decision-making processes employed by adult gatekeepers, resulting in disproportionately over- (Latino) and under-served (Asian American) populations.

Disproportionate access to services has also been documented when comparing access to school-based versus community-based intervention services. Locke et al. (2017) analyzed Medicaid claims data from children with psychiatric disorders and found that Hispanic children were more likely to use SBMH services than White children with the same clinical diagnoses. However, expenditures on out-of-school services were significantly lower than expenditures on White children, suggesting that the dosage and intensity of services received were not comparable to SBMH services. Ethnic disproportionalities in the rates of diagnosis and referrals to SBMH services among African American children are well documented, but these findings address differences in *access to* versus *utilization of* needed services (Locke et al., 2017). Cultural factors such as stigmatized views about behavioral services, perceived roles of schools and community resources in youth development (academic vs. behavioral support), and limited English proficiency were associated with underutilization of behavioral health services.

Evidence of Disproportionate *Distribution and Benefits* of Educational Interventions

Another dimension of special education disproportionality literature focuses on how individual versus contextual factors impact the distribution and benefits of special education services. Although special education disproportionality has been acknowledged as a multi-

faceted problem resulting from a number of social, cultural, and organizational variables, in order to define disproportionate representation, more recent research has sought to understand the relationships between individual student factors and the representation of those factors among broader school contexts.

In the absence of tiered service delivery models, studies on disproportionate eligibility for special education services suggest individual student demographic variables such as gender, race, socioeconomic status, and disciplinary suspensions are better predictors of eligibility than school-wide variables (Sullivan & Bal, 2013). School-level variables (such as a school's total minority student enrollment, or representation of students from limited English proficiency or low-income backgrounds in relation to "majority" students) were not as significant predictors of special education eligibility as individual-level demographics, with highest risk rates for overidentification found among students identifying as Black, receiving free/reduced lunch, or male (Sullivan & Bal, 2013). Similarly, economic marginalization has consistently been found to positively correlate with overidentification of high-incidence disabilities such as SLD, and student ethnicity and gender are consistently strong predictors of school discipline procedures (Boneshefski & Runge, 2014; Skiba et al., 2002). These selected publications support conclusions about social and contextual influences on disproportionate identification and service delivery for ethnic minority students, reflecting educational policies and practices that are neither applied equitably nor expected to produce equitable outcomes.

While identification for special education services may confer access to necessary services for support students with disabilities, disproportionate eligibility for services has also been linked to higher rates and degrees of school discipline and exclusionary practices (Skiba et al., 2011). Moreover, the efficacy of special education services in closing academic achievement

gaps between students from ethnic minority and majority backgrounds has not been established, while the compounding effects of academic underperformance and the need for behavioral support have consistently demonstrated marginalizing outcomes. Reducing access to high-quality instruction widens achievement disparities and increases challenging behavior, further limiting academic and behavioral intervention (McIntosh, Horner, Chard, Dickey, & Braun; 2008).

With regard to disproportionate school discipline, claims about the potential for MTSS to provide systematic self-evaluation and reduce disproportionality in suspensions have yet to be substantiated in the literature. Although preliminary studies on SWPBIS show promise in reducing overall discipline rates, a nationwide, three-year study on SWPBIS indicated African American populations continue to receive the most disciplinary actions (Boneshefeski & Runge, 2014). In follow-up studies more closely examining schools with high fidelity of MTSS implementation, disproportionate exclusionary practices for African American students actually increased (Vincent & Tobin, 2011). Disproportionate discipline and related exclusionary practices may compound disproportionate access to services by systematically withholding further educational services and instruction, resulting in persistent achievement and performance gaps that are exacerbated despite access to special education services (Waitoller et al., 2010).

Some authors argue overrepresentation in special education in and of itself is not always problematic, particularly if supplementary interventions and resources are provided to ethnic minority populations historically marginalized from traditional service delivery models (Heller, Holtzman, & Messick, 1982). However, when students of color are (a) disproportionately excluded from more appropriate educational services and placements, (b) overidentified due to inappropriate instruction rather than adversely impacted by disabilities, or (c) prevent students

from receiving educational services in the least restrictive setting, the need for culturally responsive service delivery models is clear (Waitoller et al., 2010).

The Current and Forthcoming Literature on Culturally Responsive MTSS

Though developing more recently in the MTSS literature, the promise of culturally responsive MTSS (CR-MTSS) procedures has gained traction as a distributive justice paradigm designed for equitable educational service delivery in schools serving all students (Artiles et al., 2010). Although some authors implicate MTSS as an attempt to "eliminate contextual variables as viable explanations for academic failure", thereby "reduc[ing] or eliminat[ing] disproportionate representation that might otherwise result from teacher or assessment bias" (Vaughn & Fuchs, 2003, pp. 141-142), extant data reflects a failure for these conceptualizations to interrupt systemic patterns of inequitable access to and benefits of educational services (Boneshefski & Runge, 2014; Vincent et al., 2009).

Social justice perspectives are embedded throughout CR-MTSS literature as a means of addressing historically unjust distribution and benefits of educational services (Artiles et al., 2010). In addition to disproportionate identification practices, traditional MTSS frameworks have been criticized as "compound[ing] the multiple marginalities that diverse learners already confront in their lives due to the devalued status of people of color in a racially stratified society and disproportionate representation in low-income groups" (Artiles et al., 2010, p. 252). As such, some authors contend greater sociocultural inequities in which school systems are embedded interfere with traditional MTSS implementation, at the risk of reproducing and reinforcing social inequities (Artiles et al., 2010).

While there is substantial literature on tiered intervention models, formats, and efficacy studies, fewer resources explicitly address MTSS through a culturally responsive lens. The push

toward culturally responsive practice to promote academic and behavioral response to intervention has generated curricula and instructional strategies that intentionally address demographic variables and their influence on achievement and opportunity gaps. The following review of literature employs a critical race lens (Delgado, 1984; Solorzano, 1998; Yosso, 2005). Critical race theory (CRT) centralizes the historical and contemporary impact of race on educational contexts and systems, focusing on dominant educational theories, systems, and policies that subordinate non-dominant students and populations to inferior positions. CRT emphasizes the continued subjugation of minority groups to positions of vulnerability, oppression, and marginalization from the benefits of educational services. Solorzano's (1998) five tenets of CRT are imbued throughout the CR-MTSS literature: (a) race and racism are inextricably linked to subordination by other minority identities, such as gender, class, immigration status, sexuality, and linguistic differences. (b) CRT also challenges dominant ideologies and research agendas veiled as "neutral" or "objective" as underrepresented epistemologies are silenced or ignored, and thus (c) holds commitments to social justice and reducing or eliminating racism, sexism, and poverty. In contrast to dominant educational theories, CRT also (d) acknowledges racialized experiences and narratives as legitimate and critical to understanding and unraveling systemic marginalization, and (e) extends anti-oppression efforts across history and various disciplines (Yosso, 2005)

Grounded in CRT and the prevention and inclusion frameworks discussed previously, CR-MTSS extends the objectives of traditional MTSS to provide high-quality instruction across a variety of student needs to the demographic or sociocultural variables linked to disproportionate outcomes. Disproportionality research in special education provides three lenses by which ethnic minority students are differentially provided educational services: professional

instructional, evaluative, and professional practices; sociodemographic profiles of students and schools; and sociohistorical perspectives on power and the structure of race (Waitoller et al., 2010). In light of the longstanding disproportionate access, distribution, and benefits of education services, the CR-MTSS literature focuses on two avenues to equitably provide tiered services: (1) embedding culturally responsive practices at the *individual practitioner-level,* and (b) establishing systematic procedures to identify and remediate disproportionate outcomes at *the school-level*.

Culturally Responsive Practices Adopted at the Practitioner-Level

The literature on culturally responsive practices to address disproportionalities in special education suggests integrating efforts among and across practitioners, schools, communities, and broader educational policies may lead to more equitable outcomes (Sullivan & Bal, 2013). Although likely deserving of discussion beyond the scope of this review, implications for two school-based practitioners are explored further: (1) educators or instructional interventionists who can adopt more inclusive instructional and referral strategies, and (2) school psychologists conducting special education evaluations.

Implications for Educators: Culturally Responsive Instruction and Referral Strategies.

The existing literature on culturally responsive instructional practices has been extended to intervention service delivery within tiered systems. The lack of empirically-supported research that intentionally recruits ethnic or racial minority study participants and accounts for demographic and sociocultural variables limits the generalizability of conclusions from "evidence-based" evaluation studies (Peterson, 2017). Suggested practices to improve cultural responsivity of educators' practices includes building capacities to critically evaluate the demographic composition of research samples (Artiles et al., 2010). Educators and tiered

intervention providers are uniquely positioned to identify localized needs within and across classrooms, grade-levels, and schools. CRT and CR-MTSS emphasize the match between demographic samples and identity dimensions impacting tiered service delivery, including a critical stance on what "counts" as evidence-based practice.

As such, individual educators might account for ecological factors such as educational or intervention history, language development, or demographic factors in adapting tiered interventions for cultural responsivity. Although knowledge of cultural or linguistic diversity may drive educators to adapt tiered interventions to meet the needs of their students, inconsistent implementation of tiered services introduces a margin of variability and error in the technical adequacy of intervention decisions (Artiles et al., 2010; Peterson, 2017; Walker, 2009). As such, culturally responsive instructional and intervention practices necessarily require a balancing of treatment fidelity with cultural adaptations to improve the acceptability and sustainability of interventions among minority student populations (Bernal, Jiminez-Chafey, & Domenech-Rodriguez, 2009; Cabassa & Baumann, 2013). Conversely, the broader base of literature on culturally responsive interventions across education and psychology disciplines highlights the importance of accounting for population risk and resilience factors as well as individual and systemic uptake of anti-oppression practices to increase intervention acceptability, adoption, and fidelity among populations of color (Artiles et al., 2010).

While minority students' educational needs may or not be related to demographic or sociocultural variables, the inclusion of culturally responsive practices grounds professional attitudes, expectations, and communication and interaction styles in classroom and therapeutic settings (Chang & Berk, 2009; Sue, Zane, Nagayama Hall, & Berger, 2009). In tiered academic service delivery models, educators are encouraged to consider the cultural and linguistic match

of universal, tier I instructional goals and practices provided in general education settings. Critical race perspectives suggest general instructional practices primarily reflect dominant cultural and linguistic values, reinforcing hegemonic approaches that unduly characterize cultural or linguistic diversity as disability and dysfunction (Garcia & Ortiz, 2006; Yosso, 2005). As such, individual instructional practices in CR-MTSS include seeking consultation from English language teachers and families to pinpoint cultural and linguistic differences in conceptualizing failure to respond to tier I instruction (Artiles et al., 2010). Ladson-Billings (1994) and Nieto (1999) describe pedagogies and dispositions adopted by teachers who engage in culturally responsive instruction.

Several models for cultural adaptations to interventions are reflected in psychological literature. Bernal et al. (1995; 2009) described eight dimensions of cultural adaptations to behavioral interventions, which can be extended to academic interventions as well: (1) intervention language, (2) cultural similarities and differences between students and practitioners, (3) cultural metaphors and concepts embedded in intervention, (4) cultural knowledge of values and social and political uniqueness, (5) treatment concepts, (6) treatment goals, (7) treatment methods and cultural reframing, and (8) consideration of the treatment context. Adapting MTSS approaches and procedures for racial or ethnic minority populations might include consideration of each of these dimensions in order to increase the acceptability and sustainability of tiered interventions.

A simplified model by Muñoz and Mendelson (2005) proposed careful consideration of (1) minority representation in intervention development, (2) cultural values, (3) religion and spirituality, (4) acculturation, and (5) racism, prejudice, and discrimination when making cultural adaptations to interventions. Liu and Clay (2002) outlined guidelines for multicultural counseling

competencies when working with children and adolescents that include several considerations that overlap with the stage models listed above, including (1) evaluating the extent to which cultural aspects are salient; (2) determining the skills necessary for treatment; (3) determining how, how much, and when to incorporate cultural issues; (4) examining cultural assumptions of treatments; and (5) implementing treatments using cultural strengths. All three models include adaptations to increase cultural responsiveness and implementation variables among racial or ethnic minority populations.

As students of color with diverse backgrounds, experiences, and existing skills generally require a degree of individualized instruction, educators in CR-MTSS systems may engage in practices such as brief experimental analyses (BEA) to test different intervention and ecological conditions to maximize positive outcomes (Artiles et al., 2005; Jones & Wickstrom, 2002). BEAs have been implicated in tier III, individualized interventions among minority students, providing insights into internal and social validity (Lau & Blatchley, 2009).

Implications for School Psychologists: Culturally Responsive Special Education Evaluations. As school psychology training includes academic and behavioral intervention, the implications for culturally responsive instructional practices can reasonably be extended from educators to school psychologists. However, the current literature on school psychologists' integration within CR-MTSS primarily focuses on special education evaluation practices. Guo et al.'s (2014) emphasis on adult gatekeepers and their decision-making practices highlights the importance of building CR-MTSS capacities in school psychologists to make nuanced and equitable decisions about academic or behavioral interventions for students suspected to have disabilities. Bearing in mind the inequitable access to services and subsequent poorer behavioral and emotional outcomes among students of color (Locke et al., 2017; Wood et al. 2005), school

psychologists are increasingly being tasked with engaging in CR-MTSS procedures to guide psychoeducational evaluations for special education services. Governing bodies that regulate the school psychology field argue that training in the accurate and valid identification of educational needs, awareness of cultural variables in psychoeducational assessment, data analysis, and consultation capacities to bridge school, family, and community supports may contribute to equitable school psychology practice (Aspiranti et al., 2019). CR-MTSS approaches hold the potential to reduce the impact of cultural or racial stereotypes with regard to decision-making by allowing *student data* to drive programmatic decisions, with systematic procedures for adapting and implementing a continuum of culturally responsive tiered services (Lean & Colucci, 2013).

In order to guide the profession toward reducing ethnic disproportionality, NASP (2010) encourages school psychologists to adopt culturally responsive practices in the evaluation process. Functional behavior assessment (FBA) is a promising best practice in school psychology evaluations, culturally adapted by Moreno and Gaytán (2013) to both increase the objectivity and validity of referrals and attune the evaluation process to individual student needs. Triangulating data from multiple informants, multiple methods, and across multiple tiers of support is a best practice in corroborating reliable data to drive equitable decision-making (Moreno & Gaytán, 2013; Whitcomb & Merrell, 2013). Although MTSS procedures have been operationalized as a means of systematizing data collection across settings and interventions, in a CR-MTSS paradigm, school psychologists might attend to demographic and sociocultural variables that limit conclusions drawn from traditional evaluation methods, with the overall goal of reducing decision-making based on technically inaccurate, socially invalid, or marginalizing evaluation practices (Moreno & Gaytán, 2013; NASP, 2010).

Culturally Responsive Systems Adopted at the School-Level

School-Wide Prevention Practices in CR-MTSS. Given the five tenets of CRT proposed by Yosso (2005), some authors suggest cultural responsivity at the systems-level begins with culturally appropriate and valid conceptualizations of service delivery and perceived educational needs. Whereas traditional MTSS models attribute underachievement to either instruction or (dis)ability, CR-MTSS considers racial, gender, and socioeconomic influences on institutionalized practices that further disenfranchise racial or ethnic minority students and schools (Artiles et al., 2010; Yosso, 2005).

Traditional MTSS models fail to address disproportionate "labeling effects, segregation of placement [in more restrictive settings], and presumed ineffectiveness of special education services" based on (Hosp & Reschly, 2003, p. 68). In contrast, the prevention frameworks in CR-MTSS are proposed to mitigate the effects of adult gatekeeper biases. Guo et al.'s (2014) study examined student self-reported data of externalizing and internalizing challenges, and discrepancies in referral rates from students versus educators to tiered services indicate students of color have greater awareness of their own needs than previously assumed. Guo et al. (2014) suggest tiered, culturally responsive systems include early identification warning systems that accurately capture the needs of ethnic minority students, reducing biased or technically inadequate decision-making around educational service allocation and delivery.

Prevention practices in CR-MTSS include school-wide prereferral strategies and processes that systematically account for cultural variables in decision-making. Ortiz et al. (2011) emphasized bilingual teachers' expertise as prereferral and eligibility advocates for equitable decision-making. More broadly, Yosso (2005) highlights the foundations of legitimizing demographic and sociocultural variables as cultural capital in discourse around

student needs and services. Among other conceptualizations of cultural dimensions, Yosso (2005) articulated the importance of identifying racial minority students' aspirational, linguistic, familial, social, navigational, and resistance capital as cultural strengths rather than risk factors in educational improvement systems, at the risk of interpreting these dimensions as risk factors warranting further intervention. Likewise, CRT and CR-MTSS literature emphasizes the impact of adult-mediated discourses about student needs on implementing prevention and inclusion frameworks equitably, among all students.

School-Wide Intervention Practices in CR-MTSS. Culturally responsive intervention practices in CR-MTSS capitalize on the number and interaction of key players in and across school settings – from individual students to school systems to community and family systems – to shore up social supports and promote positive outcomes in both academic and behavioral domains. While prevention efforts in CR-MTSS aim to increase academic and behavioral resilience and cultivate protective factors, CR-MTSS intervention efforts seek to remediate educational needs and produce equitable student outcomes. Evaluation efforts in CR-MTSS provide insight into how effectively schools provide tiered services to meet the needs of individual students, subgroups of students, and overall school-wide performance.

Klingner and Edwards (2006) describe the ambiguities around culturally responsive tier II and III interventions due to the aforementioned balance between implementation fidelity and adaptation. At minimum, the authors suggested CR-MTSS models ideally integrate research-based strategies for supporting English language learners, with nuanced decision-making around referral procedures based on language development and acculturation. In psychological research, Bernal et al. (1995) proposed the Ecological Validity Model (EVM), a framework developed to adapt culturally responsive intervention services for racial or ethnic minority populations along

eight dimensions of culture: language, persons, metaphors, content, concepts, goals, methods, and context of interventions. Domenech-Rodriguez and Weiling (2004) expanded on the EVM to develop the Cultural Adaptation Process (CAP) model of intervention adaptation. In phase I of CAS, leadership and stakeholders identify areas for cultural adaptations to empirically-supported interventions. In phase II, interventions are adapted based on data provided in phase I. In phase III, leadership continuously monitor and evaluate the need for more adaptations (Domenech & Weiling, 2004; Peterson, 2017).

The individualized nature of tier III services was proposed as an ideal avenue for multidisciplinary evaluations that take ecological, demographic, and historical variables into account (Klingner & Edwards, 2006). Peterson (2017) suggested CR-MTSS interventions should focus on empowering parents to advocate for their children, maximize collaboration across home and community supports, and preserve cultural values in academic and behavioral goal setting. Culturally responsive functional interviewing methods with teachers, parents, and students themselves provides insight into situational and cultural variables in performance and intervention (Moreno, Wong-Lu, & Bullock, 2014). Traditional MTSS procedures may conceptualize culture as a peripheral rather than central component of intervention implementation and fidelity (Moreno et al., 2014).

Student outcome data reflecting disproportionate responses to intervention may then be corroborated across CR-MTSS teams to support the social validity and technical accuracy of data-based decisions. Culturally responsive interventions in CR-MTSS aim to reduce special education disproportionalities by reducing subjectivity in service delivery. Using both direct and indirect evaluation methods, CR-MTSS processes promote data-based decision-making based on data from multiple informants, using multiple methods, to operationally and equitably identify

and serve students' needs and outcomes in the general education setting. As such, culturally adapted interventions may serve as a stopgate against biased referrals for special education evaluations, further reducing the potential for disproportionate outcomes for students of color (NASP, 2010).

School-Wide Systems and Evaluation Practices in CR-MTSS. Systems and evaluation practices provide a third avenue for culturally responsive school-wide practices for equitable outcomes. Given the crucial relationships between MTSS implementation and equitable generalization of positive outcomes among ethnic minority students (Abou-Rjaily & Stoddard, 2017; Garcia & Ortiz, 2006), the literature indicates a need for recursive, systematic evaluation of CR-MTSS goals and outcomes. Briesch, Chafouleas, Nissen, and Long (2019) conducted a meta-analysis of state-level procedural guidance for MTSS implementation. Results indicated little to no consistency between federal, state, or district guidance documents for implementing or adapting MTSS practices and student-level outcomes.

Bal (2018) proposed a process-oriented framework for behavioral CR-MTSS. With foundations in CRT, his model of CR-MTSS intentionally strives to "open up decision-making processes to those who have been excluded from schools' activities, and builds coalitions among local stakeholders… [to examine and remediate] exclusionary and punitive school systems… addressing disproportionality from the ground up" (Bal, 2018, pp. 146-147). Five interacting influences are conceptualized as variables that reproduce or disrupt disproportionate outcomes: (a) *individual* experiences, cultures, agency, and practices among students and staff, (b) *institutional* cultures, values, privileged behavioral practices, and legitimized ways of knowing (c) *interpersonal* factors and school-wide collaboration for equitable outcomes, and (d) *infrastructure* of preventative, inclusive, and equitable frameworks (Bal, 2018).

Recursive systems evaluation of the extent to which equity goals are being achieved through CR-MTSS practices is also described in the literature. Villarreal et al. (2016) describe the importance of collecting and analyzing disproportionality data related to the technical accuracy of identification for tiered services (Torgeson, 2007), longitudinal academic and behavioral performance and progress (Carney & Stiefel, 2008), decision validity and implementation fidelity of tiered interventions (Reynolds & Shaywitz, 2009), and cultural adaptations in CR-MTSS. Additionally, Forman and Crystal (2015) identified critical implementation factors and potential avenues for cultural adaptation: leadership, data-based decision-making, intervention selection based on evidence and fit, stakeholder involvement, training and technical assistance, supportive organizational structures, and external systems support.

