**DRAFT of Manuscript for the *Journal of Research on Educational Effectiveness (JREE)* Special Issue on "Critical Quantitative Approaches for Anti-Racist Transformation in Education"**

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## Applying and Extending QuantCrit: Examining Overrepresentation at the Intersection of Race/Ethnicity and Special Education

**Abstract:** The field of education urgently needs research, aligned with QuantCrit, to address the overrepresentation of Black and Latinx students in special education. Our concern about how statistics have been (mis)applied motivated us to consider the possibility of quantitative methods for use in educational research that aims to dismantle white supremacy, and its intersections with other forms of oppression. Therefore, we applied and extended QuantCrit to develop specific methodological principles of practice to guide the use of quantitative methods for research on race and special education. Specifically, we examined data from the 2011 Early Childhood Longitudinal Study (ECLS-K) Study to advance data sensitivity approaches, using critical structural equation modeling (CritSEM), for anti-racist research on overrepresentation in special education.

**Keywords: QuantCrit, Special Education, Overrepresentation, Data Sensitivity Analysis**

The combination of longstanding critical theoretical arguments, court cases, and research has informed policy aimed at addressing the overrepresentation of Students of Color[1] in special education legislation, grounded in assumptions that overrepresentation equates to another form of racial segregation (Connor, 2019, Larry P v Riles, 1984; Skiba et al., 2016). Recent findings conveyed by researchers employing inferential statistics and claiming the underrepresentation of

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[1] In this paper, we choose not to capitalize white and do choose to capitalize Black, Latinx, and Students or Communities of Color as a grammatical move toward social and racial justice. This choice is informed by critical scholarship and activism, such as that by Dumas (2016) who writes that Black is a "self-determined name of a racialized social group that shares a specific set of histories, cultural processes, and imagined and performed kinships" (p. 12), white, on the other hand, is a socially constructed category that was created for the purposes of dominance and exclusion; it "does not describe a group with a sense of common experiences or kinship outside of acts of colonization or terror" (p. 13).

Black and Latinx students in special education have started to change these policies, despite differential findings and methodological concerns (Cavendish et al., 2018; Collins et al., 2018). For example, a major concern is the usage of achievement covariates in statistical models that fail to adequately and systematically account for structural inequities, and thus identify Students of Color for special education by relying on culturally deficit rationales (Author et al., 2023). While this research (Morgan, et al, 2015; Morgan, Farkas, Cook, et al., 2017; Morgan, Farkas, Hillemeier, et al., 2017; Shifrer, et al., 2011; Wiley et al., 2013) claims to advance justice, its methodological shortcomings instead reinstate former policies that promote white supremacy[2]. Activists fighting to achieve racial justice in special education see their efforts unraveling from opposing research and changing policy.

The field of education urgently needs research aligned with QuantCrit — Quantitative Critical Race Theory — to address the overrepresentation of Black and Latinx students in special education. Our concern about how statistics have been (mis)applied motivated us to consider the use of quantitative methods in special education research that aims to dismantle white supremacy, and its intersections with other forms of oppression. Therefore, we developed specific QuantCrit principles of practice that would guide our research inquiry on race and special education. Specifically, we examined data from the 2011 Early Childhood Longitudinal Study (ECLS-K) Study to advance data sensitivity approaches, using critical structural equation modeling (CritSEM), for anti-racist research on overrepresentation in special education. We asked the following methodological questions:

- How do we *extend and apply* QuantCrit to study the overrepresentation of Black and Latinx students identified for special education?
- How do we envision the future of extending QuantCrit in education research?

**Researcher Positionality**

The three of us came together inspired by the potential of quantitative approaches to contribute and amplify the contextualization of educational phenomena, a research outcome most associated with qualitative research. Recent educational scholarship about how quantitative

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[2] In contrast to a meaning of white supremacy that focuses on overt acts of racialized hatred, when we use the term "white supremacy," we mean the everyday enactments of "the systematic maintenance of the dominant position that produces [w]hite privilege" (Battey & Leyva, 2016, p. 50) – the multitude of mechanisms by which whiteness stays at the center.

methods could be employed to advance projects of racial justice, opened the door for us to further theorize, innovate, and use statistical tools in alignment with our political aims (Author, 2018; Barnes, 2016; Gillborn et. al, 2018;; Sablan, 2019). Similar to these scholars, we refused to shy away from quantitative approaches, while mindful of well-merited critiques of their misuse to study and frame Communities of Color across disciplines. This meant refusing superficial nods to Critical Race Theory (CRT) in quantitative research that fail to demonstrate adequate theoretical application throughout the inquiry process. We also aspired to greater transparency in the technical workings of statistical approaches to demonstrate the utility of QuantCrit in quantitative research design and analysis.