Future Directions for CR-MTSS Research, Training, and Practice

Given the longstanding disproportionalities in special education service delivery and student outcomes that disadvantage students of color, this survey of literature provides insight into the historic practices, implementation issues, and potential adaptations to MTSS frameworks to produce more equitable outcomes. In attempts to address the enduring sociocultural inequities replicated through institutionalized racism in education, CR-MTSS provides structure to culturally responsive practice among individual practitioners and school systems (Bal, 2018).

Future directions for CR-MTSS research include cultural adaptations to dissemination and implementation strategies, with a foundation in CRT principles and perspectives. More nuanced study of the sociocultural mediators and moderators affecting MTSS implementation in racial or ethnic minority student populations is sorely needed to identify how individual cultural and linguistic factors limit or facilitate responses to intervention. Culturally responsive research

acknowledges the influence of power and hegemony in theoretical conceptualizations, research methodologies, and practitioners' dispositions and competencies (Solorzano & Yosso, 2002). CR-MTSS evaluation studies that monitor implementation and adaptation practices in addition to student performance indicators are needed.

Future directions for CR-MTSS training include graduate training in CR-MTSS implementation, interdisciplinary collaboration, and intervention planning to enhance student outcomes and professional competency development (Forman & Crystal, 2015). In the case of school psychology programs, training in systems-level evaluation and intervention can be leveraged to facilitate CR-MTSS activities at the school building or district level (Eagle, Dowd-Eagle, Snyder, & Gibbons Holtzman, 2015).

Future directions for CR-MTSS practice indicates a need for empirical support for adapting and delivering culturally responsive, evidence-based interventions in a CR-MTSS framework. An essential component of CRT is building capacity and collaboration among stakeholders, including ethnic minority stakeholders typically excluded from service delivery planning. Minority populations historically denied access to equitable participation in educational decision-making are further marginalized from the benefits of psychological and educational practice through underrepresentation in CR-MTSS (Boneshefski & Runge, 2014).

Summary and Research Questions

Taking into account the literature on ethnic disproportionalities in special education and the potential for tiered service delivery models to promote equitable outcomes, the present study sought to examine the variables underlying patterns of disproportionality in state-level special education data. Special education laws charge states with monitoring and preemptively taking action to address disproportionality, such as section 618 of IDEIA (2004) which requires states

to report data about students and special education services provided through IDEIA funding. No known studies have examined the resulting large-scale data to measure the strength and direction of relationships between variables related to disproportionality and tiered services, such as inclusion in general education settings, early intervention services, or exclusionary discipline. Although IDEIA assumes compliance with special education regulations would ensure fulfillment of obligations to address disproportionalities, the enduring discrepancies between special education services and outcomes among students of color compared to their majority peers suggest measures to provide equitable outcomes have not yet been fully realized. To that end, the following research questions are examined:

Research question 1: To what extent were racial or ethnic minority students disproportionately represented in special education in 2017-2018? In order to understand the state of special education disproportionalities on a national scale, section 618 IDEIA data will be disaggregated to compute risk ratios for under- or over-representation among special education eligibility determinations. While the majority of disproportionality studies examined discrepancies between students identifying as Black/African-American and White/Caucasian, all ethnic groups reported in the data will be preserved to determine if there are qualitative differences in risk ratios for specific subpopulations of students in comparison to the literature on special education disproportionality.

Research question 2: To what extent was compliance with special education regulations predicted by variables purported to influence disproportionate outcomes among students of color, such as representativeness of the population receiving special education services, provision of early intervention services, inclusion in general

education settings, or exit rates from special to general education settings? After controlling for representation of ethnic minorities in special education, how well do three variables identified as mechanisms of equity in special education law predict fulfillment of special education requirements?

Chapter 3: Methodology

Study Dataset

Given the literature on MTSS and disproportionate representation of ethnic minorities in special education, this investigation examined special education disproportionality, early intervention, and compliance using IDEIA data from the 2017-2018 school year. IDEIA requires states to submit data on infants (birth through age two) receiving early intervention services and children (ages three through 21) receiving special education services. Section 611(c)(1) and Section 616(i) of IDEIA include provisions for technical assistance activities to collect and report special education data, with additional authorizations to divert funding to meet IDEIA compliance standards. According to the U.S. Department of Education website (https://www2.ed.gov/programs/osepidea/index.html), section 618 data is specifically reported to measure progress in four arenas:

1. *Providing a free appropriate public education (FAPE) for children with disabilities under IDEA, Part B and early intervention services to infants and toddlers with disabilities and their families under IDEA, Part C,*
2. *Ensuring that the rights of these children with disabilities and their parents are protected,*
3. *Assisting states and localities in providing for the education of all children with disabilities, and*
4. *Assessing the effectiveness of efforts to educate children with disabilities.*

Section 618 data was obtained through the U.S. Department of Education website, which houses state-level IDEIA data within the Office of Special Education and Rehabilitative Services. Dimensions of student demographics, educational environments, discipline, exiting,

and maintenance of effort reduction and coordinated early intervening services were reported and included in this study. To calculate risk ratios, corresponding state-level student enrollment data from 2017-2018 was obtained from the Elementary and Secondary Information System (ELSi), available through the National Center for Education Statistics (https://nces.ed.gov/ccd/elsi/).

Data Sample

The primary objectives of this study employed the 2017-18 Section 618 dataset, the most recent and most complete dataset for which the relevant variables was available. The final sample was derived from states' reported numbers of students ages 6 to 21 receiving special education services identified as English Learners (EL), White (WH), Multiracial (MU; defined as two or more races), American Indian or Alaska Native (AI), Asian (AS), Black or African American (BL), Hispanic/Latino (LA), and Native Hawaiian or Other Pacific Islander (NH). To account for variability in state sample sizes, the raw student enrollment numbers were converted to percentages and standardized.

Some data was not included in the final sample. The IDEA Data Center suppressed data due to insufficient sample size and questionable data quality, and thus was not available for analysis. The following data was excluded: American Samoa, the Bureau of Indian Education, District of Columbia, Federated States of Micronesia, Guam, Hawaii (included in research question #2), Kansas, Louisiana, Maine, Minnesota, Montana, Northern Marianas, Puerto Rico, Republic of Palau, Republic of the Marshall Islands, Vermont, Virgin Islands, and Wisconsin. The states included in the final sample are listed in Tables 1a and 1b below.

Table 1a.

Final sample descriptive statistics: Total Sample, English Learners, White, and Multiracial

	TOTAL	EL		WH		MU	
	n	*n*	*%*	*n*	*%*	*n*	*%*
Alabama	82492	120	0.15%	43860	53.17%	1656	2.01%
Alaska	16718	91	0.54%	7045	42.14%	2182	13.05%
Arizona	124185	1230	0.99%	46766	37.66%	3688	2.97%
Arkansas	59119	716	1.21%	36051	60.98%	1441	2.44%
California	683709	15389	2.25%	163330	23.89%	25036	3.66%
Colorado	87947	1122	1.28%	43470	49.43%	3587	4.08%
Connecticut	70638	510	0.72%	34392	48.69%	2094	2.96%
Delaware	20580	113	0.55%	8378	40.71%	721	3.50%
Florida	349764	6398	1.83%	135095	38.62%	11923	3.41%
Georgia	195434	683	0.35%	78552	40.19%	6887	3.52%
Idaho	29175	74	0.25%	20897	71.63%	869	2.98%
Illinois	257929	7660	2.97%	121131	46.96%	9473	3.67%
Indiana	157460	376	0.24%	109932	69.82%	8075	5.13%
Iowa	58959	146	0.25%	41935	71.13%	2802	4.75%
Kentucky	86200	164	0.19%	67692	78.53%	3219	3.73%
Maryland	94191	742	0.79%	33811	35.90%	3810	4.04%
Massachusetts	155740	1935	1.24%	92814	59.60%	5572	3.58%
Michigan	177127	539	0.30%	115291	65.09%	7227	4.08%
Mississippi	60797	66	0.11%	27918	45.92%	1271	2.09%
Missouri	112714	257	0.23%	79893	70.88%	4320	3.83%
Nebraska	44198	242	0.55%	28195	63.79%	2101	4.75%
Nevada	51139	789	1.54%	17269	33.77%	3037	5.94%
New Hampshire	25714	40	0.16%	22708	88.31%	342	1.33%
New Jersey	218332	910	0.42%	108997	49.92%	3818	1.75%
New Mexico	48425	51	0.11%	10403	21.48%	885	1.83%
New York	450328	1493	0.33%	180277	40.03%	11016	2.45%
North Carolina	181006	1050	0.58%	82603	45.64%	8007	4.42%
North Dakota	12964	11	0.08%	9517	73.41%	396	3.05%
Ohio	241423	372	0.15%	164710	68.22%	12489	5.17%
Oklahoma	102329	513	0.50%	50222	49.08%	8912	8.71%
Oregon	75825	2291	3.02%	46684	61.57%	4668	6.16%
Pennsylvania	284477	2962	1.04%	182236	64.06%	12581	4.42%
Rhode Island	20580	110	0.53%	11572	56.23%	893	4.34%
South Carolina	95130	637	0.67%	43670	45.91%	4203	4.42%
South Dakota	18249	20	0.11%	12532	68.67%	866	4.75%

Tennessee	115369	91	0.08%	74312	64.41%	2805	2.43%
Texas	448907	7880	1.76%	127136	28.32%	9983	2.22%
Utah	73465	268	0.36%	52272	71.15%	1941	2.64%
Virginia	154074	955	0.62%	74129	48.11%	8075	5.24%
Washington	127073	881	0.69%	68703	54.07%	10420	8.20%
West Virginia	41591	8	0.02%	37686	90.61%	1201	2.89%
Wyoming	12132	45	0.37%	9171	75.59%	547	4.51%

Note. EL = English Learner. WH = White. MU = Multiracial (two or more races).

Table 1b.

Final sample descriptive statistics: American Indian or Alaska Native, Asian, Black or African American, Hispanic/Latino, and Native Hawaiian or Other Pacific Islander

	TOTAL	AI		AS		BL		LA		NH	
	n	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Alabama	82492	690	0.84%	508	0.62%	30770	37.30%	4949	6.00%	59	0.07%
Alaska	16718	4733	28.31%	584	3.49%	569	3.40%	1187	7.10%	418	2.50%
Arizona	124185	7648	6.16%	1577	1.27%	8164	6.57%	56003	45.10%	339	0.27%
Arkansas	59119	417	0.71%	458	0.77%	13760	23.28%	6681	11.30%	311	0.53%
California	683709	5062	0.74%	41259	6.03%	58195	8.51%	388183	56.78%	2644	0.39%
Colorado	87947	949	1.08%	1462	1.66%	5144	5.85%	33165	37.71%	170	0.19%
Connecticut	70638	226	0.32%	1529	2.16%	11525	16.32%	20807	29.46%	65	0.09%
Delaware	20580	85	0.41%	293	1.42%	7769	37.75%	3312	16.09%	22	0.11%
Florida	349764	1102	0.32%	4513	1.29%	89289	25.53%	107450	30.72%	392	0.11%
Georgia	195434	401	0.21%	3456	1.77%	78220	40.02%	27761	14.20%	157	0.08%
Idaho	29175	646	2.21%	325	1.11%	424	1.45%	6014	20.61%	0	0.00%
Illinois	257929	747	0.29%	5848	2.27%	53862	20.88%	66646	25.84%	222	0.09%
Indiana	157460	384	0.24%	1502	0.95%	21705	13.78%	15793	10.03%	69	0.04%
Iowa	58959	371	0.63%	730	1.24%	5929	10.06%	7050	11.96%	142	0.24%
Kentucky	86200	127	0.15%	650	0.75%	9810	11.38%	4649	5.39%	53	0.06%
Maryland	94191	272	0.29%	2771	2.94%	39196	41.61%	14232	15.11%	99	0.11%
Massachusetts	155740	419	0.27%	4797	3.08%	16349	10.50%	35672	22.90%	117	0.08%
Michigan	177127	1513	0.85%	2515	1.42%	36758	20.75%	13705	7.74%	118	0.07%
Mississippi	60797	132	0.22%	301	0.50%	29545	48.60%	1604	2.64%	26	0.04%
Missouri	112714	533	0.47%	1161	1.03%	20459	18.15%	6193	5.49%	155	0.14%
Nebraska	44198	835	1.89%	711	1.61%	3900	8.82%	8409	19.03%	47	0.11%
Nevada	51139	684	1.34%	1287	2.52%	7591	14.84%	20759	40.59%	512	1.00%

New Hampshire	25714	94	0.37%	353	1.37%	681	2.65%	1503	5.85%	33	0.13%
New Jersey	218332	292	0.13%	9108	4.17%	37705	17.27%	58123	26.62%	289	0.13%
New Mexico	48425	5232	10.80%	233	0.48%	1112	2.30%	30498	62.98%	62	0.13%
New York	450328	3233	0.72%	18044	4.01%	95684	21.25%	141297	31.38%	777	0.17%
North Carolina	181006	2746	1.52%	2378	1.31%	56863	31.41%	28229	15.60%	180	0.10%
North Dakota	12964	1421	10.96%	93	0.72%	665	5.13%	848	6.54%	24	0.19%
Ohio	241423	340	0.14%	2181	0.90%	48275	20.00%	13278	5.50%	150	0.06%
Oklahoma	102329	16704	16.32%	824	0.81%	10812	10.57%	14660	14.33%	195	0.19%
Oregon	75825	1446	1.91%	1513	2.00%	2360	3.11%	18745	24.72%	409	0.54%
Pennsylvania	284477	598	0.21%	4453	1.57%	49144	17.28%	35306	12.41%	159	0.06%
Rhode Island	20580	250	1.21%	348	1.69%	1927	9.36%	5559	27.01%	31	0.15%
South Carolina	95130	364	0.38%	658	0.69%	38963	40.96%	7179	7.55%	93	0.10%
South Dakota	18249	2844	15.58%	191	1.05%	617	3.38%	1184	6.49%	15	0.08%
Tennessee	115369	257	0.22%	1089	0.94%	27651	23.97%	9168	7.95%	87	0.08%
Texas	448907	1907	0.42%	9149	2.04%	71444	15.92%	228761	50.96%	527	0.12%
Utah	73465	1283	1.75%	657	0.89%	1462	1.99%	15012	20.43%	838	1.14%
Virginia	154074	451	0.29%	5349	3.47%	42398	27.52%	23478	15.24%	194	0.13%
Washington	127073	2616	2.06%	4759	3.75%	7271	5.72%	32223	25.36%	1081	0.85%
West Virginia	41591	44	0.11%	105	0.25%	1936	4.65%	611	1.47%	8	0.02%
Wyoming	12132	571	4.71%	63	0.52%	145	1.20%	1617	13.33%	18	0.15%

Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black or African American. LA = Hispanic/Latino. NH = Native Hawaiian or Other Pacific Islander.

Independent Variables

Seven demographic independent variables were included in this study. Each state reported the number of students receiving special education services who were identified as English Learners (EL) or racial/ethnic minorities (AI, AS, BL, LA, MU, and NH). Student enrollment counts were converted to percentages by dividing raw counts by the total number of students receiving special education services, then standardized before entry into the regression model. Table 2 includes aggregate descriptive statistics for each demographic variable.

Table 2.

2017-2018 Special education descriptive statistics

	M	*(SD)*	*Min*	*Max*
English Learners	9.02	2.56	0.62	29.34
American Indian or Alaska Native	2.80	6.58	0.11	28.31
Asian	1.73	5.65	0.25	6.03
Black or African American	16.45	12.89	1.20	48.60
Hispanic/Latino	19.61	14.97	1.47	62.98
Multiracial	4.07	2.10	1.33	13.05
Native Hawaiian or Other Pacific Islander	0.26	0.43	0	2.50
White	55.08	16.59	21.48	90.61

Note. Percentages reported for 42 states.

Three independent variables implicated in special education law as mechanisms of equity were included in the regression model: early intervention, inclusion in general education settings, and rates of exit from special education to general education settings. Section 616(i) of IDEIA Part B (2004) charged local educational agencies with identifying and addressing the root causes of disproportionality, including significant differences in the rates of early intervention services, general education inclusion, and exit rates among students of color. Moreover, penalties for

noncompliance with section 616 regulations include mandated provisions for coordinated early intervention services (CEIS).

The percentage of students receiving CEIS was calculated by dividing the number of students who received services out of the total student enrollment for each state. Inclusion in general education settings was included as the reported percentage of special education students who spent 80% or more of their day in the general education setting. Additionally, states reported the percentage of students who exited from special education services to the general education setting relative to other exit reasons (such as dropped out or reached maximum age).

Dependent Variable

The dependent variable for this study predicted compliance with federal special education regulations. Section 618 data includes the percentage of local educational agencies within each state determined to meet the purposes and requirements of IDEIA Part B (IDEIAcompliance) during the 2017-2018 school year. The 2004 amendments to IDEIA required states to develop performance plans and reports to evaluate efforts to equitably provide special education services. As part of the reporting requirements, states must provide a measure of progress toward the goals outlined in the performance plan. Under this provision, local educational agencies are determined to fall into one of four categories: *meets, needs assistance, needs intervention, or needs substantial intervention* to implement the requirements of IDEIA.

Data Analysis Strategy

Research Question 1. The first research question sought to define risk ratios for identification for special education services, within and across disability categories. The disproportionality literature includes references to both *odds ratios* (odds of identification in one racial group versus odds of identification in another racial group) and *risk ratios* (risk of

identification for one racial group versus the risk of identification in another racial group), and both metrics of disproportionality can be calculated using the same data. In this study, risk ratios were used exclusively as IDEIA legislation defines significant disproportionality as risk rather than odds ratios (IDEIA Section 300.647: Determining significant disproportionality). Moreover, risk ratios are preferred in retrospective cohort studies for ease of interpretation (Ranganathan, Aggarwal, & Pramesh, 2015).

Risk ratios were calculated using procedures outlined in the IDEA Data Center's (IDC, 2014) *Methods for Assessing Racial/Ethnic Disproportionality in Special Education: A Technical Assistance Guide (Revised)*. To determine risk ratios for special education identification, the IDC suggested the following general equation:

Figure 2.

General formula to calculate risk ratios (IDC, 2014)

$$Risk\ ratio\ (RR) = \frac{Risk\ for\ racial/ethnic\ group\ for\ disability\ (risk1)}{Risk\ for\ comparison\ group\ for\ disability\ (risk2)},$$

where the risk for any racial/ethnic group for disability (risk1) is defined as:

$$risk1 = \frac{Number\ of\ students\ from\ racial\ group\ A\ identified\ with\ disability\ B}{All\ students\ from\ racial\ group\ A},$$

and the risk for comparison group for disability (risk 2) is defined as:

$$risk2 = \frac{All\ other\ students\ identified\ with\ disability\ B}{All\ other\ enrolled\ students}.$$

Risk ratios derived from this equation were used to answer the question, "What is a specific racial/ethnic group's risk of receiving special education and related services for a particular disability as compared to the risk for all other children?" (IDC, 2014, p. 16). Risk

ratios for each racial group were examined qualitatively and in comparison to the literature on ethnic disproportionalities in special education.

Research Question 2. The second research question used Section 618 data to model factors related to IDEIA compliance. Data was analyzed using multiple linear regression with sequential predictor entry. The survey data was stored, coded, and analyzed using IBM SPSS Statistics, Version 25. The predictor variables were rescaled and standardized to support the statistical assumptions necessary to complete the regression analysis. Sequential predictor entry allowed measures of incremental variance to be accounted for as predictors were added to the model.

The assumption of independence was assumed tenable as no data was purposively sampled. Normality, linearity, and homoscedasticity of residuals was examined for each model to ensure these assumptions are tenable. No interactions were included as the majority of variables were highly correlated (most ps < 0.001), but each variable was included separately into the model as the literature reflects differing conceptions of the demographic, practice, and policy-based determinants of disproportionality.

Independent variables in the first block included the seven demographic variables, including language and race. In the second block, predictors related to inclusion in general education settings, exit from special education services, and early intervention services were added to the model. The resulting model for the regression analysis was as follows:

$$\begin{aligned}\text{IDEIACompliance} = {} & b_0 + b_1*(\text{English Learner}) + b_2*(\text{American Indian or Alaska Native}) + \\ & b_3*(\text{Asian}) + b_4*(\text{Black}) + b_5*(\text{Hispanic/Latino}) + b_6*(\text{Multiracial}) + \\ & b_7*(\text{Native Hawaiian or Other Pacific Islander}) + \\ & b_8*(\text{inclusion}) + b_9*(\text{exit}) + b_{10}*(\text{ceis}) + \text{error}\end{aligned}$$

Chapter 4: Results

The goal of this study was to investigate special education disproportionality from two perspectives: disproportionate identification of racial/ethnic minority students for special education services, and disproportionate compliance with special education regulations. The first research question focused on the extent to which racial or ethnic minority students disproportionately represented in special education. The second research question examined the influence of racial representation, early intervention, and inclusion and exit rates from special to general education settings. Both research questions analyzed state-level IDEIA Section 618 data from the 2017-2018 school year.

Research Question 1: *To what extent are racial or ethnic minority students disproportionately represented in special education?*

Risk ratios (RR) were calculated to compare the risk for specific racial/ethnic minority groups with the risk for comparison groups. An RR of 1.00 suggests no difference between the risks for each group, while RRs greater than 1.00 indicate greater risk for the racial group and RRs less than 1.00 indicate less risk for the racial group. The IDEA Data Center's Technical Assistance Guide for calculating risk ratios (2014) specifies that each state is responsible for establishing and monitoring RR thresholds for determining significant disproportionality. IDEIA provides standard methods for determining disproportionality, but states are charged with determining "reasonable" thresholds based on stakeholders' suggestions and State Advisory Panels (Office of Special Education Programs, 2017). The only requirement for thresholds stipulates, "Risk ratio thresholds must be reasonable (34 C.F.R. §300.647(b)(1)(i)(A))… a sound judgment in light of all the facts and circumstances that bear upon the choice… consider[ing States'] unique characteristics, such as the racial and ethnic composition of the State and LEAs,

enrollment demographics, and factors correlated with various disabilities or disability categories" (OSEP, 2017, p. 5).

The Office of Special Education Programs (2017) specified that states may set different RR thresholds for disability identification compared to other indicators of disproportionality (educational placements, exclusionary discipline). For example, one state with a proposed RR threshold of 1.50 for Intellectual Disability identification might flag an observed RR of 2.57 as indicative of significant disproportionality. However, in another state with an RR threshold of 3.00 for the same category, the observed RR of 2.57 would not be identified as evidence of disproportionality. States are explicitly prohibited from establishing different thresholds for different racial/ethnic groups, as this practice "would be unlikely to meet constitutional scrutiny" (OSEP, 2017, p. 6). As this study compared RRs across races/ethnicities, disabilities, and states, no standard threshold for significance was established.

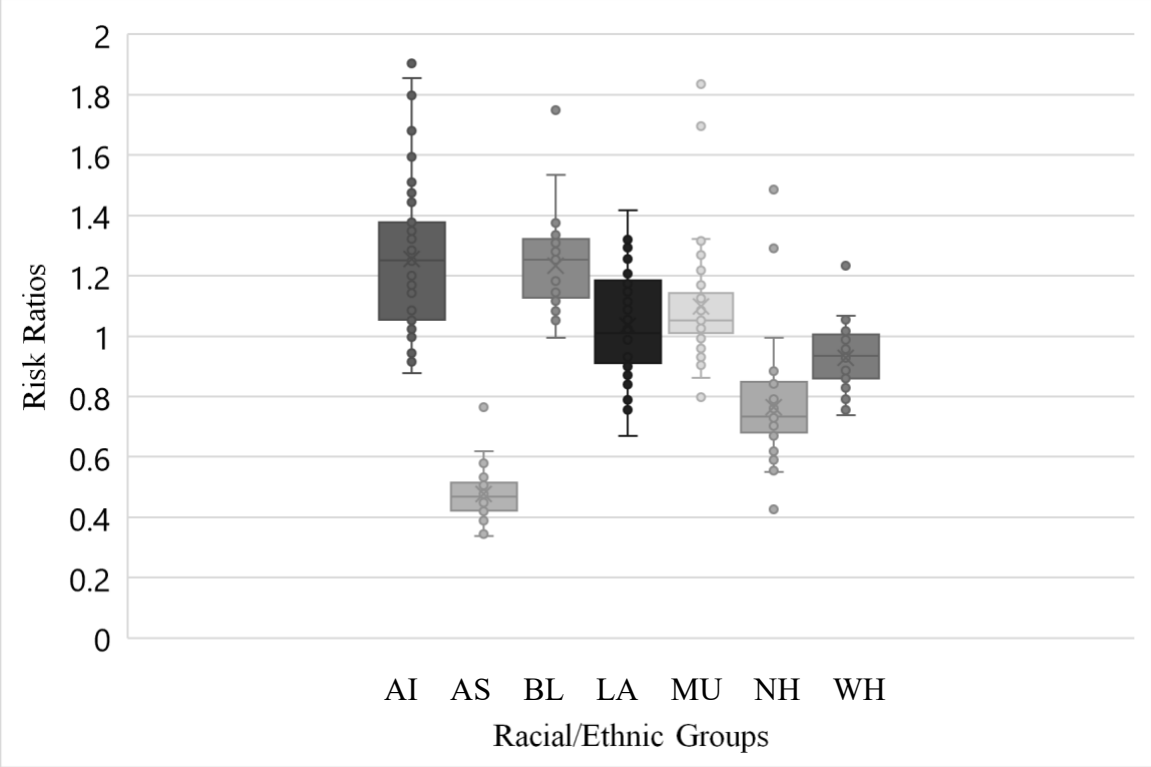
The Technical Assistance Guide (IDC, 2014) also includes several caveats for interpreting RRs. While RRs allow for comparisons in service delivery regardless of the heterogeneity of the minority population, RRs based on small sample sizes should be interpreted with caution. Similarly, when the risk of the comparison group is zero, RRs cannot be calculated. As such, the number of states included in each RR analysis, as well as the mean and standard deviation of all RRs is tabled below each figure. Results for the four most commonly discussed identification categories in disproportionality research were examined in depth: All Disabilities, Emotional Disturbance, Intellectual Disability, and Specific Learning Disability. Results for the remaining disability categories are included in Appendix A and summarized below. Box-and-whisker plots depict the range and spread of state risk ratios across seven racial/ethnic groups: American Indian or Alaska Native (AI), Asian (AS), Black or African American (BL),

Hispanic/Latino (LA), Multiracial (MU), Native Hawaiian or Other Pacific Islander (NH), and White (WH). Descriptive statistics including the minimum, median, and maximum RR from each racial/ethnic group are also included in the table. The first quartile (25th percentile), third quartile (75th percentile), and interquartile range (IQR, representing the middle 50% of RRs) are also reported.

All Disabilities. The risk ratio analysis for all students identified with a disability in the 2017-2018 school year are summarized in Figure 3 and Table 3.

Figure 3

2017-2018 IDEIA Risk ratios: All Disabilities



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Table 3.

Descriptive Statistics: Risk Ratios for All Disabilities

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	47	47
Mean RR	**1.26**	0.48	1.23	1.03	1.10	0.77	0.93
Standard deviation	0.25	0.08	0.14	0.17	0.18	0.17	0.10
Minimum RR	0.88	0.34	0.99	0.67	0.80	0.43	0.74
1st quartile	1.05	0.42	1.13	0.91	1.01	0.68	0.86
Median RR	1.25	0.47	1.25	1.01	1.05	0.73	0.94
3rd quartile	1.38	0.52	1.32	1.18	1.14	0.85	1.00
Maximum RR	1.90	0.76	1.75	1.42	1.83	1.49	1.23
Interquartile range	**0.32**	0.09	0.19	**0.27**	0.13	0.17	0.15

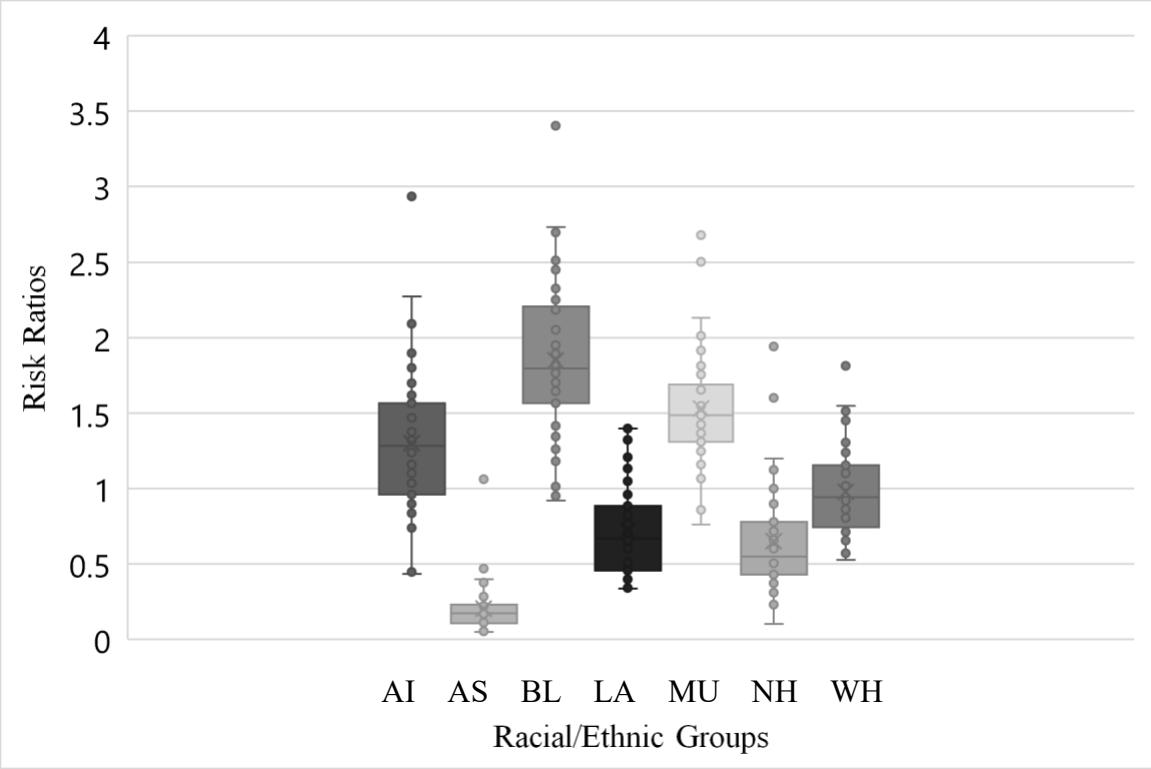
Across the full sample of 47 states, more AI populations were at higher risk for receiving special education services than students from other racial groups. RRs for AI students were also most widely dispersed across the sample (IQR = 0.32). The mean RRs for BL (1.23), LA (1.03), and MU (1.10) populations were greater than 1.00, suggesting overrepresentation. By comparison, the mean RRs were less than 1.00 for AS (0.48), NH (0.77), and WH (0.93) populations, and RRs for AS students were below 1.00 for all states. The greatest variability in interquartile ranges was observed among AI (0.32) and LA (0.27) RRs.

Emotional Disturbance. Figure and Table 4 depict the spread of risk ratios for students identified with an Emotional Disturbance in 2017-2018. No NH students were identified in Alabama, Nebraska, South Dakota, or West Virginia, so the NH risk ratios were calculated based on 43 states. The average risk ratio for BL students (1.85, SD = 0.53) was higher than every other racial group (AI = 1.30, AS = 0.20, LA = 0.72, MU = 1.53, NH = 0.65, and WH = 0.97), indicating BL students continued to be identified as Emotionally Disturbed disproportionately to their representation in the population more than other racial minorities. The average RRs for AS (0.20), LA (0.72), and NH (0.65) students was lower than 1.00, suggesting under-identification

for services to support emotional and behavioral needs. The greatest interquartile range (middle 50% of RRs) was observed among AI (0.61) and BL (0.64) RRs, compared to the smallest IQR observed among AS RRs (0.12).

Figure 4

2017-2018 IDEIA Risk ratios: Emotional Disturbance



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Table 4.

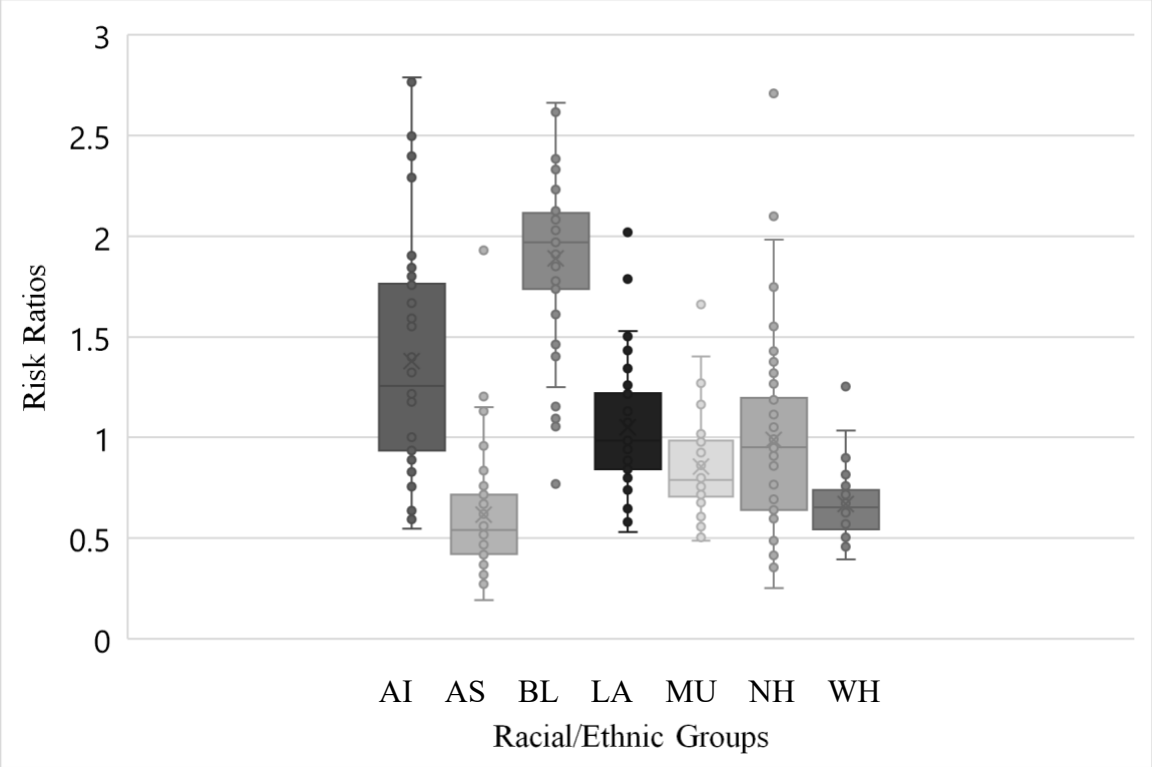
Descriptive statistics: Risk ratios for Emotional Disturbance

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	43	47
Mean RR	**1.30**	0.20	**1.85**	0.72	**1.53**	0.65	0.97
Standard deviation	0.48	0.16	0.53	0.30	0.38	0.35	0.28
Minimum RR	0.43	0.05	0.92	0.34	0.76	0.10	0.53
1st quartile	0.96	0.11	1.57	0.45	1.31	0.43	0.74
Median RR	1.28	0.17	1.79	0.67	1.49	0.55	0.94
3rd quartile	1.57	0.23	2.21	0.88	1.69	0.78	1.15
Maximum RR	2.94	1.06	3.40	1.40	2.68	1.94	1.81
Interquartile range	**0.61**	0.12	**0.64**	0.43	0.38	0.35	0.41

Intellectual Disability. Disproportionate over-representation of BL students has been most saliently addressed in the literature with regards to categorizations under Intellectual Disability. From 2017-2018, the average risk ratio for BL students was 1.89 (SD = 0.41), more than one and a half times greater than other races identified under Intellectual Disability. Variability in RRs was greatest among AI and NH students (IQRs = 0.83 and 0.56, respectively), suggesting inconsistency in risk for Intellectual Disability identification across states. AS students were the least likely to be identified under Intellectual Disability (mean RR = 0.61, SD = 0.29), followed by WH populations (mean RR = 0.67, SD = 0.15).

Figure 5

2017-2018 IDEIA Risk ratios: Intellectual Disability



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

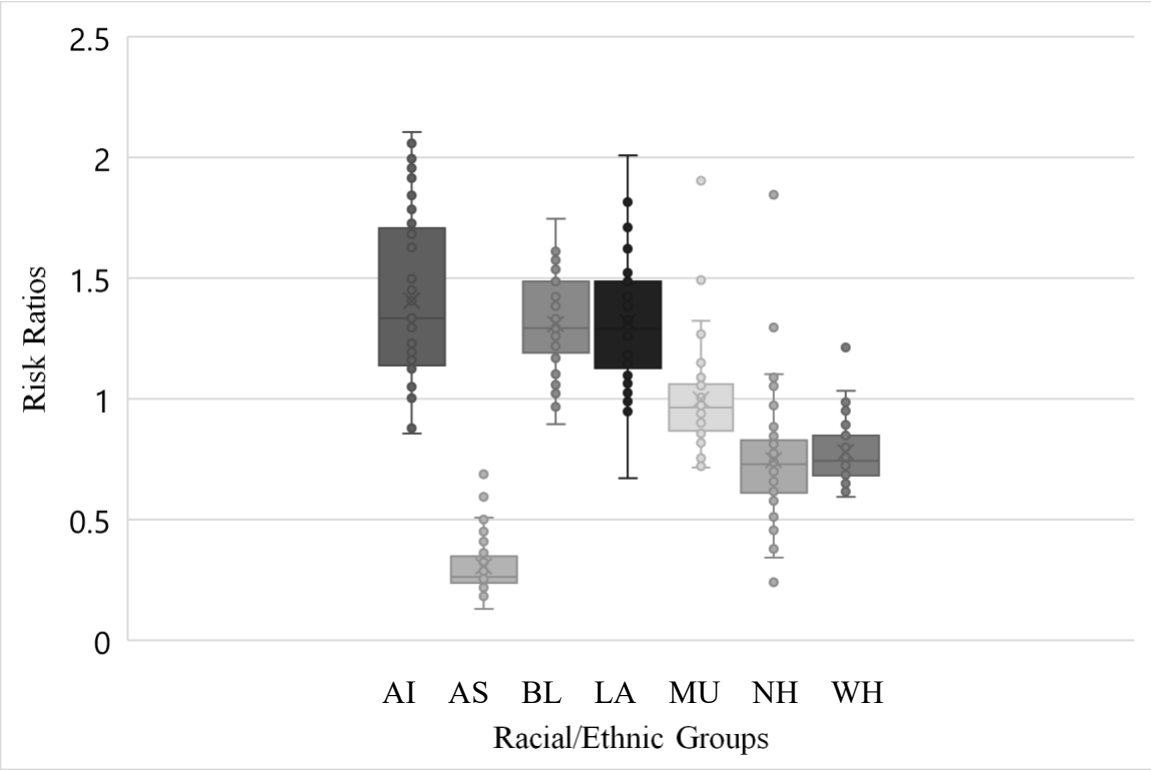
Table 5.
Descriptive statistics: Risk ratios for Intellectual Disability

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	46	47
Mean RR	**1.38**	0.61	**1.89**	1.05	0.86	0.99	0.67
Standard deviation	0.58	0.29	0.41	0.32	0.23	0.49	0.15
Minimum RR	0.55	0.19	0.77	0.53	0.49	0.25	0.40
1st quartile	0.93	0.42	1.74	0.84	0.71	0.64	0.54
Median RR	1.26	0.54	1.97	0.99	0.79	0.95	0.65
3rd quartile	1.76	0.72	2.12	1.22	0.99	1.20	0.74
Maximum RR	2.79	1.93	2.66	2.02	1.66	2.71	1.25
Interquartile range	**0.83**	0.29	0.38	0.38	0.28	**0.56**	0.20

Specific Learning Disability. RRs were computed for students who received special education services under the category of Specific Learning Disability. Figure and Table 6 provide a synthesis of RR comparisons for each racial/ethnic group included in the final sample.

Figure 6.

2017-2018 IDEIA Risk ratios: Specific Learning Disability



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Table 6.

Descriptive statistics: Risk ratios for Specific Learning Disability

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	47	47
Mean RR	**1.41**	0.31	**1.31**	**1.32**	1.00	0.75	0.78
Standard deviation	0.35	0.12	0.19	0.25	0.21	0.27	0.13
Minimum RR	0.86	0.13	0.90	0.67	0.72	0.24	0.59
1st quartile	1.14	0.24	1.19	1.13	0.87	0.61	0.68
Median RR	1.34	0.26	1.29	1.29	0.97	0.73	0.74
3rd quartile	1.71	0.35	1.49	1.49	1.06	0.83	0.85
Maximum RR	2.11	0.69	1.75	2.01	1.90	1.84	1.21
Interquartile range	0.57	0.11	0.30	0.36	0.19	0.22	0.16

In the 2017-2018 school year, AS students were the least likely to be identified with a Specific Learning Disability. The average RR for AS students (mean RR = 0.31, SD = 0.12) was lower than all other racial groups. RRs for NH and WH populations were generally below 1.00, suggesting lower risk than other racial groups. The majority of RRs for AI, BL, and LA students were greater than 1.00, indicating higher likelihood of representation. Notably, RRs varied the most widely for AI, BL, and LA students as well (IQRs = 0.57, 0.30, and 0.36). These results indicate Specific Learning Disability was neither equitably nor consistently identified, putting AI, BL, and LA populations at greater risk for special education service provision.

Other Disability Categories. Appendix A includes figures and tables documenting RR analysis results for the following disability categories: (Figure and Table 7) Autism, (8) Deaf-blindness, (9) Developmental Delay, (10) Hearing Impairment, (11) Multiple Disabilities, (12) Orthopedic Impairment, (13) Other Health Impairment, (14) Speech or Language Impairment, (15) Traumatic Brain Injury, and (16) Visual Impairment. Three patterns emerged from the data:

1. *Lower AS RRs.* Compared to other racial/ethnic groups, RRs for AS students were the lowest and predominantly below 1.00 in the categories of Developmental Delay, Multiple

Disabilities, Other Health Impairment, Speech or Language Impairment, and Traumatic Brain Injury. No RRs greater than 1.00 were reported for Other Health Impairment (maximum RR = 0.50), in addition to All Disabilities (maximum RR = 0.76) and Specific Learning Disabilities (maximum RR = 0.69), as described above.