Our collaboration began when [Author] invited us to co-analyze data from his broader body of work, that a) applies CRT to expose research mechanisms steeped in white supremacy and eugenics that therefore contribute to the overrepresentation of Black, Latinx, and Emerging Bilingual students in special education; and b) explores anti-racist special education policy and practices to disrupt overrepresentation. [Author's] research underscores the troubling consequences of how overrepresentation is measured for these populations and raises questions that should concern all educational scholars, and especially those who tackle race centrally in educational inquiry. We argue that few *quantitative* studies to date appropriately contextualize the historical and political landscape that necessarily shape the educational realities under investigation. Race, gender, class, disability – every identity that exists in a hierarchy of power – all matter in the US social matrix and in shaping how we perceive social phenomena (Collins, 1986). Thus, an important part of any research is articulating what influences our analysis. Further, Smith, Tuck, and Yang (2019) emphasize the importance of naming positionality for challenging settler-colonial logics in research; that is, challenging the notion of knowledge as separate from self, community, and place. Toward that end, it is vital to articulate our positionalities - the social location from which we designed this study and collectively engaged in data analysis.

[Author] is a white cis-gendered man who spent ten years working as a special education teacher. During that time, he witnessed rampant racism, ableism, and sexism in elementary and high schools. This experience shaped his pursuit of research on overrepresentation in special education through the lens of CRT, particularly as it intersects with disability. For [Author], the persistence and pervasiveness of white supremacy in special education has been at the heart of

systemic injustices in school since the early 20th century when the concept of special education became an institutionalized practice to control the flow of students. This history and his own direct experiences in K-12 classrooms have motivated [Author] to advance racial and social justice in research on special education through the lens of CRT and QuantCrit.

[Author's] academic journey has been characterized by a notable lack of diversity, particularly in terms of race and regional background. As a Black Southern man working in the field of measurement and statistics, he has often been the only person of his demographic in various educational and professional settings, including his undergraduate program for special education teaching, his graduate studies in measurement and statistics, his internship at the Education Testing Service, and his current position at the [University]. In light of this, [Author] has actively sought out opportunities for research, leadership, and service in order to make a meaningful impact, but also to promote inclusivity and diversity in educational spaces for individuals like himself.

[Author] is the US-born daughter of Latinx immigrant parents. Like many children of immigrants, she served as a translator for her family. She witnessed countless moments of disdain and judgment on behalf of her teachers toward her mother for not assimilating, and the frustration and shame her mother felt as a result. Though she didn't have the language then, Author understood at an early age how schools actively work to subtract her family's culture (Valenzuela, 1999) and envelope her, and others like her, in whitestream ideologies (Grande, 2015). These early schooling experiences motivated [Author] to pursue grassroots organizing with Latinx migrant families in campaigns for educational reform. This trajectory informs her current work that centers CRT and LatCrit to deepen theoretical and methodological skills, particularly computational and spatial approaches, for conducting research on race and racism in education.

**Critical Race Theory, QuantCrit, and the Use of Statistics for Social and Racial Justice**

Critical race theory (CRT) originated in the late 1970s from the work of lawyers, activists, and legal scholars as a new strategy for dealing with the emergence of a post-Civil Rights racial structure in the United States. This structure, they argued, was maintained by a color-evasive[3] ideology that hides and protects white privilege while masking racism in a

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[3] We use color-evasive in lieu of color-blind, the more traditional term for this ideology to (a) problematize an assumption that equates blindness with ignorance that inaccurately conveys and distorts the unique way blind individuals interact with the world;

rhetoric of "meritocracy" and "fairness" (Bonilla-Silva, 2001; Delgado & Stefancic, 2001; Solorzano & Yosso, 2002). Premised on the belief that the Civil Rights struggle and numerous legal decisions, such as Brown vs. Board of Education of Topeka (1954), granted equal opportunities to all citizens, color-evasive ideology argues that race is no longer a decisive factor in the distribution of resources. The danger of color-evasive "racism," though, is that it disregards the ". . . enormous and multifarious implications of the massive existing racial inequality" (Bonilla- Silva, 2001, p. 80). Not only does it deny that institutions continue to perpetuate racism, its "reasonable" and politically correct style has made it both a popular and "moral" position, creating an ". . . almost impenetrable defense of postmodern white supremacy" (Bonilla-Silva, 2001, p.162). CRT powerfully emerged within this context as a framework aimed at undermining color-evasive ideology through a deconstruction of its racist premise.