2. *Low AI and NH sample sizes.* For some disabilities, low AI and NH incidence rates skewed results and interpretability of RRs. For example, only three states identified NH students under the category of Deaf-blindness (by comparison, the sample sizes for WH = 39, BL = 32, AS = 25), and only 18 NH RRs were calculated for Traumatic Brain Injury (compared to samples sizes of 47 for WH and BL, and 46 for LA and MU). Fewer RRs were able to be calculated for AI and NH populations compared to the other racial/ethnic groups in the following categories: Autism, Deaf-Blindness, Developmental Delay, Hearing Impairment, Multiple Disabilities, Orthopedic Impairment, Other Health Impairment, Traumatic Brain Injury, and Visual Impairment.
3. *Greater variability in AI and NH RRs.* Due in part to the aforementioned lower AI sample sizes, larger interquartile ranges were observed among AI RRs than other minority groups for Autism (AI = 0.36, NH = 0.46), Deaf-blindness (AI = 2.60, NH = 9.97), Developmental Delay (AI = 0.96, NH = 0.53), Hearing Impairment (AI = 0.94, NH = 1.58), Multiple Disabilities (AI = 0.54, NH = 0.76), Traumatic Brain Injury (AI = 1.55, NH = 1.06), and Visual Impairment (AI = 1.04, NH = 1.85).

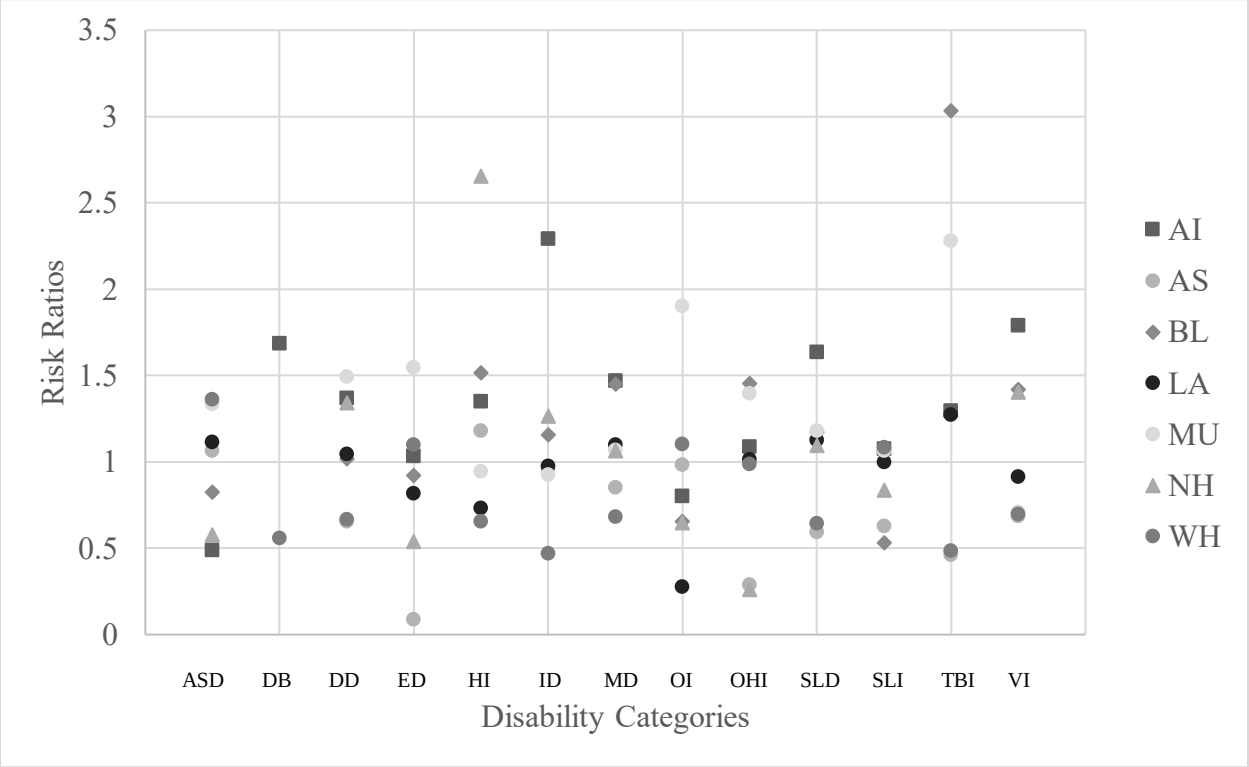
All three of these patterns were also observed in the categories of All Disabilities, Emotional Disturbance, Intellectual Disability, and Specific Learning Disability.

State-Level Case Studies: Alaska, California, Hawai'i, Oregon, and Washington. In order to further examine the differences in RRs for racial/ethnic minority groups, data was

analyzed for five states: Alaska, California, Hawai'i, Oregon, and Washington. Patterns of disproportionality were specifically investigated in these Pacific states since they have greater representation of AI, MU, and NH individuals.

Figure 17.

2017-2018 IDEIA Risk ratios: Alaska



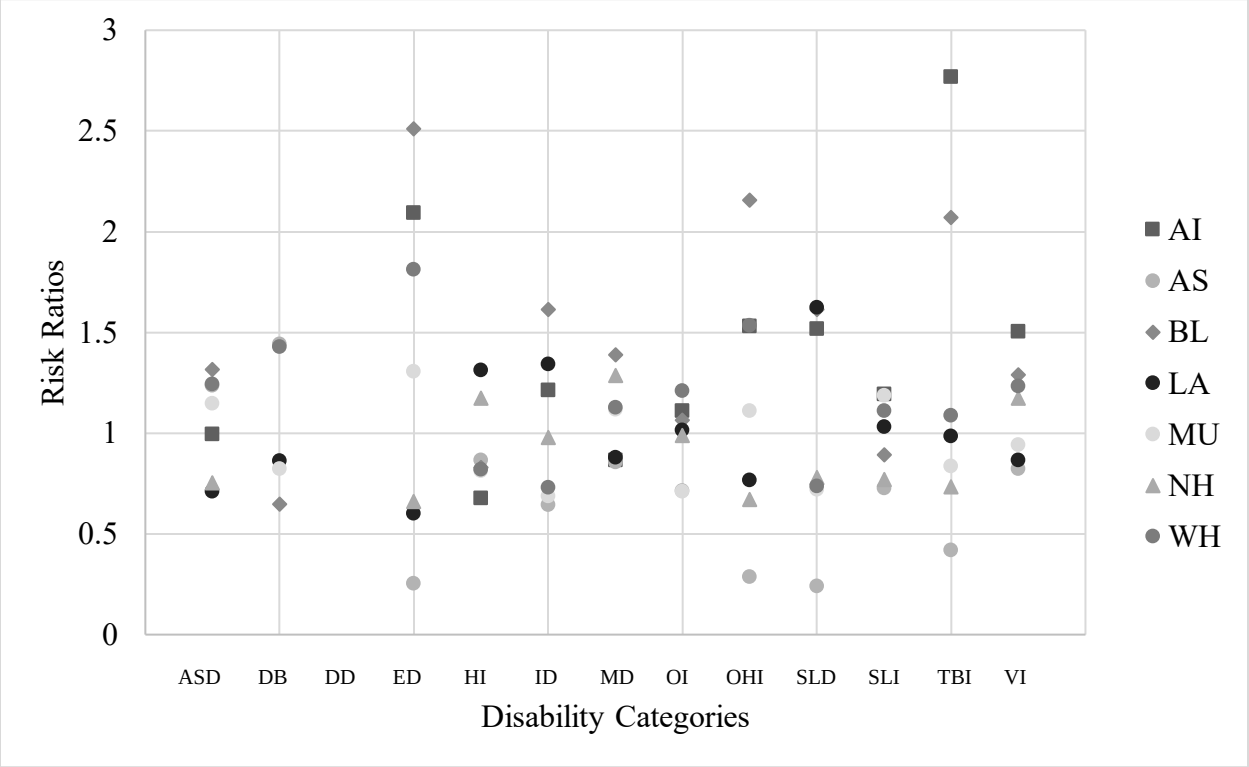
Note. For disability categories, ASD = Autism. DB = Deaf-blindness. DD = Developmental Delay. ED = Emotional Disturbance. HI = Hearing Impairment. ID = Intellectual disability. MD = Multiple Disabilities. OI = Orthopedic Impairment. OHI = Other Health Impaired. SLD = Specific Learning Disability. SLI = Speech or Language Impairment. TBI = Traumatic Brain Injury. VI = Visual Impairment.

For racial/ethnic groups, AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

The comparison of RRs for the state of Alaska was heavily skewed by an outlier RR of 8.34 for Asian students identified with Deaf-blindness. The outlier was excluded from Figure 17 above, and the resulting patterns of RRs suggested AI students were less likely to be identified under Autism (RR = 0.49) and 2.29 times more likely to be identified under Intellectual Disability than other races. RRs for AI students were closer to 1.00 compared to other states.

Figure 18.

2017-2018 IDEIA Risk ratios: California



Note. For disability categories, ASD = Autism. DB = Deaf-blindness. DD = Developmental Delay. ED = Emotional Disturbance. HI = Hearing Impairment. ID = Intellectual disability. MD = Multiple Disabilities. OI = Orthopedic Impairment. OHI = Other Health Impaired. SLD = Specific Learning Disability. SLI = Speech or Language Impairment. TBI = Traumatic Brain Injury. VI = Visual Impairment.

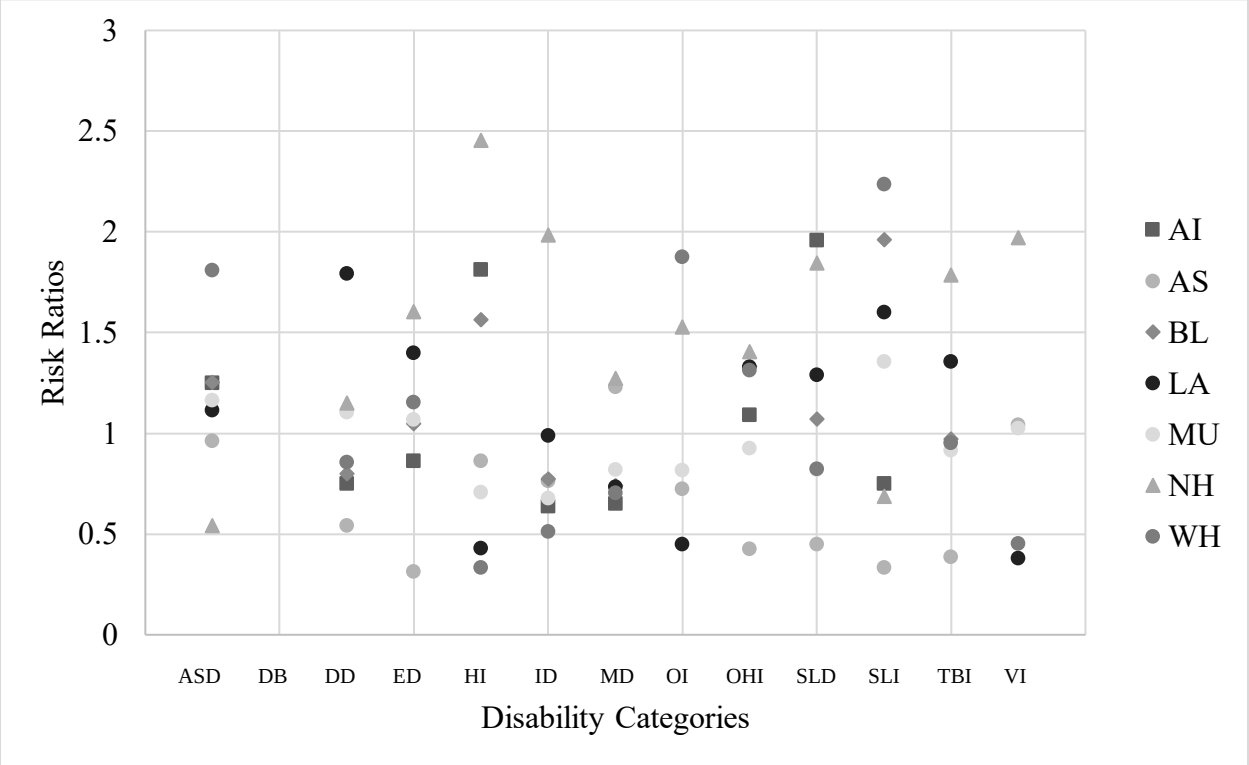
For racial/ethnic groups, AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Comparing RRs across the state of California, the most variability between racial groups was observed for the disability categories of Emotional Disturbance and Traumatic Brain Injury. AS students were 0.25 times less likely to be identified with an Emotional Disturbance than other races, compared to BL students who were 2.51 times more likely to be identified under the same category. The RRs for Traumatic Brain Injury also varied between 0.42 (AS) and 2.77 (AI). The

majority of RRs in California were between 0.5 and 1.5.

Figure 19.

2017-2018 IDEIA Risk ratios: Hawai'i



Note. For disability categories, ASD = Autism. DB = Deaf-blindness. DD = Developmental Delay. ED = Emotional Disturbance. HI = Hearing Impairment. ID = Intellectual disability. MD = Multiple Disabilities. OI = Orthopedic Impairment. OHI = Other Health Impaired. SLD = Specific Learning Disability. SLI = Speech or Language Impairment. TBI = Traumatic Brain Injury. VI = Visual Impairment.

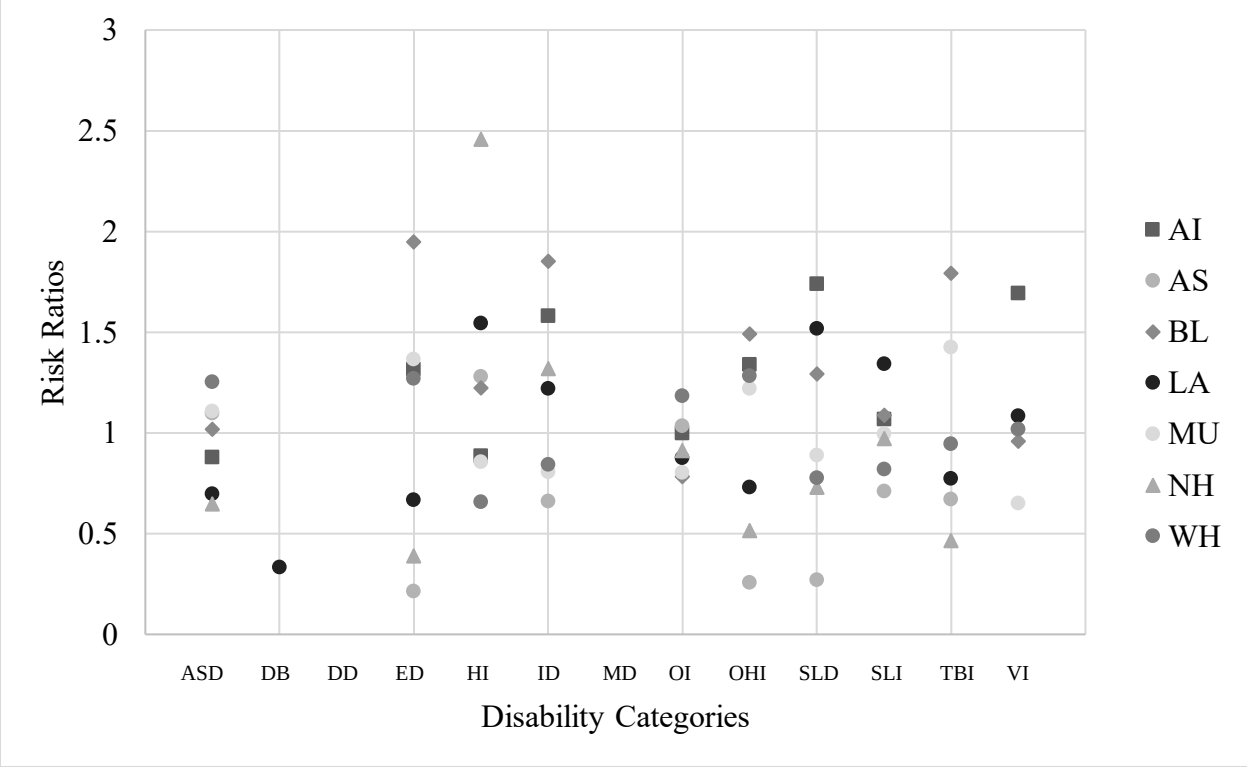
For racial/ethnic groups, AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

In Hawai'i, RRs for racial/ethnic groups varied more widely than California. The majority of RRs were between 0.5 and 2.0, with NH RRs that were generally higher than those in California, Oregon, and Washington. The greatest variation in RRs was observed among students

identified with a Hearing Impairment (RRs for WH = 0.33, NH = 2.45), followed by Speech or Language Impairment (AS = 0.33, WH = 2.23).

Figure 20.

2017-2018 IDEIA Risk ratios: Oregon



Note. For disability categories, ASD = Autism. DB = Deaf-blindness. DD = Developmental Delay. ED = Emotional Disturbance. HI = Hearing Impairment. ID = Intellectual disability. MD = Multiple Disabilities. OI = Orthopedic Impairment. OHI = Other Health Impaired. SLD = Specific Learning Disability. SLI = Speech or Language Impairment. TBI = Traumatic Brain Injury. VI = Visual Impairment.

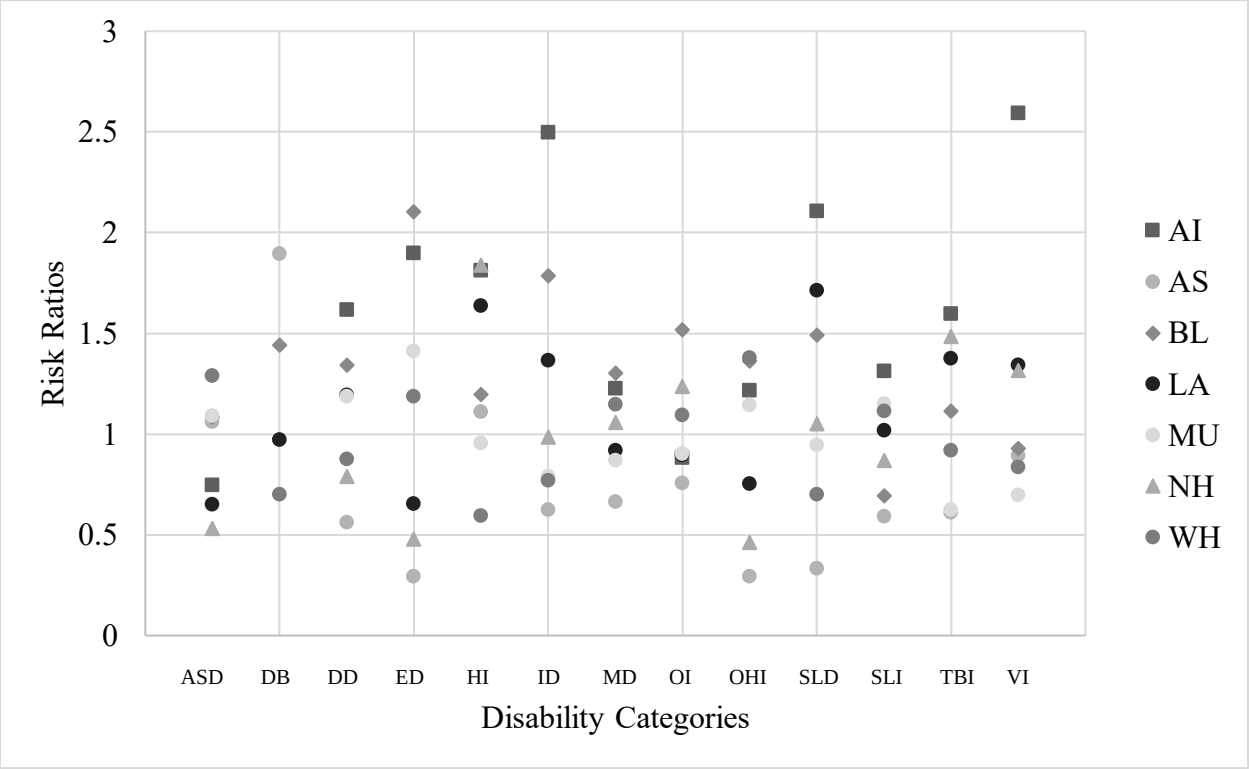
For racial/ethnic groups, AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

The distribution of RRs across Oregon more closely resembled Hawai'i than California. Most RRs were between 0.21 and 2.0. RRs for BL and AI students were generally higher than

AS and WH students. Like NH students in Hawai'i, NH students in Oregon were more than twice as likely to be identified with a Hearing Impairment than all other races (NH = 2.46). RRs varied more for Hearing Impairment (NH = 2.46, WH = 0.66) and Emotional Disturbance (BL = 2.46, WH = 0.66) than for other disabilities.

Figure 21.

2017-2018 IDEIA Risk ratios: Washington



Note. For disability categories, ASD = Autism. DB = Deaf-blindness. DD = Developmental Delay. ED = Emotional Disturbance. HI = Hearing Impairment. ID = Intellectual disability. MD = Multiple Disabilities. OI = Orthopedic Impairment. OHI = Other Health Impaired. SLD = Specific Learning Disability. SLI = Speech or Language Impairment. TBI = Traumatic Brain Injury. VI = Visual Impairment.

For racial/ethnic groups, AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Similarly to California, RRs in Washington state varied between racial/ethnic groups less than Hawai'i and Oregon. Most RRs were in the range of 0.5 and 2.0, and the greatest RR differences between racial/ethnic groups were observed in the categories of Intellectual Disability (AS = 0.62, AI = 2.50, difference = 1.87), Emotional Disturbance (AS = 0.29, BL = 2.10, difference = 1.81), and Specific Learning Disability (AS = 0.33, AI = 2.11, difference = 1.77).

Research Question 2: *To what extent is compliance with special education regulations predicted by variables purported to influence disproportionate outcomes among students of color, such as representativeness of the population receiving special education services, provision of early intervention services, inclusion in general education settings, or exit rates from special to general education settings?*

In order to predict state-level compliance with IDEIA regulations, a total of 10 variables were entered into a regression model. The descriptive analyses, bivariate analyses, and regression models are described below, based on the following model:

$$\begin{aligned}\text{IDEIACompliance} = {} & b_0 + b_1*(\text{English Learner}) + b_2*(\text{American Indian or Alaska Native}) + \\ & b_3*(\text{Asian}) + b_4*(\text{Black}) + b_5*(\text{Hispanic/Latino}) + b_6*(\text{Multiracial}) + \\ & b_7*(\text{Native Hawaiian or Other Pacific Islander}) + \\ & b_8*(\text{inclusion}) + b_9*(\text{exit}) + b_{10}*(\text{ceis}) + \text{error}\end{aligned}$$

Descriptive Analyses. The final sample used to predict compliance was comprised of IDEIA section 618 data from 42 states. In addition to the demographic descriptive statistics in Table 2 above, the means, standard deviations, minimum, and maximum values for the other variables are listed in Table 17.

Table 17.

Final sample descriptive statistics: Special education variables.

	M	*(SD)*	*Min*	*Max*
IDEIA Compliance	98.88	2.56	90.51	100.00
Exit	37.02	16.05	8.00	74.14
Inclusion	65.61	7.70	44.62	83.65
CEIS	0.23	0.34	0.00	1.78

Note. Reported student enrollment percentages for 42 states. CEIS = Coordinated Early Intervention Services.

In the 2017-2018 school year, the average percentage of districts determined to be in compliance with IDEIA regulations was 98.88 (SD = 2.56). On average, 37.02% of students who exited from special education transferred to general education (SD = 16.05), ranging from 8% to 74%. Among the 42 states, the mean percentage of students who spend at least 80% of their day in the general education setting was 65.61 (SD = 7.70). Lastly, the average percentage of students receiving CEIS was 0.23%, indicating few students received early intervention services.

Bivariate Correlations. Table 18 provides the means, standard deviations, and bivariate correlations between the 10 variables included in the regression model. IDEIA compliance was only significantly correlated with the percentage of LA students represented in the population ($r(42) = -.29$, $p = .03$). The percentage of students identified as EL was also highly correlated with percentages of AS ($r(42) = .54$, $p < .001$), LA ($r(42) = .81$, $p < .001$), and NH students ($r(42) = .38$, $p < .01$) in the sample. Percentages of AI and AS students were not correlated ($r(42) = -.02$, $p = .46$), while MU percentages were significantly corelated with NH percentages ($r(42) = .67$, $p < .001$). The three special education variables (inclusion, exit, and CEIS) were not correlated with each other or the outcome variable.

Regression Model. To predict IDEIA compliance, the dependent variables were entered into a multiple linear regression model with sequential predictor entry. Results of the overall sample and each block are summarized in Table 19.

Table 18.

Bivariate correlations

Measure	*M*	*(SD)*	1	2	3	4	5	6	7	8	9	10	11
Outcome													
1. IDEIACompliance	98.88	(2.56)	--										
Block 1 Predictors													
2. EL	9.02	(6.58)	-.08	--									
3. AI	2.80	(5.65)	.01	.12	--								
4. AS	1.73	(1.23)	.05	.54 ***	-.02	--							
5. BL	16.45	(12.89)	.17	-.19	-.38 **	-.04	--						
6. LA	19.61	(14.97)	-.29 *	.81 ***	-.04	.44 **	-.27 *	--					
7. MU	0.26	(0.43)	-.03	.20	.63 ***	.23	-.22	-.15	--				
8. NH	4.07	(2.10)	-.07	.38 **	.59 ***	.31 *	-.29 *	.05	.67 ***	--			
Block 2 Predictors													
9. Inclusion	65.61	(7.70)	-.24	-.33 *	.02	-.39 **	.02	-.31 *	.07	-.14	--		
10. Exit	37.02	(16.05)	-.21	.66 ***	.13	.33 *	.35 *	.64 ***	.06	.14	-.19	--	
11. CEIS	0.23	(0.34)	.13	-.11	-.01	.09	.10	-.02	.01	.00	-.11	.04	--

Note. N = 42. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White. CEIS = Coordinated Early Intervention Services.

**p < .05, ** p < .01, *** p < .001.*

Table 19.

Multiple linear regression models with sequential predictor entry

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	*b*	sr^2
Model Fit	0.32 *	0.32	0.18			0.15 *	0.46	0.29		
Coefficients										
Intercept				98.89 ***					98.89 ***	
EL				2.20 **	0.82				2.66 **	0.81
AI				0.82	0.54				1.53 *	0.62
AS				0.77	0.46				0.32	0.46
BL				-0.09	0.43				1.24	0.87
LA				-2.97 ***	0.83				-1.65	1.12
MU				-1.11	0.61				-0.76	0.59
NH				-0.84	0.58				-0.97	0.54
Inclusion									-0.57	0.39
Exit									-1.91	1.04
CEIS									0.48	0.35

Note. $N = 42$. Block 1 F-change test $df = 7,34$; Block 2 $df = 3,31$. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White. CEIS = Coordinated Early Intervention Services.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Block 1: Demographic Variables. The first block included variables related to seven demographic profiles: percentages of EL, AI, AS, BL, LA, MU, and NH students. The demographic variables accounted for 32% of variation in IDEIA compliance, $F(7, 34) = 2.25$, $p = .05$, $R^2_{\text{adjusted}} = 0.18$), suggesting the demographic makeup of students receiving special education services reliably and significantly predicted compliance with special education regulations. Among the demographic variables entered in Block 1, IDEIA compliance was uniquely predicted by the percentage of EL students ($b = 2.20$, $p < .01$) and LA students ($b = -2.97$, $p < .001$) who received services. Higher percentages of EL students was correlated with greater IDEIA compliance, whereas higher percentages of LA students correlated negatively with compliance. The regression results for the first block suggest greater representation of EL and LA students among the special education population was associated with greater IDEIA compliance.

Block 2: Special Education Variables. The second and final block included three additional special education variables associated in the literature and legislation as a means of promoting equitable outcomes: inclusion in general education settings, rates of exit from special to general education settings, and CEIS. The second block accounted for an additional 15% of variation in IDEIA compliance after controlling for demographics ($F_{change}(3, 31) = 2.82$, $p = .055$, $R^2_{adjusted} = 0.29$), which was minimal in comparison to the variation accounted for by the first block. With both demographic and special education variables entered into the regression model, only standardized percentages of EL students ($p < .01$) and AI students ($p < .05$) were significant predictors of compliance. None of the three special education variables reliably predicted compliance (ps = .15, .08, and .18, respectively).

Final Model: Block 1 Parameters. The *b*-values obtained from the first block suggested that higher standardized percentages of EL students and lower percentages of LA representation are associated with more compliance. With all variables entered in the first block, the average percentage of LEAs that were compliant with IDEIA regulations was 98.89% (*SE* = 2.56), when holding all other variables constant, $t(34) = 71.39$, $p < .001$. The only significant predictors of compliance were representation of EL students ($b = 2.20$, $p < .01$) and LA students ($b = -2.97$, $p < .001$). Holding all else constant, for every one standard deviation increase of EL student representation, compliance increased by 2.20%, $t(34) = 2.68$, $p = .01$. Conversely, holding all else constant, a one standard deviation increase of LA student representation decreased compliance by 2.97%, $t(34) = -3.60$, $p = .001$. Results from the first block entered into the regression model are interpreted in the discussion that follows.

Chapter 5: Discussion

The purpose of this study was to model the determinants and nuances of state-level special education disproportionality and compliance. IDEIA Section 618 special education data collected and reported for the 2017-2018 school year was compared to overall (general and special education) student enrollment data obtained through the Elementary and Secondary Information System (ELSi). The first research question examined risk ratios (RRs), defined as any racial/ethnic group's likelihood of receiving special education services compared to the risk for all other children (IDEA Data Center, 2014), across disability categories. Descriptive analyses of risk ratios illustrated the current state of racial/ethnic disproportionality in identification for special education services. The second research question explored the predictive power of demographic and special education variables to model states' compliance with IDEIA regulations. Taken together, these research questions extended the existing school psychology literature on disproportionality by examining the most recently made available patterns of overidentification, under-representation, and special education compliance across states. Implications for special education and school psychology practice, limitations, and future directions for research and practice are also described below.

Research Question 1: The Current State of Special Education Disproportionality

Overrepresentation and the Need for Theoretical and Methodological Consensus. The results of the RR analyses demonstrated variability in the patterns of over- and under-representation across states and disability categories. Consistent with previous literature on overrepresentation of racial/ethnic minority students in special education, marginalized racial groups were at higher risk for identification across most disabilities (Losen & Orfield, 2002; Sullivan et al., 2013). For All Disabilities, American Indian or Alaska Native, Black or African

American, Hispanic/Latino, and Multiracial populations were at higher risk of being identified to receive special education services, while Asian, Native Hawaiian or Other Pacific Islander, and White students were at lower risk.

On par with similar studies of Black or African American overrepresentation (Sullivan et al., 2013), the range of RRs for Black students identified with an Emotional Disturbance was markedly higher than every other racial group. On average, Black or African American students were 1.85 times as likely to be represented in the Emotional Disturbance category than other races, as compared to Asian, Hispanic/Latino, and White populations who were less likely to be represented (average RRs of 0.20, 0.72, and 0.97 respectively). RRs for American Indian or Alaska Native and Black or African American students with Emotional Disturbance varied greatly between states, suggesting less consistency in how these two populations were identified for special education services.

Overrepresentation of BL students was also observed among RRs for Intellectual Disability, consistent with established literature on biased assessment tools and practices, differential instructional opportunities, and minority enrollment at the school-level (Losen & Orfield, 2002; Morgan et al., 2017; US Department of Education, 2002). The middle 50 percent of RRs fell between 1.74 and 2.12, indicating Black or African American populations in at least 23 states were between 1.74 and 2.12 times as likely as other racial groups to be identified with an Intellectual Disability. By contrast, the middle 50 percent of Asian RRs were between 0.42 and 0.72, and about half of RRs for White students fell between 0.54 and 0.74. Similar patterns of overrepresentation among Black or African American students and underrepresentation of Asian and White students identified with a Specific Learning Disability were also observed. One study suggested disproportionate identification rates between Black and White students has

increased since the 1970s, with consistently higher risk of identification for Black students (Ong-Dean, 2006). The Specific Learning Disability RRs in this study were least consistent between American Indian or Alaska Native, Hispanic/Latino, and Black or African American students, echoing established patterns of variability in how the category is distributed between racial groups (Skiba et al., 2016).

A significant proportion of the disproportionality literature has debated *when* and *why* over- or under-representation of racial/ethnic minorities in special education becomes problematic. While the majority of studies focus on overrepresentation of Black students in special education (Losen & Orfield, 2002; US Department of Education, 2002; Skiba et al., 2005), other studies have found lower likelihoods of being referred or determined eligible for special education (Morgan et al., 2017) while yet others found evidence of both under- *and* over-representation (Sullivan & Bal, 2013). These oftentimes contradictory results have been attributed to methodological differences in how disproportionality is defined.

Consistent across studies, however, is a need to more fully examine the directionality of disproportionality and covariates that may significantly impact the relationship between racial inequities and identification for services (Skiba et al., 2016). Disproportionality is often mediated by other variables at the child, school, and institutional levels, such as poverty or socioeconomic status (Morgan et al., 2017), academic achievement and engagement (Hibel, Farkas, & Morgan, 2010), and compositional makeup of surrounding school environments (Morgan et al., 2015). However, large-scale datasets used to determine disproportionality often fail to include sufficient data to allow for multilevel analyses. Disproportionality rates have been found to vary based on school composition, disability category, and state (Skiba et al., 2008), but specificity on thresholds for over- or underrepresentation and consensus about the root causes underlying

disproportionality are needed to address disproportionality (Skiba et al., 2016). Whereas the lack of a standard RR threshold initially appeared to be an oversight in establishing consistency across states, the flexibility for states to determine disproportionality thresholds and evaluate compliance on a case-by-case basis may actually serve states and districts in the long run by encouraging self-study and examination of state-specific historical special education practices and patterns of disproportionality.

Underrepresentation and the Need for Disaggregated Data. Descriptive analyses of RRs for the other disability categories in this study produced three main findings. First, RRs for Asian populations were predominantly less than 1.00, suggesting fewer Asian students are receiving special education services than other racial groups. The underrepresentation of Asian students among those receiving special education services has been a topic of disproportionality discourse for over 20 years (National Alliance for Bilingual Education, 2002). Consistent with previous research calling for the disaggregation of Asian and Native Hawaiian or Other Pacific Islander data (Cooc & Kiru, 2018; Sullivan & Artiles, 2011; Sullivan et al., 2020), RRs for Asian students were generally lower than RRs for Native Hawaiian or Other Pacific Islander students, particularly when more Asian students were identified than Native Hawaiian or Other Pacific Islander students.

Literature on the vastly different educational, cultural, and socioeconomic experiences and trajectories of Asian and Native Hawaiian or Other Pacific Islander individuals has suggested that the use of aggregate data obscures the needs of underrepresented individuals (Nguyen, Noguera, Adkins, & Teranishi, 2019; Sullivan et al., 2020). The negative impact of collapsing multiple Asian racial subgroups into a single, homogenous category has been addressed in higher education literature, specifically as it relates to the subsumed academic needs

and trajectories of smaller ethnic groups such as Hmong, Cambodian, and Laotian American populations in relation to the more dominant populations from Chinese, Japanese, and Korean descent (Pang, Han, & Pang, 2011; Teranishi, 2010). Disaggregating data by ethnic subgroup has been hailed as a promising practice to direct attention and resources to subgroups who are disproportionally disadvantaged by the "model minority" myth (Teranishi, 2012).

The breadth of research on Asian educational experiences reflects an overreliance on "model minority" stereotypes which assume high academic and professional achievement (DePouw, 2012; Ng, Lee, & Pak, 2007). These stereotypes have been identified in educators' perceptions, instructional practices, and expectations of students across a variety of Asian racial subgroups, socioeconomic statuses, and immigration histories (Teranishi, 2010; Vaught, 2012). Despite being held to "model minority" standards, less represented subgroups such as Native Hawaiian or Other Pacific Islander and American Indian or Alaska Native face additional challenges to have their needs reflected in educational data (Teranishi, 2012). One advantage of using section 618 IDEIA data for this study was that seven racial/ethnic groups were represented, with distinct patterns emerging in risk ratios for Asian versus Native Hawaiian or Other Pacific Islander populations.

The second main finding from analyzing other disability categories was the heavy impact of low American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander sample sizes. Some states did not identify any students from these racial/ethnic backgrounds with lower incidence disabilities such as Deaf-blindness and Visual Impairment. Third, as a result of low sample sizes, the RRs for American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander populations varied more widely than other minority groups. These findings echo more recent literature on disproportionately differential risk, protective, and intervention factors

when fewer students are represented amongst low-incidence disabilities (Sullivan et al., 2020). The IDEA Data Center's Technical Assistance Guide (2014) also emphasizes the difficulty of interpreting RRs computed from small sample sizes. Smaller sample sizes have been found to artificially inflate measures of disproportionality, potentially leading to misidentifications of disproportionality. The Technical Assistance Guide suggests states and districts determine a minimum sample size based on factors such as overall enrollment, enrollment by race, enrollment of children with disabilities, and/or enrollment in educational environments or discipline categories (IDC, 2014, pp. 71-72). For the purpose of this study, the minimum sample size suggestion was not used to retain differences in state-level RRs. For categories with no enrolled students in a given disability category, RRs were not computed.

Lastly, state-level RRs for the racial/ethnic groups were also descriptively examined for Alaska, California, Hawai'i, Oregon, and Washington; Western states with greater representation of American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander populations. RRs were less dispersed across disability categories in California and Washington compared to Alaska, Hawai'i, and Oregon. Overall larger student populations and greater representation of students from all racial/ethnic subgroups, demonstrated in Table 20 below, appeared to affect how consistently states identified students across disability categories. The American Indian or Alaska Native risk ratios were closer to 1.00 in Alaska, where 28.31% of students receiving special education services were American Indian or Alaska Native. In Hawai'i, where Native Hawaiian or Other Pacific Islanders comprised 39.06% of the special education population, the majority of risk ratios were greater than 1.50, in comparison to risk ratios generally less than 1.0 in other Pacific states. Greater representation at the state-level appeared to impact disproportionate identification in Alaska differently than in Hawai'i, reiterating the importance

of defining contexts when discussing disproportionality and systemic interventions (Sullivan et al., 2020).

Table 20.

Final sample descriptive statistics: American Indian or Alaska Native, Asian, Black or African American, Hispanic/Latino, and Native Hawaiian or Other Pacific Islander

	TOTAL	AI		AS		BL		LA		NH	
	n	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Alaska	16718	4733	28.31%	584	3.49%	569	3.40%	1187	7.10%	418	2.50%
California	683709	5062	0.74%	41259	6.03%	58195	8.51%	388183	56.78%	2644	0.39%
Hawaii	16807	64	0.38%	3061	18.21%	349	2.08%	2662	15.84%	6565	39.06%
Oregon	75825	1446	1.91%	1513	2.00%	2360	3.11%	18745	24.72%	409	0.54%
Washington	127073	2616	2.06%	4759	3.75%	7271	5.72%	32223	25.36%	1081	0.85%

Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black or African American. LA = Hispanic/Latino. NH = Native Hawaiian or Other Pacific Islander.

Higher Black or African American and American Indian or Alaska Native RRs in California and Oregon reflected more than two times the likelihood of being identified with an Emotional Disturbance or Traumatic Brain Injury than all other races. The effect of small sample sizes on interpretation of RRs was observed in Alaska, Hawai'i, and Oregon. In Washington, disability categories of Intellectual Disability, Emotional Disturbance, and Specific Learning Disability were least consistently reported, suggesting greater inequalities in the way these disabilities are identified between racial/ethnic groups. These results provide a localized context for discussing future directions for addressing disproportionality.

In sum, the results of the first research question highlighted the importance of how special education disproportionality is operationalized and identified. While some racial/ethnic groups appear to be overrepresented in special education, comparisons across states and disability categories suggested differing degrees of disproportionality. RRs from this descriptive analysis could only be meaningfully interpreted when the demographic or disability categories were clearly defined (Sullivan et al., 2020; US Department of Education, 2020), and the five Pacific state-level case studies demonstrated greater differences in likelihood for special education identification *between* than *within* states. Although section 611(c)(1) and section 616(i) of IDEIA obligate states to collect and report disproportionality data for a number of procedural and evaluative purposes, the results of this analysis suggest disaggregated, multi-level data may be more effective for identifying localized disproportionality than systemic disproportionality (Sullivan et al., 2020).

Research Question 2: Modeling the Determinants of Special Education Compliance

The second research question sought to predict state-level compliance with IDEIA regulations based on demographic and special education variables. Results from the regression

analysis indicated that, taking into account percentages of English Language Learners, American Indian or Alaska Native, Asian, Black or African American, Hispanic/Latino, Multiracial, and Native Hawaiian or Other Pacific Islander populations; inclusion in general education settings; exit from special to general education settings; and provision of Coordinated Early Intervention Services (CEIS), only percentages of English Language Learners and Hispanic/Latino students were significantly correlated with and predictive of special education compliance (sr^2 = 0.14 and 0.26, respectively). Despite prior literature and legislation linking inclusion in less restrictive educational settings and positive academic and behavioral outcomes (Barrett et al., 2019; Skiba et al., 2002), neither inclusion nor exit rates were significant predictors of compliance. Likewise, early identification and intervention systems have been highlighted in the special education literature as a means of decreasing later disproportionalities (Jenkins et al., 2007; Losen & Orfield, 2002; Stecker et al., 2017), but CEIS in the 2017-2018 school year did not predict IDEIA compliance. Although IDEIA legislation inextricably intertwines inclusion and early intervention with special education regulations, the results of this analysis do not suggest they were statistically linked. This result is more likely due to limitations in data collection and access to confounding variable data than theoretical linkages put forth in the literature.

The only significant predictors of compliance were standardized percentages of English Language Learning students (b = 2.20, p < .01) and Hispanic/Latino students (b = -2.97, p < .001). Greater English Language Learning representation was correlated with greater IDEIA compliance, whereas greater Hispanic/Latino representation correlated negatively with compliance. This finding was supportive of more recent dimensions of disproportionality research that examine the impact of linguistic differences and diversity among Hispanic/Latino populations (Harry & Klingner, 2006). Students with limited English proficiency, and

Hispanic/Latino students with limited English proficiency, have been disproportionately misidentified as learning disabled for more than three decades (Ochoa, Pacheco, & Omark, 1988) as second language acquisition is often conflated with cognitive abilities (Klingner et al., 2006). In this sample of 2017-2018 school year data, the range of percentages of school districts that met IDEIA compliance regulations was 90.51 to 100.00, suggesting most districts across most states were in compliance with special education laws.

Limitations and Future Directions for Research and Practice

Limitations commonly referenced in the disproportionality literature were also encountered in this study. Third-party data was suppressed due to low sample size or questionable data quality, obscuring potential further study of disproportionality in low-incidence outcomes among under-represented populations. Moreover, the lack of IDEIA data collection on district, school, or student levels precluded the use of hierarchical analyses, which would allow for statistical control of second- or third-order covariates discussed in previous special education literature, such as socioeconomic status, gender, or academic achievement (Shifrer, Muller, & Callahan, 2011; Sullivan et al., 2020). While this study intended to examine disproportionality across the United States, the lack of disaggregated data obscured localized differences, and the data may have been interpreted differently viewed through different lenses. The first research question only included introductory risk ratio comparisons across the national landscape and five Pacific states, and further study comparing disaggregated subgroup data may provide targeted points for intervention. Individual schools and school districts may wish to conduct their own disaggregated risk ratio analyses, which may be more finely tuned to local contexts than the national level (Robinston & Norton, 2019).

Another limitation of this study was the narrow focus on disproportionate identification for special education services, setting aside disproportionate discipline and inclusionary practices for future study. Disproportionate identification was operationalized (both in this study and in special education law) as the number and percentage of students identified as receiving special education services during the school year. School psychology and special education literature address numerous dimensions of educational inequity before and after students are identified for services, such as differential referral rates for evaluation or intervention, biased evaluation tools or practices, and parental consent to receive services even if found eligible for services. Further examination of these dimensions of racial/ethnic disproportionality are needed to shed light on the points of systemic intervention to special education practices. Sullivan and Osher (2019) concluded their policy analysis, "Disproportionality policy remains a complicated patchwork that seeks to address equality and equity but may lead to as many questions as answers given schools' completing legal obligations" (p. 407). The limitations of this study call for deeper understanding of the theoretical and observed linkages between best practices, tiered approaches, and special education regulations and outcomes.

Understanding disproportionate patterns of special education identification is a necessary precursor for equitable intervention (Teranishi, 2016). This study investigated disproportionate special education identification during a single school year, and historical patterns of racial/ethnic minority marginalization from the intent and benefits of special education were also observed. The results of this study raised awareness of the promises and pitfalls of methodologies, both theoretical and statistical, set forth by IDEIA to determine special education disproportionality. In order to promote equitable outcomes among underrepresented racial/ethnic groups such as American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander,

their needs must first be disaggregated in the data rather than suppressed or excluded from disproportionate analyses due to small sample size. However, smaller sample sizes affect statistical interpretations of risk ratio analyses, and IDEIA suggestions for states to set a minimum cell size introduces a large degree of variability in when populations are represented – or not.

Disproportionality data should also continue to be collected and disaggregated at the school, district, and state level to inform hypotheses about the impact of the environment. Further study on these interconnected systems and contexts of risk, specifically comparing school- versus district-level data, could allow leaders to determine *when* and *why* disproportionality is problematic, and how to intervene.

Just as the degree of racial/ethnic disproportionality analyzed in this study varied depending on which of the multiple dimensions of unequal representation was being examined, the way disproportionality is defined and identified in special education research is likely to continue evolving. The current study attempted to provide a snapshot of ethnic disproportionality through the lens of the 2017-2018 section 618 data, and understanding patterns and outliers in disproportionality is necessary to determine which students and communities are being significantly underserved through unequal access to or benefits from special education. As the school-aged population becomes increasingly diverse, so will the challenge to identify and act upon educational inequities further marginalizing students and communities furthest from educational justice.

References

Abou-Rjaily, K., & Stoddard, S. (2017). Response to Intervention (RTI) for students presenting with behavioral difficulties: Culturally responsive guiding questions. *International Journal of Multicultural Education*, *19*(3), 18.

Acevedo-Polakovich, I. D., Reynaga-Abiko, G., Garriott, P. O., Derefinko, K. J., Wimsatt, M. K., Gudonis, L. C., & Brown, T. L. (2007). Beyond instrument selection: Cultural considerations in the psychological assessment of U.S. Latinas/os. *Professional Psychology: Research and Practice*, *38*(4), 375–384. https://doi.org/10.1037/0735-7028.38.4.375

Albrecht, S. F., Skiba, R. J., Losen, D. J., Chung, C.-G., & Middelberg, L. (2012). Federal Policy on Disproportionality in Special Education: Is it Moving us Forward? *Journal of Disability Policy Studies*, *23*(1), 14–25. https://doi.org/10.1177/1044207311407917

American Educational Research Association (AERA), American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

Artiles, A. J. (2011). Toward an interdisciplinary understanding of educational equity and difference: The case of the racialization of ability. *Educational Researcher*, *40*(9), 431–445. https://doi.org/10.3102/0013189X11429391

Artiles, A. J., Bal, A., & Thorius, K. A. K. (2010). Back to the future: A critique of Response to Intervention's social justice views. *Theory Into Practice*, *49*(4), 250–257. https://doi.org/10.1080/00405841.2010.510447

Artiles, A. J., Kozleski, E. B., Trent, S. C., Osher, D., & Ortiz, A. (2010). Justifying and explaining disproportionality 1968—2008: A critique of underlying views of culture. *Exceptional Children, 76*(3), 279-299.

Avant, D. W. (2016). Using response to intervention/multi-tiered systems of supports to promote social justice in schools. *Journal for Multicultural Education, 10*(4), 507–520. https://doi.org/10.1108/JME-06-2015-0019

Bal, A. (2018). Culturally responsive positive behavioral interventions and supports: A process–oriented framework for systemic transformation. *Review of Education, Pedagogy, and Cultural Studies, 40*(2), 144–174. https://doi.org/10.1080/10714413.2017.1417579

Bal, A., Kozleski, E. B., Schrader, E. M., Rodriguez, E. M., & Pelton, S. (2014). Systemic transformation from the ground–up: Using learning lab to design culturally responsive schoolwide positive behavioral supports. *Remedial and Special Education, 35*(6), 327–339. https://doi.org/10.1177/0741932514536995

Balu, R., Zhu, P., Doolittle, F., Schiller, E., Jenkins, J., & Gersten, R. (2015). *Evaluation of Response to Intervention Practices for Elementary School Reading*. Institute of Education Sciences.

Barrett, C. A., & Newman, D. S. (2018). Examining MTSS implementation across systems for SLD identification: A case study. *School Psychology Forum, 12*(1), 30-43.

Barrett, C. A., Stevenson, N. A., & Burns, M. K. (2019). Relationship between disability category, time spent in general education and academic achievement. *Educational Studies*, 1–16. https://doi.org/10.1080/03055698.2019.1614433

Bernal, G., Bonilla, J., & Bellido, C. (1995). Ecological validity and cultural sensitivity for outcome research: issues for cultural adaptation and development of psychosocial

treatments with Hispanics. *Journal of Abnormal Child Psychology, 23*, 67–82. doi:10.1007 /BF01447045.

Bernal, G., Jiménez-Chafey, M. I., & Domenech-Rodríguez, M. M. (2009). Cultural adaptation of treatments: A resource for considering culture in evidence-based practice. *Professional Psychology: Research and Practice, 40*(4), 361–368. doi:10.1037/a0016401.

Boneshefski, M. J., & Runge, T. J. (2014). Addressing disproportionate discipline practices within a school-wide positive behavioral interventions and supports framework: A practical guide for calculating and using disproportionality rates. *Journal of Positive Behavior Interventions*, *16*(3), 149–158. https://doi.org/10.1177/1098300713484064

Briesch, A. M., Chafouleas, S. M., Nissen, K., & Long, S. (2019). A review of state-level procedural guidance for implementing multitiered systems of support for behavior (MTSS-B). *Journal of Positive Behavior Interventions*, 1-14.

Cabassa, L. J., & Baumann, A. A. (2013). A two-way street: Bridging implementation science and cultural adaptations of mental health treatments. *Implementation Science, 8*(1), 90. doi:10.1186/1748-5908-8-90.

Carney, K. J., & Stiefel, G. S. (2008). Long-term results of a problem-solving approach to response to intervention: discussion and implications. *Learning Disabilities: A Contemporary Journal, 6*(2), 61–75.

Castro-Villarreal, F., Villarreal, V., & Sullivan, J. R. (2016). Special Education Policy and Response to Intervention: Identifying Promises and Pitfalls to Advance Social Justice for Diverse Students. *Contemporary School Psychology*, *20*(1), 10–20. https://doi.org/10.1007/s40688-015-0077-3

Chang, D. F., & Berk, A. (2009). Making cross-racial therapy work: A phenomenological study of clients' experiences of cross-racial therapy. *Journal of Counseling Psychology*, *56*(4), 521–536. https://doi.org/10.1037/a0016905

Cooc, N., & Kiru, E. W. (2018). Disproportionality in special education: A synthesis of international research and trends. *The Journal of Special Education*, *52*(3), 163–173. https://doi.org/10.1177/0022466918772300

Cook, C. R., Frye, M., Slemrod, T., Lyon, A. R., Renshaw, T. L., & Zhang, Y. (2015). An integrated approach to universal prevention: Independent and combined effects of PBIS and SEL on youths' mental health. *School Psychology Quarterly*, *30*(2), 166–183. https://doi.org/10.1037/spq0000102

Delgado, R. (1984) The imperial scholar: reflections on a review of civil rights literature, *University of Pennsylvania Law Review*, 132, 561–578.

DePouw, C. (2012). When culture implies deficit: Placing race at the center of Hmong American education. *Race, Ethnicity, and Education, 15*(2), 223-239.

Domenech Rodríguez, M., & Weiling, E. (2004). Developing culturally appropriate, evidence-based treatments for interventions with ethnic minority populations. In M. Rastogin & E. Weiling (Eds.), *Voices of color: first person accounts of ethnic minority therapists* (pp. 313– 333). Thousand Oaks: Sage.

Dunlap, G., & Fox, L. (2015) Supportive interventions for young children with social, emotional, and behavioral delays and disorders. In H. M. Walker, F. M. Gresham, & J. M. Kauffman (Eds.), *Handbook of Evidence-Based Practices for Emotional and Behavioral Disorders: Applications in Schools*. New York, NY: Guilford.

Dunn, L. (1968). Special education for the mildly retarded: Is much of it justifiable? *Exceptional Children, 35,* 5–22.

Eagle, J. W., Dowd-Eagle, S. E., Snyder, A., & Holtzman, E. G. (2015). Implementing a multi-tiered system of support (MTSS): Collaboration between school psychologists and administrators to promote systems-level change. *Journal of Educational and Psychological Consultation*, *25*(2–3), 160–177. https://doi.org/10.1080/10474412.2014.929960

Erickson, A. G., Noonan, P. M., & Jenson, R. (2012). The school implementation scale: Measuring implementation in response to intervention models. *Learning Disabilities, A Contemporary Journal, 10*(2), 33-52.

Forbringer, L., & Fuchs, W. W. (2014). *RtI in math: Evidence-based interventions for struggling students.* Routledge: New York, NY.

Forman, S. G., & Crystal, C. D. (2015). Systems consultation for Multitiered Systems of Supports (MTSS): Implementation issues. *Journal of Educational and Psychological Consultation*, *25*(2–3), 276–285. https://doi.org/10.1080/10474412.2014.963226

Fuchs, D., & Fuchs, L. (2006). Introduction to response to intervention: What, why, and how valid is it? *Reading Research Quarterly, 41*(1), 93–99. https://doi.org/10.1598/RRQ.41.1.4

Fuchs, L. S., & Fuchs, D. (2007). A model for implementing responsiveness to intervention. *Teaching Exceptional Children, 39,* 14–20.

Fuchs, L. S., & Stecker, P. M. (2010). The blurring of special education in a new continuum of general education placements and services. *Exceptional Children, 76,* 301–323.

Fuchs, L. S., & Vaughn, S. (2012). Responsiveness-to-intervention: A decade later. *Journal of Learning Disabilities*, *45*(3), 195–203. https://doi.org/10.1177/0022219412442150

Gamm, S., Elliott, J., Halbert, J. W., Price-Baugh, R., Hall, R., Walstron, D., Uro, G., & Casserly, M. (2012). *Common core state standards and diverse urban students: Using multi-tiered systems of support.* Washington, DC: Council of the Great City Schools.

García, S. B., & Ortiz, A. A. (2006). Preventing disproportionate representation: Culturally and linguistically responsive prereferral interventions. *Teaching Exceptional Children*, *38*(4), 64–68. https://doi.org/10.1177/004005990603800410

Garcia, S. B., & Ortiz, A. A. (2008). A framework for culturally and linguistically responsive design of response-to-intervention models. *Multiple Voices for Ethnically Diverse Exceptional Learners, 11*(1), 24–41.

Gischlar, K. L., Keller-Margulis, M., & Faith, E. L. (2019). Ten years of response to intervention: Trends in the school psychology literature. *Contemporary School Psychology*, *23*(3), 201–210. https://doi.org/10.1007/s40688-018-0179-9

Glover, T. A., & DiPerna, J. C. (2007). Service delivery for response to intervention: core components and directions for future research. *School Psychology Review, 36,* 526–540.

Green, A. L., Cohen, D. R., & Stormont, M. (2019). Addressing and preventing disproportionality in exclusionary discipline practices for students of color with disabilities. *Intervention in School and Clinic*, *54*(4), 241–245. https://doi.org/10.1177/1053451218782437

Guo, S., Kataoka, S., Bear, L., & Lau, A. (2014). Differences in school-based referrals for mental health care: Understanding racial/ethnic disparities between Asian American and Latino youth. *School Mental Health, 6*. https://doi.org/10.1007/s12310-013-9108-2

Hale, J. B., Kaufman, A., Naglieri, J. A., & Kavale, K. A. (2006). Implementation of IDEA: Integrating response to intervention and cognitive assessment methods. *Psychology in the Schools*, *43*(7), 753–770. https://doi.org/10.1002/pits.20186

Harry, B. & Klingner, J., (2006). *Why are so many minority students in special education?: Understanding race and disability in schools.* New York: Teachers College Press, Columbia University.

Heller, K. A., Holtzman, W. H., & Messick, S. (Eds.) (1982). *Placing children in special education: A strategy for equity.* Washington, DC: National Academy Press.

Hernández Finch, M. E. (2012). Special considerations with response to intervention and instruction for students with diverse backgrounds. *Psychology in the Schools*, *49*(3), 285–296. https://doi.org/10.1002/pits.21597

Hibel, J., Farkas, G., & Morgan, P. L. (2010). Who is placed into special education? *Sociology of Education*, *83*(4), 312–332. https://doi.org/10.1177/0038040710383518

Hosp, J. L., & Reschly, D. J. (2003). Referral rates for intervention or assessment: A meta-analysis of racial differences. *The Journal of Special Education*, *37*(2), 67–80. https://doi.org/10.1177/00224669030370020201

IDEA Data Center. (2014). *Methods for assessing racial/ethnic disproportionality in special education: A technical assistance guide (Revised).* Rockville, MD.

Jenkins, J. R., Hudson, R. F., & Johnson, E. S. (2007). Screening for at-risk readers in a response to intervention framework. *School Psychology Review*, *36*(4), 582–600.

Klingner, J. K., Artiles, A. J., Kozleski, E., Harry, B., Zion, S., Tate, W., Duran, G. Z., & Riley, D. (2005). Addressing the disproportionate representation of culturally and linguistically

diverse students in special education through culturally responsive educational systems. *Education Policy Analysis Archives, 13,* 38. https://doi.org/10.14507/epaa.v13n38.2005

Klingner, J. K., & Edwards, P. A. (2006). Cultural considerations with response to intervention models. *Reading Research Quarterly*, *41*(1), 108–117. https://doi.org/10.1598/RRQ.41.1.6

Knotek, S. (2003). Bias in problem solving and the social process of student study team: A qualitative investigation. *The Journal of Special Education*, *37*(1), 2–14.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465-491.

Lean, D., & Colucci, V.A. (2013). *School-based mental health: A framework for intervention.* Lanham, MD: R&L Education.

Liu, W. M., & Clay, D. L. (2002). Multicultural counseling competencies: Guidelines in working with children and adolescents. *Journal of Mental Health Counseling*, *24*(2), 177. Retrieved from https://www.questia.com/library/journal/1G1-87015310/multicultural-counseling-competencies-guidelines

Locke, J., Kang-Yi, C. D., Pellecchia, M., Marcus, S., Hadley, T., & Mandell, D. S. (2017). Ethnic disparities in school-based behavioral health service use for children with psychiatric disorders. *Journal of School Health*, *87*(1), 47–54. https://doi.org/10.1111/josh.12469

Losen D.J., & Orfield. G. (Eds.). (2002). *Racial inequity in special education.* Cambridge, MA: Harvard Education Press.

McIntosh, K., Chard, D. J., Boland, J. B., & Horner, R. H. (2006). Demonstration of combined efforts in school-wide academic and behavioral systems and incidence of reading and

behavior challenges in early elementary grades. *Journal of Positive Behavior Interventions, 8,* 146–154.

McIntosh, K., Horner, R. H., Chard, D. J., Dickey, C. R., & Braun, D. H. (2008). Reading skills and function of problem behavior in typical school settings. *The Journal of Special Education, 42*(3), 131-147. https://doi.org/10.1177/0022466907313253

McMahon, B. M., & Sembiante, S. F. (2019). Re-envisioning the purpose of early warning systems: Shifting the mindset from student identification to meaningful prediction and intervention. *Review of Education*. https://doi.org/10.1002/rev3.3183

Moreno, G., & Gaytán, R. X. (2013). Reducing subjectivity in special education referrals by educators working with Latino students: Using functional behavioral assessment as a pre-referral practice in student support teams. *Emotional and Behavioral Difficulties, 18*(1), 88-101. doi: 10.1080/13632752.2012.675132

Moreno, G., Wong-Lo, M., & Bullock, L. M. (2014). Assisting students from diverse backgrounds with challenging behaviors: Incorporating a culturally attuned functional behavioral assessment in referral services. *Preventing School Failure, 58*(1), 58-68.

Morgan, P. L., Farkas, G., Cook, M., Strassfeld, N. M., Hillemeier, M. M., Pun, W. H., & Schussler, D. L. (2017). Are Black children disproportionately overrepresented in special education? A best-evidence synthesis. *Exceptional Children, 83*(2), 181–198. https://doi.org/10.1177/0014402916664042

Muñoz, R. F., & Mendelson, T. (2005). Toward evidence-based interventions for diverse populations: The San Francisco General Hospital prevention and treatment manuals. *Journal of Consulting and Clinical Psychology, 73,* 790–799.

National Association for Bilingual Education. (2002). *Determining appropriate referrals of*

English language learners to special education: A self-assessment guide for principals.

National Association of School Psychologists. (2010). *Principles for professional ethics.* Bethesda, MD: Author.

Nelson, J. R., Benner, G. J., Lane, K. L., & Smith, B. W. (2004). Academic achievement of K–12 students with emotional and behavioral disorders. *Exceptional Children, 71,* 59–73.

Ng, J. C., Lee, S. S., & Pak, Y. K. (2007). Contesting the model minority and perpetual foreigner stereotypes: A critical review of literature on Asian Americans in education. *Review of Research in Education, 31,* 95-130.

Nguyen, B. M. D., Noguera, P., Adkins, N., & Teranishi, R. T. (2019). Ethnic discipline gap: Unseen dimensions of racial disproportionality in school discipline. *American Educational Research Journal*, *56*(5), 1973–2003. https://doi.org/10.3102/0002831219833919

Nieto, S. (1999). *The light in their eyes*. New York, NY: Teachers College Press.

National Research Council (NRC). (2002). *Minority students in special and gifted education.* Committee on Minority Representation in Special Education, M. S. Donovan & C. T. Cross (Eds.). Washington, DC: National Academies Press.

O'Connor, R. E., Bocian, K. M., Beach, K. D., Sanchez, V., & Flynn, L. J. (2013). Special education in a 4-year Response to Intervention (RtI) environment: Characteristics of students with learning disability and grade of identification. *Learning Disabilities Research & Practice, 28,* 98–112. doi:10.1111/ldrp.12013.

Office for Civil Rights. (2012). *A snapshot of opportunity gap data*. Retrieved from http://ocrdata.ed.gov/

Office of Special Education Programs. (2017). IDEA Part B Regulations: Significant disproportionality (Equity in IDEA). Essential questions and answers.

Ong-Dean, C. (2006). High roads and low roads: Learning disabilities in California, 1976– 1998. *Sociological Perspectives*, *49*, 91–113. doi:10.1525/sop.2006.49.1.91

Ortiz, A. A., Robertson, P. M., Wilkinson, C. Y., Liu, Y.-J., McGhee, B. D., & Kushner, M. I. (2011). The role of bilingual education teachers in preventing inappropriate referrals of ells to special education: Implications for response to Intervention. *Bilingual Research Journal, 34*(3), 316–333. https://doi.org/10.1080/15235882.2011.628608

Padilla, A., & Perez, W. (2003). Acculturation, social identity, and social cognition: A new perspective. *Hispanic Journal of Behavioral Sciences, 25*(1), 35–55. https://doi.org/10.1177/0739986303251694

Pang, V. O., Han, P. P., & Pang, J. M. (2011). Asian American and Pacific Islander students: Equity and the achievement gap. *Educational Researcher, 40*(8), 378-389. doi: 10.3102/0013189X11424222

Peterson, L. S., Villarreal, V., & Castro, M. J. (2017). Models and frameworks for culturally responsive adaptations of interventions. *Contemporary School Psychology*, *21*(3), 181–190. https://doi.org/10.1007/s40688-016-0115-9

Petscher, Y., Kim, Y.-S., & Foorman, B. R. (2011). The importance of predictive power in early screening assessments: Implications for placement in the response to intervention framework. *Assessment for Effective Intervention*, *36*(3), 158–166. https://doi.org/10.1177/1534508410396698

Ranganathan, P., Aggarwal, R., & Pramesh, C. (2015). Common pitfalls in statistical analysis: Odds versus risk. *Perspectives in Clinical Research*, *6*(4), 222. https://doi.org/10.4103/2229-3485.167092

Reynolds, C. R., & Shaywitz, S. E. (2009). Response to intervention: Prevention and remediation, perhaps. Diagnosis, no. *Child Development Perspectives*, *3*(1), 44–47. https://doi.org/10.1111/j.1750-8606.2008.00075.x

Robinson, G. G. (2016). Culturally responsive beliefs and practices of general and special education teachers within a response to intervention framework. *Multiple Voices for Ethnically Diverse Exceptional Learners*, *16*(2), 2016, 22–36

Sanetti, L.M., & Kratochwill, T.R. (2009). Toward developing a science of treatment integrity: Introduction to the special series. *School Psychology Review*, *38*, 445-459.

Shifrer, D., Muller, C., & Callahan, R. (2011). Disproportionality and Learning Disabilities: Parsing Apart Race, Socioeconomic Status, and Language. *Journal of Learning Disabilities*, *44*(3), 246–257. https://doi.org/10.1177/0022219410374236

Skiba, R. J., Artiles, A J., Kozleski, E. B., Losen, D. J., & Harry, E. G. (2016). Risks and consequences of oversimplifying educational inequities: A response to Morgan et al. (2015). *Educational Researcher*, *45*(3), 221-225.

Skiba, R. J., Michael, R. S., Nardo, A. C., & Peterson, R. L. (2002). The color of discipline: Sources of racial and gender disproportionality in school punishment. *The Urban Review*, *34*(4), 317–342. https://doi.org/10.1023/A:1021320817372

Solórzano, D. (1998) Critical race theory, racial and gender microaggressions, and the experiences of Chicana and Chicano Scholars, *International Journal of Qualitative Studies in Education, 11*, 121–136.

Solórzano, D. G., & Yosso, T. J. (2002). Critical race methodology: Counter-storytelling as an analytical framework for education research. *Qualitative Inquiry, 8*(1), 23-44.

Stecker, P. M., Fuchs, D., & Fuchs, L. S. (2008). Progress monitoring as essential practice within response to intervention. *Rural Special Education Quarterly, 27*(4), 10–17. https://doi.org/10.1177/875687050802700403

Sugai, G. (2009). Reaching all students: RTI & SWPBS. [PowerPoint slides]. Retrieved from http://www.pbis.org/pbis_resource_detail_page.aspx?Type=1&PBIS_ ResourceID=807.

Sullivan, A. L., & Bal, A. (2013). Disproportionality in special education: Effects of individual and school variables on disability risk. *Exceptional Children, 79*(4), 475–494. https://doi.org/10.1177/001440291307900406

Sullivan, A. L., & Osher, D. (2019). IDEA's double bind: A synthesis of disproportionality policy interpretations. *Exceptional Children, 85*(4), 395-412.

Teranishi, R. T. (2010). *Asians in the ivory tower: Dilemmas of racial inequality in American higher education. Multicultural Education Series.* New York and London: Teachers College, Columbia University.

Tilly, D. (2008). The evaluation of school psychology in science-based practice: Problem solving and the three-tiered model. *Best Practices in School Psychology V.*

Torgesen, J. K. (2009). The response to intervention instructional model: Some outcomes from a large-scale implementation in reading first schools. *Child Development Perspectives, 3*(1), 38–40. https://doi.org/10.1111/j.1750-8606.2009.00073.x

U.S. Department of Education. (2000). *Twenty-second annual report to Congress on the implementation of the Individuals with Disabilities Education Act.* Washington, DC: Author.

U.S. Department of Education. (2004). *Individuals With Disabilities Education Act of 2004.* Retrieved from http://frwebgate. access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108 cong public laws &docid=f:publ446.108

U.S. Department of Education, Office of Civil Rights. (1994). *Elementary and secondary school civil rights compliance report.* Washington, DC.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. (2020). *41st annual report to Congress on the implementation of the Individuals with Disabilities Education Act, 2019.* Washington, DC.

VanDerHeyden, A. (2010). Use of classification agreement analyses to evaluate rti implementation. *Theory Into Practice, 49*(4), 281-288.

VanDerHeyden, A. M. (2011). Technical adequacy of response to intervention decisions. *Exceptional Children*, *77*(3), 335-350.

VanDerHeyden, A. M., Witt, J. C., & Gilbertson, D. (2007). A multi-year evaluation of the effects of a response to intervention (RTI) model on identification of children for special education. *Journal of School Psychology, 45,* 225–256. doi:10. 1016/j.jsp.2006.11.004.

Vaughn, S., & Fuchs, L. S. (2003). Redefining learning disabilities as inadequate response to instruction: The promise and potential problems. *Learning Disabilities Research and Practice*, *18*(3), 137–146. https://doi.org/10.1111/1540-5826.00070

Vaught, S. E. (2012). "They might as well be Black": The racialization of Sa'moan high school students. *International Journal of Qualitative Studies in Education, 25(*5), 557-582.

Vincent, C. G., and T. J. Tobin. (2011). The relationship between implementation of schoolwide positive behavior support (swpbs) and disciplinary exclusion of students from various

ethnic backgrounds with and without disabilities. *Journal of Emotional and Behavioral Disorders, 19,* 17–32. doi:10.1177/1063426610377329.

Waitoller, F. R., Artiles, A. J., & Cheney, D. A. (2010). The miner's canary: A review of overrepresentation research and explanations. *The Journal of Special Education, 44*(1), 29–49. https://doi.org/10.1177/0022466908329226

Walker, H. M., & Shinn, M. A. (2002). Structuring school-based interventions to achieve integrated primary, secondary, and tertiary prevention goals for safe and effective schools. In M. Shinn, H. Walker, & G. Stoner (Eds.), *Interventions for Academic and Behavior Problems II* (pp. 1-26). Bethesda, MD: National Association of School Psychologists.

Walker, M. W. (2009). Errors in diagnostic decision making and clinical judgment. In T. B. Gutkin & C. R. Reynolds (Eds.), *Handbook of school psychology, 4th ed.* (pp. 210-229). Hoboken, NJ: Wiley.

Welch, K., & Payne, A. A. (2012). Exclusionary school punishment: The effect of racial threat on expulsion and suspension. *Youth Violence and Juvenile Justice, 10,* 155–171. doi:10.1177/1541204011423766.

Whitcomb, S. A. & Merrell, K. W. (2013). *Behavioral, social, and emotional assessment of children and adolescents (4th ed).* New York, NY: Routledge

Wood, J. J., Chiu, A. W., Hwang, W., Jacobs, J., & Ifekwunigwe, M. (2008). Adapting cognitive-behavioral therapy for Mexican American students with anxiety disorders: recommendations for school psychologists. *School Psychology Quarterly, 23,* 515–532. doi:10.1037/1045-3830.23.4.515.

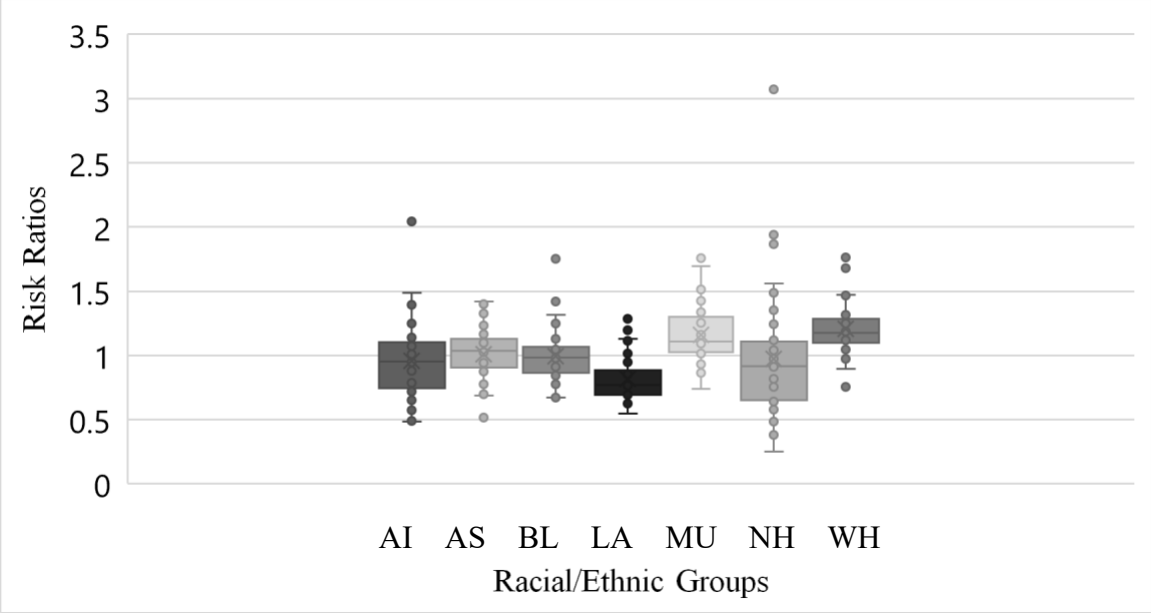
Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education*, *8*(1), 69–91. https://doi.org/10.1080/1361332052000341006

Appendix A

Research Question 1: Risk Ratio Analyses

Figure 7

2017-2018 IDEIA Risk ratios: Autism



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

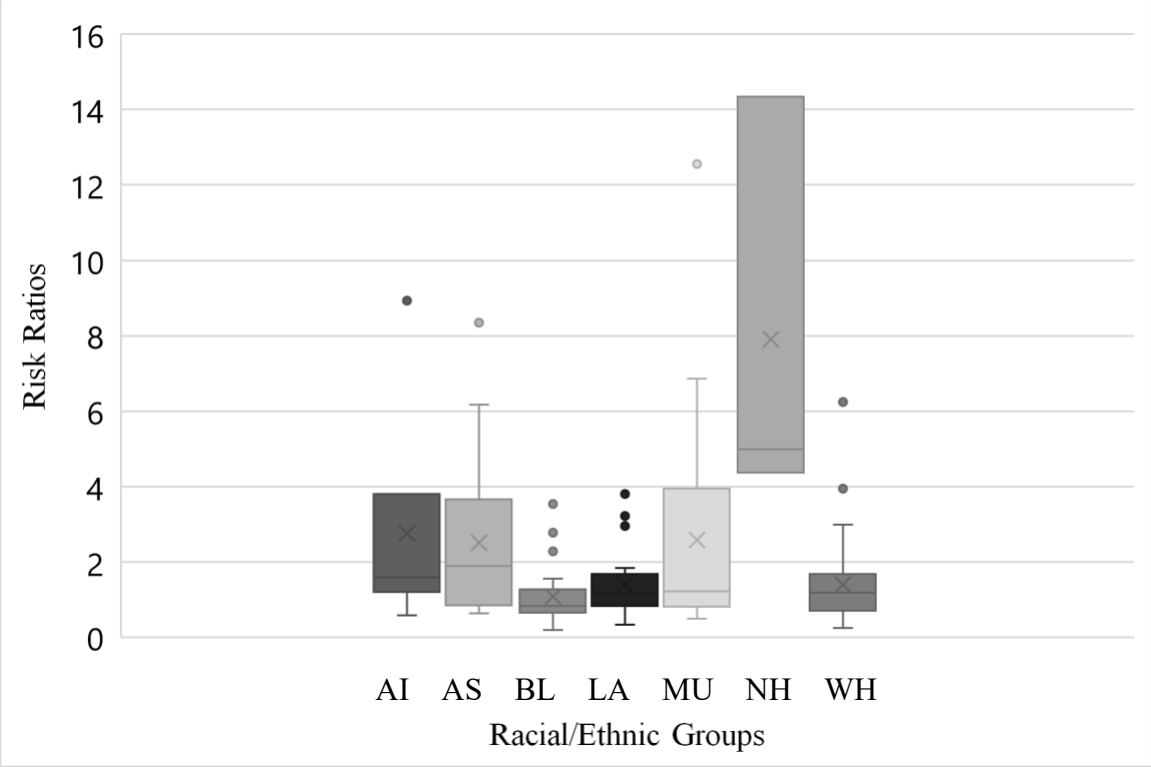
Table 7.

Descriptive statistics: Risk ratios for Autism

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	45	47
Mean RR	0.96	1.01	1.00	0.82	1.16	0.97	1.21
Standard deviation	0.28	0.19	0.20	0.17	0.21	0.49	0.20
Minimum RR	0.48	0.52	0.67	0.55	0.74	0.25	0.75
1st quartile	0.75	0.90	0.86	0.69	1.03	0.65	1.10
Median RR	0.95	1.03	0.98	0.77	1.11	0.92	1.18
3rd quartile	1.10	1.13	1.07	0.88	1.30	1.11	1.29
Maximum RR	2.04	1.42	1.75	1.28	1.76	3.07	1.81
Interquartile range	0.36	0.22	0.21	0.19	0.27	0.46	0.19

Figure 8

2017-2018 IDEIA Risk ratios: Deaf-Blindness



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

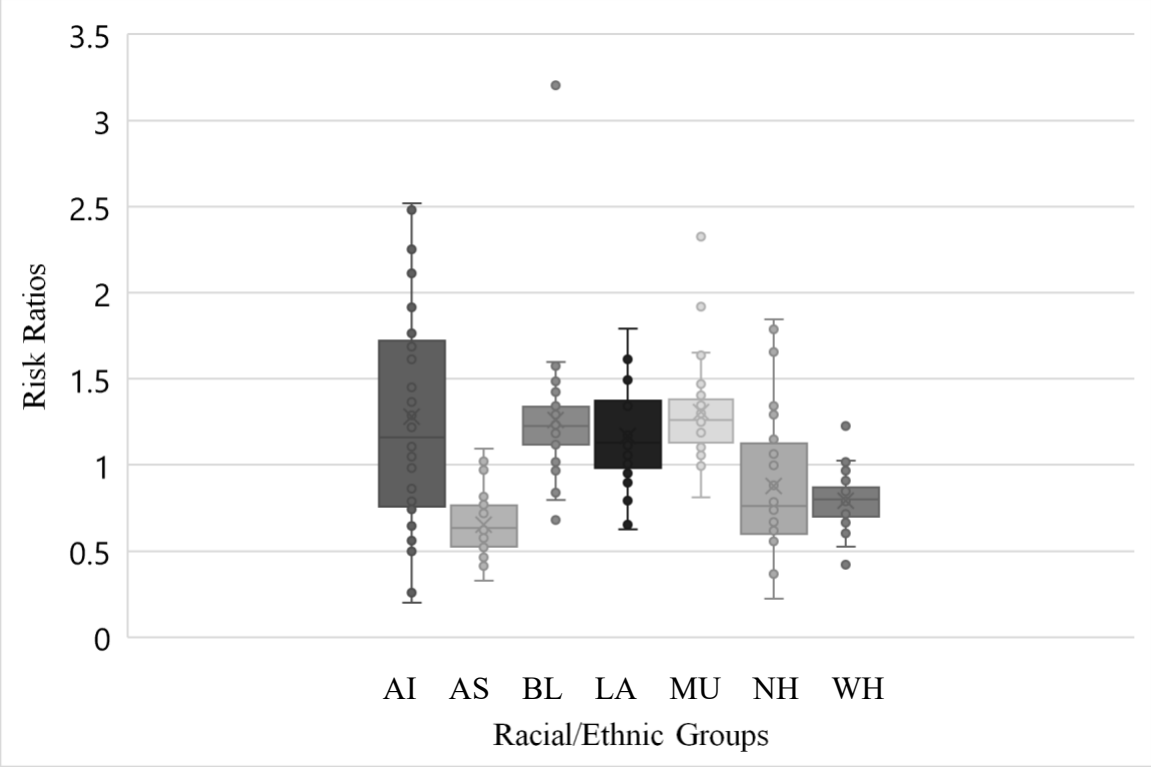
Table 8.

Descriptive statistics: Risk ratios for Deaf-Blindness

	AI	AS	BL	LA	MU	NH	WH
n	7	25	32	33	22	3	39
Mean RR	2.75	2.51	1.08	1.40	2.58	7.90	1.39
Standard deviation	2.90	2.00	0.74	0.95	2.88	5.59	1.11
Minimum RR	0.59	0.64	0.19	0.33	0.50	4.37	0.24
1st quartile	1.20	0.85	0.64	0.82	0.82	4.37	0.70
Median RR	1.59	1.90	0.83	1.16	1.21	4.99	1.18
3rd quartile	3.79	3.66	1.27	1.67	3.94	14.34	1.67
Maximum RR	8.92	8.34	3.54	3.82	12.56	14.34	6.23
Interquartile range	2.60	2.81	0.63	0.85	3.13	9.97	0.97

Figure 9

2017-2018 IDEIA Risk ratios: Developmental Delay



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

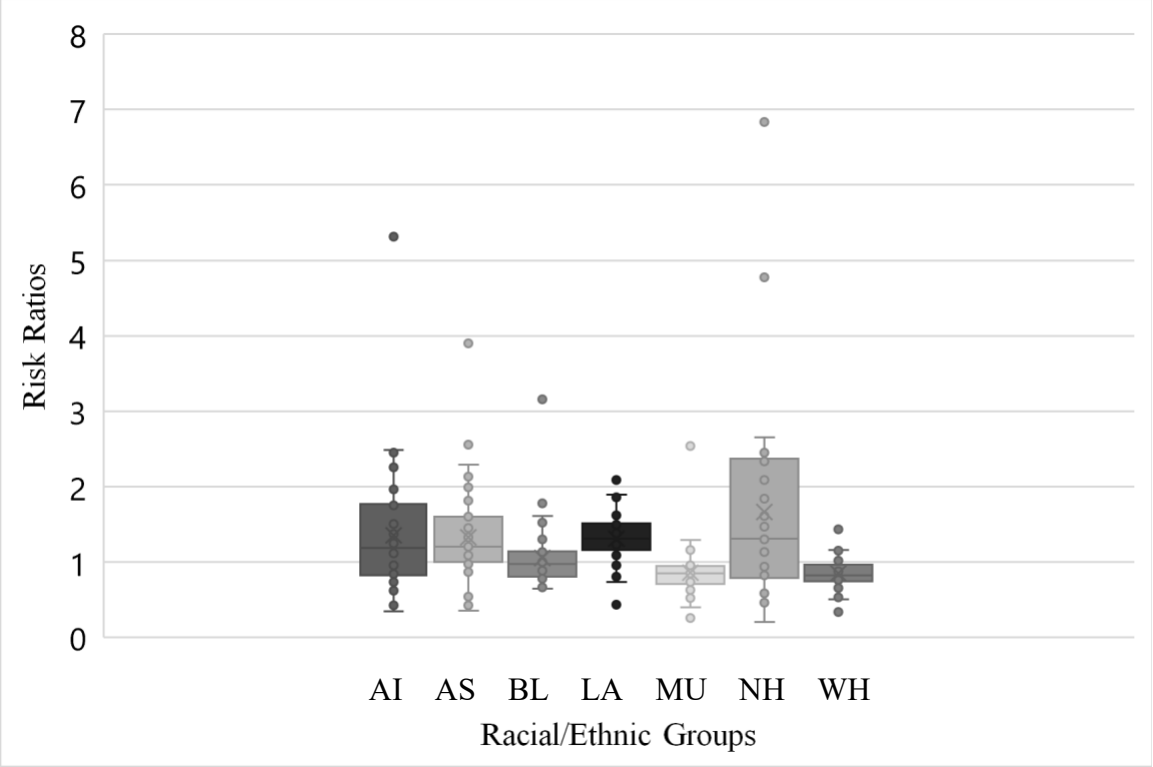
Table 9.

Descriptive statistics: Risk ratios for Developmental Delay

	AI	AS	BL	LA	MU	NH	WH
n	32	33	33	33	33	28	33
Mean RR	1.28	0.66	1.26	1.17	1.31	0.88	0.79
Standard deviation	0.65	0.19	0.40	0.27	0.28	0.42	0.16
Minimum RR	0.20	0.33	0.68	0.63	0.81	0.22	0.42
1st quartile	0.76	0.53	1.12	0.98	1.13	0.60	0.70
Median RR	1.16	0.63	1.23	1.13	1.26	0.76	0.80
3rd quartile	1.72	0.77	1.34	1.37	1.38	1.13	0.87
Maximum RR	2.52	1.09	3.20	1.79	2.33	1.84	1.23
Interquartile range	0.96	0.24	0.22	0.39	0.25	0.53	0.17

Figure 10

2017-2018 IDEIA Risk ratios: Hearing Impairment



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

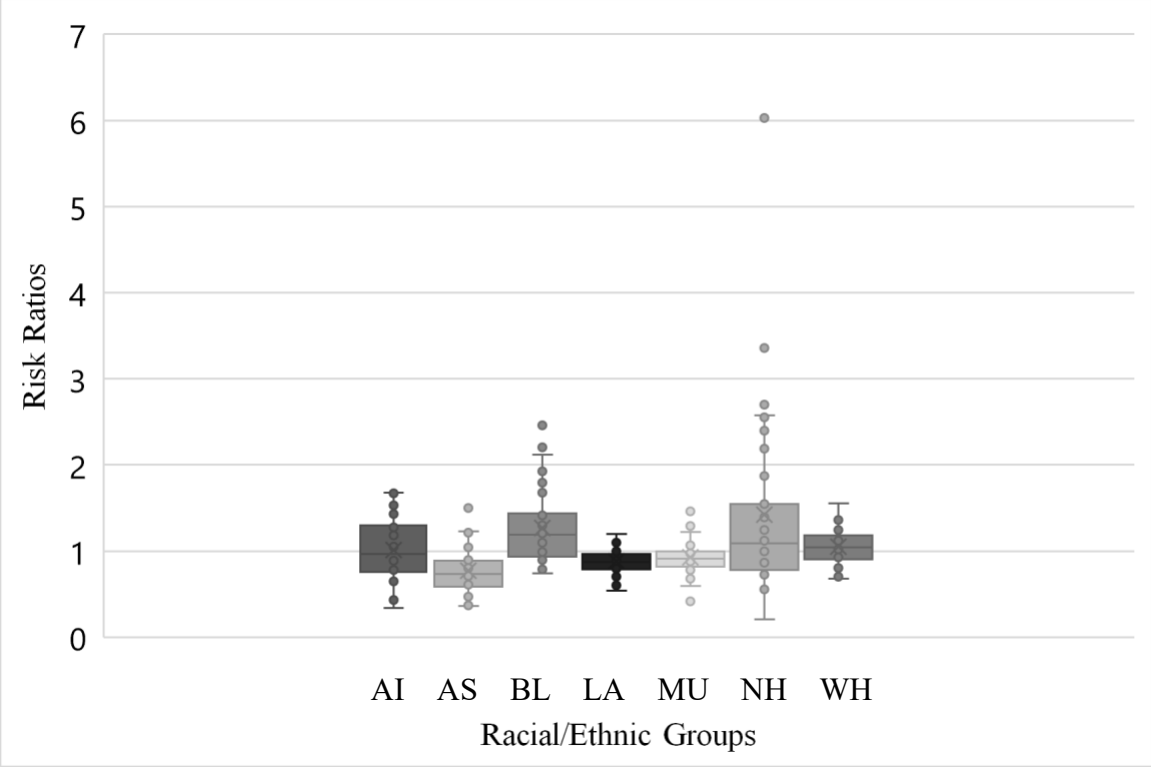
Table 10.

Descriptive statistics: Risk ratios for Hearing Impairment

	AI	AS	BL	LA	MU	NH	WH
n	42	47	46	47	47	30	47
Mean RR	1.35	1.32	1.05	1.31	0.86	1.66	0.84
Standard deviation	0.84	0.62	0.41	0.30	0.33	1.36	0.21
Minimum RR	0.34	0.36	0.64	0.43	0.26	0.20	0.33
1st quartile	0.82	1.00	0.80	1.16	0.71	0.79	0.74
Median RR	1.18	1.20	0.97	1.31	0.85	1.31	0.82
3rd quartile	1.76	1.60	1.14	1.51	0.94	2.37	0.96
Maximum RR	5.31	3.90	3.16	2.09	2.54	6.83	1.44
Interquartile range	0.94	0.60	0.34	0.36	0.24	1.58	0.22

Figure 11

2017-2018 IDEIA Risk ratios: Multiple Disabilities



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

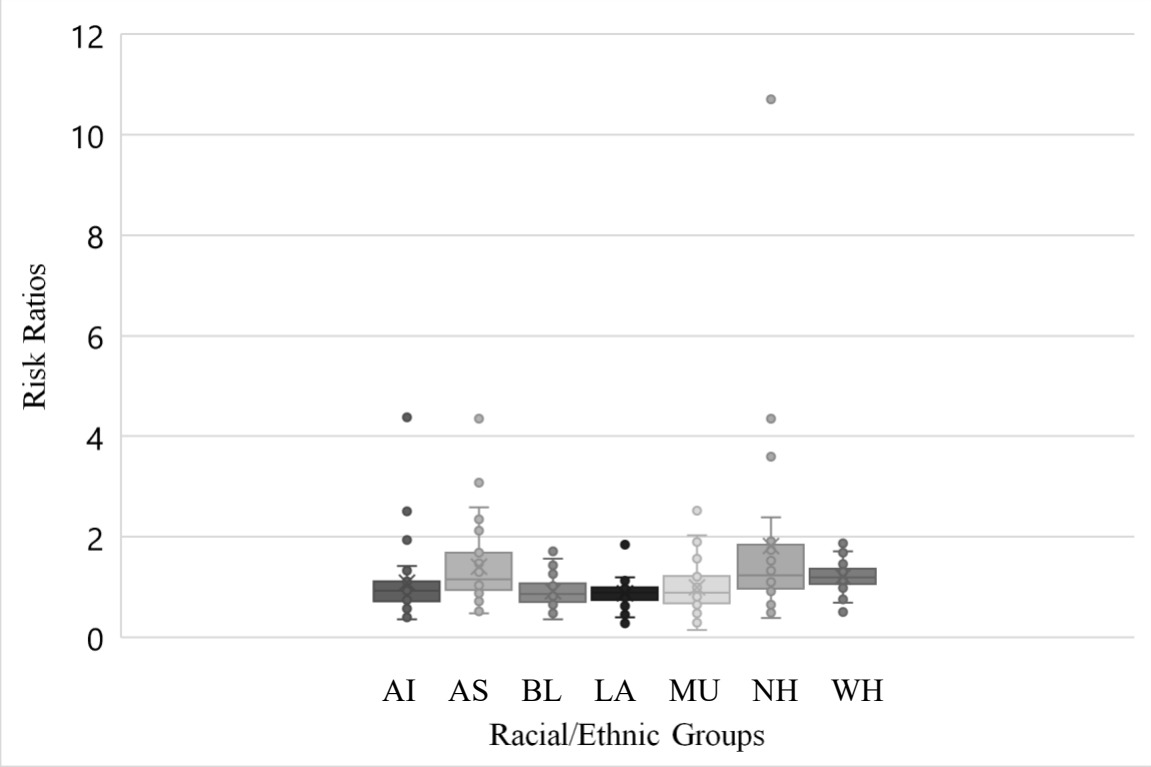
Table 11.

Descriptive statistics: Risk ratios for Multiple Disabilities

	AI	AS	BL	LA	MU	NH	WH
n	41	41	41	41	41	35	41
Mean RR	1.01	0.77	1.27	0.88	0.93	1.43	1.05
Standard deviation	0.35	0.27	0.41	0.16	0.19	1.07	0.20
Minimum RR	0.34	0.36	0.74	0.54	0.42	0.21	0.68
1st quartile	0.76	0.58	0.93	0.79	0.82	0.78	0.91
Median RR	0.97	0.74	1.19	0.87	0.91	1.09	1.04
3rd quartile	1.30	0.89	1.44	0.96	1.00	1.54	1.19
Maximum RR	1.68	1.52	2.46	1.20	1.46	6.03	1.55
Interquartile range	0.54	0.31	0.51	0.18	0.18	0.76	0.28

Figure 12

2017-2018 IDEIA Risk ratios: Orthopedic Impairment



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

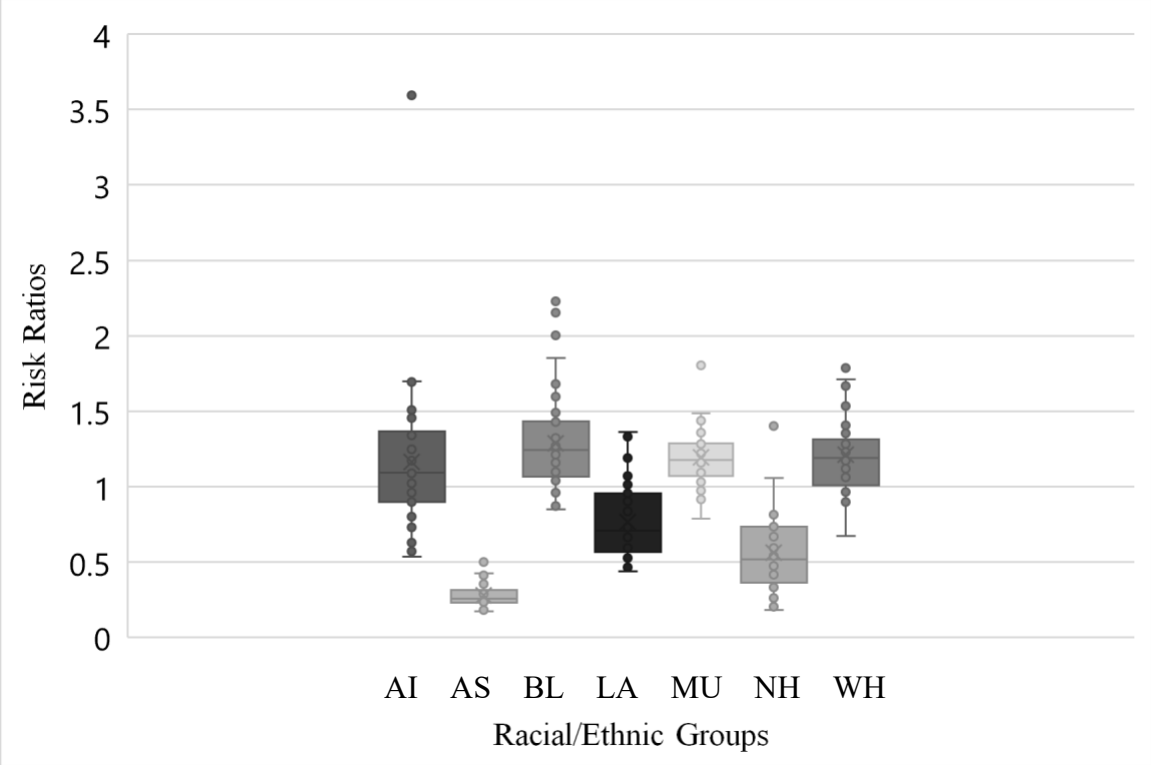
Table 12.

Descriptive statistics: Risk ratios for Orthopedic Impairment

	AI	AS	BL	LA	MU	NH	WH
n	35	47	44	44	45	25	47
Mean RR	1.09	1.40	0.92	0.87	0.99	1.81	1.20
Standard deviation	0.74	0.77	0.31	0.25	0.48	2.06	0.25
Minimum RR	0.36	0.47	0.36	0.27	0.14	0.38	0.50
1st quartile	0.72	0.94	0.70	0.74	0.68	0.96	1.06
Median RR	0.92	1.15	0.86	0.88	0.89	1.24	1.19
3rd quartile	1.12	1.68	1.07	0.99	1.22	1.84	1.37
Maximum RR	4.38	4.35	1.75	1.85	2.52	10.70	1.87
Interquartile range	0.40	0.74	0.37	0.25	0.54	0.88	0.31

Figure 13

2017-2018 IDEIA Risk ratios: Other Health Impairment



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

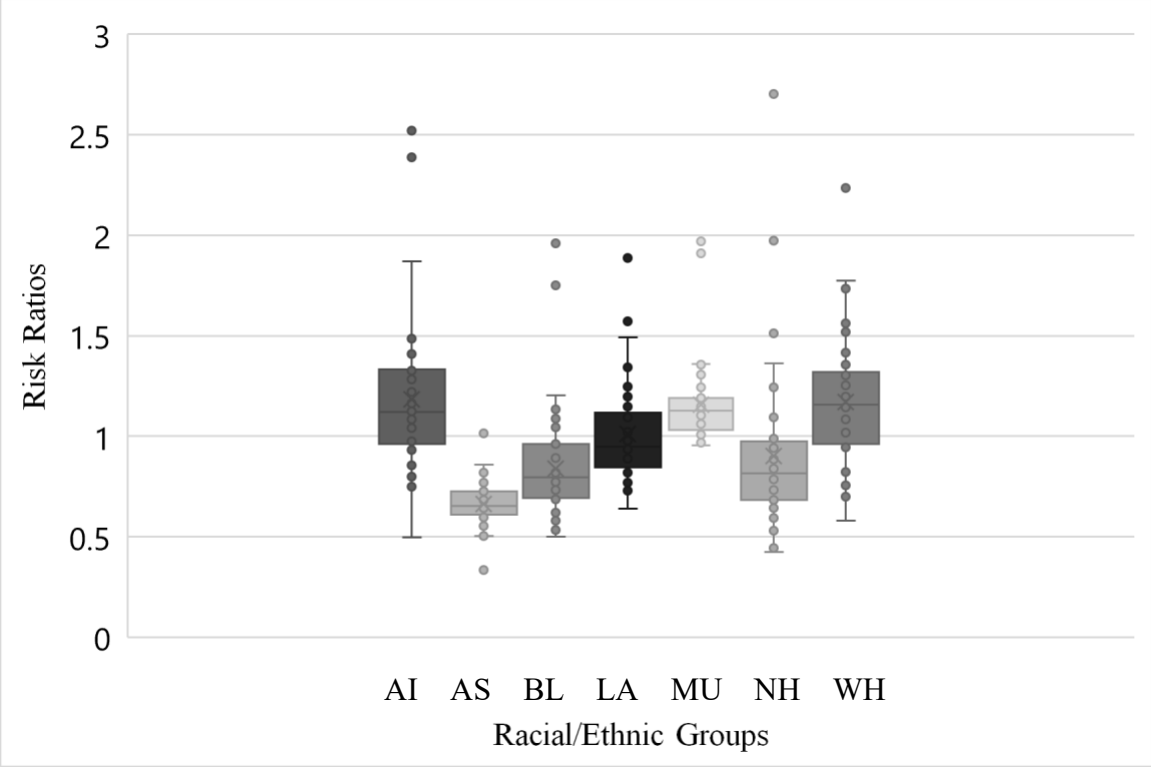
Table 13.

Descriptive statistics: Risk ratios for Other Health Impairment

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	43	47
Mean RR	1.16	0.28	1.29	0.76	1.19	0.56	1.21
Standard deviation	0.47	0.07	0.31	0.25	0.18	0.24	0.24
Minimum RR	0.53	0.17	0.85	0.44	0.79	0.18	0.67
1st quartile	0.90	0.23	1.06	0.57	1.07	0.36	1.01
Median RR	1.09	0.26	1.24	0.71	1.18	0.52	1.19
3rd quartile	1.36	0.31	1.43	0.95	1.29	0.73	1.31
Maximum RR	3.60	0.50	2.23	1.36	1.80	1.40	1.80
Interquartile range	0.47	0.08	0.37	0.39	0.22	0.37	0.31

Figure 14

2017-2018 IDEIA Risk ratios: Speech or Language Impairment



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

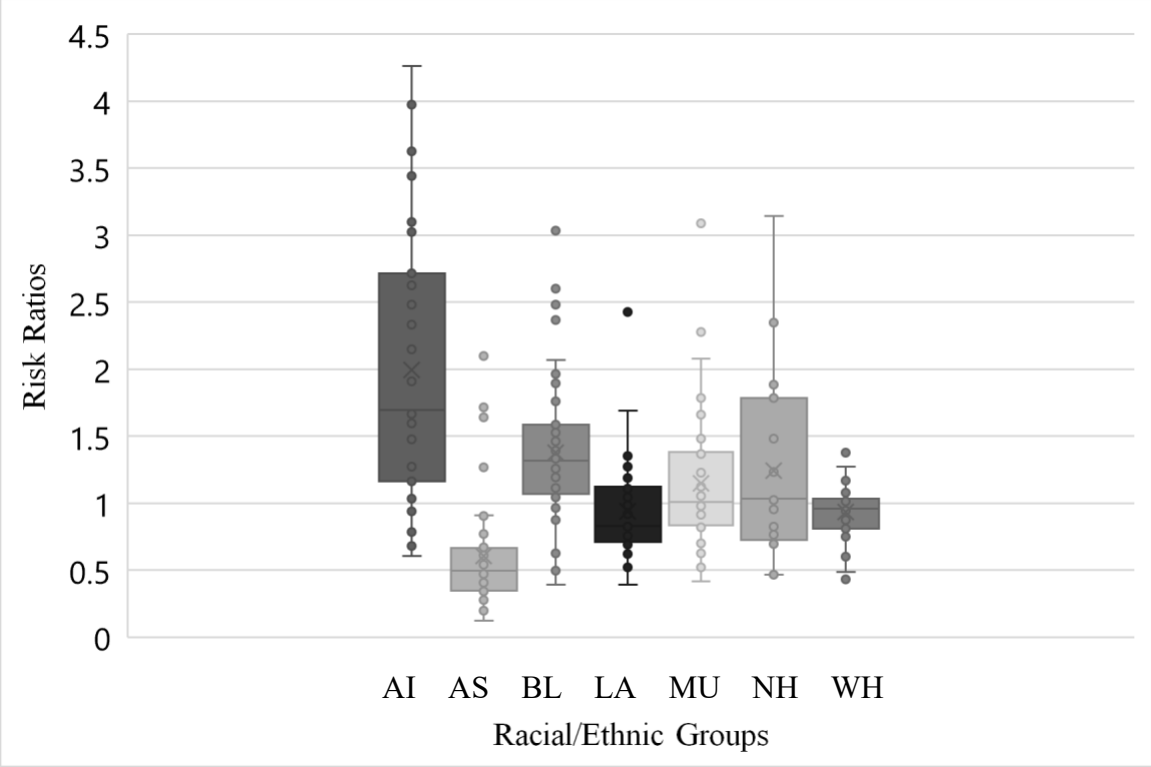
Table 14.

Descriptive statistics: Risk ratios for Speech or Language Impairment

	AI	AS	BL	LA	MU	NH	WH
n	47	47	47	47	47	47	47
Mean RR	1.18	0.66	0.84	1.01	1.16	0.90	1.17
Standard deviation	0.37	0.11	0.27	0.25	0.19	0.40	0.31
Minimum RR	0.50	0.33	0.50	0.64	0.96	0.42	0.58
1st quartile	0.96	0.61	0.69	0.85	1.03	0.68	0.96
Median RR	1.12	0.65	0.80	0.95	1.13	0.82	1.16
3rd quartile	1.33	0.73	0.96	1.12	1.19	0.97	1.32
Maximum RR	2.52	1.01	1.96	1.89	1.97	2.70	2.23
Interquartile range	0.37	0.12	0.27	0.27	0.16	0.29	0.36

Figure 15

2017-2018 IDEIA Risk ratios: Traumatic Brain Injury



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

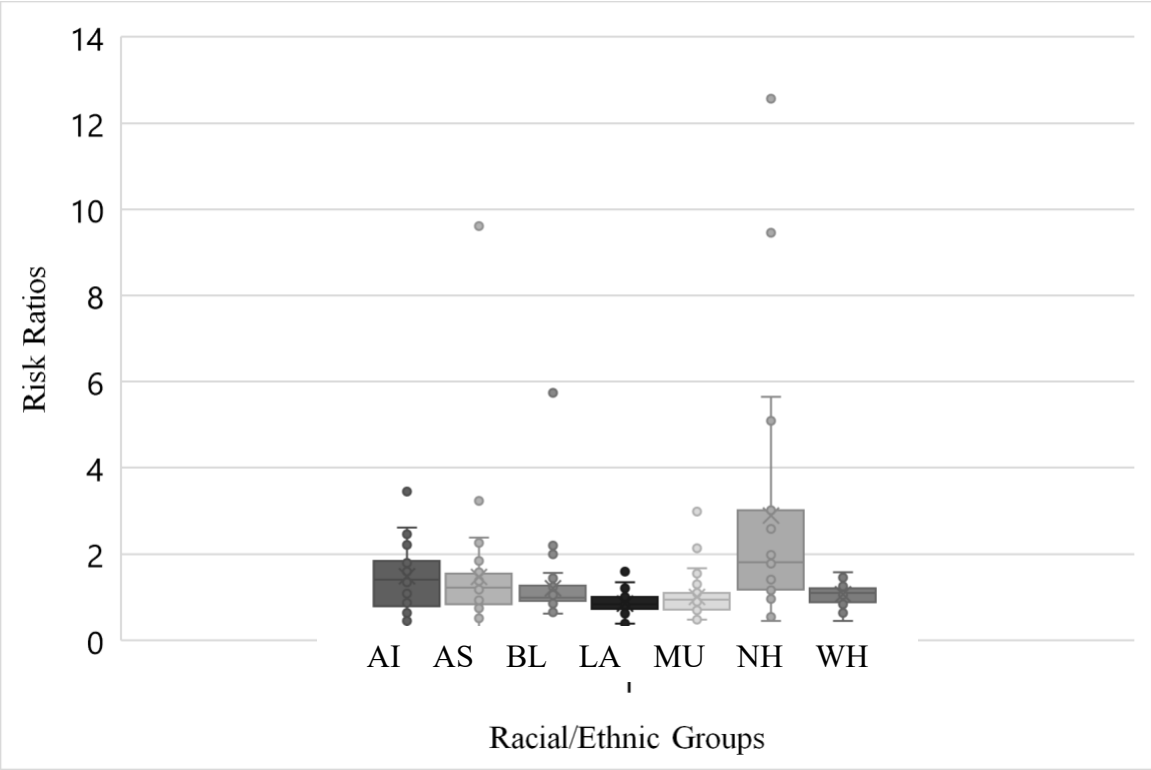
Table 15.

Descriptive statistics: Risk ratios for Traumatic Brain Injury

	AI	AS	BL	LA	MU	NH	WH
n	35	40	47	46	46	18	47
Mean RR	2.00	0.61	1.38	0.94	1.15	1.25	0.93
Standard deviation	0.97	0.42	0.53	0.35	0.49	0.72	0.19
Minimum RR	0.61	0.12	0.39	0.39	0.42	0.47	0.43
1st quartile	1.16	0.34	1.07	0.71	0.84	0.72	0.81
Median RR	1.69	0.50	1.32	0.83	1.01	1.03	0.96
3rd quartile	2.72	0.67	1.59	1.12	1.38	1.79	1.03
Maximum RR	4.26	2.10	3.03	2.43	3.09	3.14	1.38
Interquartile range	1.55	0.32	0.51	0.41	0.54	1.06	0.22

Figure 16

2017-2018 IDEIA Risk ratios: Visual Impairment



Note. AI = American Indian or Alaska Native. AS = Asian. BL = Black. LA = Hispanic/Latino. MU = Multiracial. NH = Native Hawaiian or Other Pacific Islander. WH = White.

Table 16.
Descriptive statistics: Risk ratios for Visual Impairment

	AI	AS	BL	LA	MU	NH	WH
n	38	45	45	46	47	23	47
Mean RR	1.49	1.47	1.20	0.86	1.00	2.89	1.06
Standard deviation	0.86	1.40	0.77	0.24	0.44	2.97	0.24
Minimum RR	0.18	0.15	0.61	0.38	0.47	0.45	0.45
1st quartile	0.79	0.83	0.91	0.72	0.71	1.17	0.88
Median RR	1.40	1.22	0.98	0.84	0.94	1.81	1.10
3rd quartile	1.83	1.54	1.26	1.01	1.10	3.02	1.21
Maximum RR	3.60	9.61	5.74	1.59	2.99	12.56	1.58
Interquartile range	1.04	0.72	0.35	0.28	0.39	1.85	0.33