CRT draws from several disciplines, including civil rights, ethnic, and critical legal studies, to examine and transform the relationship among race, racism, and power (Delgado & Stefancic, 2001). Mari Matsuda (1991) defines CRT as ". . . the work of progressive legal scholars of color who are attempting to develop a jurisprudence that accounts for the role of racism in American law and that works toward the elimination of racism as part of a larger goal of eliminating all forms of subordination" (p.1331). Thus, CRT is motivated by social justice and characterized by a passionate activism to eliminate racism as part of a broader effort to end subordination on gender, class, sexual orientation, language, national origin, and other social and structural locations. Some of the basic tenets or themes of CRT include the re-examination of history through the experiences of People of Color and interest convergence, the belief that racial reform only served to promote whites' self-interest (Bell, 2004; Delgado & Stefancic, 2001). Since it was introduced, CRT has branched into several areas to denote key intersections in the material and ideological realities of white supremacy and other social locations of identity. For example, Critical Race feminisms (Wing, 1997) intersects an analysis of white supremacy with patriarchy to examine the experiences of Women of Color and analyze the reasons why conventional approaches to addressing gender discrimination have failed them (e.g., white-centered feminism).

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and, (b) rethink and remove ableist language as core to our explicit efforts toward social justice in all aspects of our work, particularly in research and scholarship (Annamma, Morrison, & Jackson, 2014).

Anchored within CRT, QuantCrit subverts the notion of objectivity in quantitative methods to problematize color-evasive approaches that use numbers and statistics to frame Communities of Color as deficient. There is plenty of historical evidence of the misuse of quantitative data to misrepresent, silence, oppress, and ultimately blame People of Color for their purported failures at social and educational progress (Ladson-Billings, 2007; Zuberi & Bonilla-Silva, 2008). Within education, examples of this misuse of data are common. For example, discussions of the achievement gap, school "dropouts," and failing schools, often leverage statistics to "prove" a culture of poverty among Students of Color and their families (Valencia, 2015; Ladson-Billing, 2017). Given that "[n]umbers are increasingly used to justify policy priorities and to label teachers, schools, districts, and even entire countries, as educational successes and failures" (Gillborn et. al, 2018, p. 161), the urgency to rethink quantitative approaches in educational research is clear, particularly when People of Color are targeted.

Arguably as the first QuantCrit scholar, Du Bois (1899) demonstrated how statistical analyses could disrupt racist data narratives to center a more critical narrative of Black life in the U.S. Morris (2015) highlights how Du Bois relied on statistical and comparative data, analyzed and displayed through powerful visuals in the form of charts, graphs, and maps, to demonstrate how Blacks and Europeans behaved similarly in shared social circumstances. This challenged social Darwinist beliefs of white scholars at the time, pointing instead to structural conditions. As Morris (2015) notes, Du Bois, "refut[ed] the notion that [B]lack people were intellectually inferior, uninterested, and incapable of learning. He accomplished this by presenting graphs that showed the [B]lack illiteracy rate was rapidly declining and school enrollments were climbing" (p. 35). Thus, the trajectory of scholars questioning, while *insisting*, on quantitative approaches that endeavor to produce anti-racist research is *not* a recent phenomenon.

In addition to CRT, QuantCrit has its intellectual roots in the field of sociology, where Scholars of Color pushed methodological boundaries by deracializing statistics and applying race conscious inquiry (Du Bois, 1899; Cruse, 1967; Zuberi, 2001, Lander, 1973; Zuberi & Bonilla-Silva, 2008). To conceptualize quantitative approaches for more radical ends, Zuberi (2001), for example, traced the origins of statistics to the eugenics movement (see also Morris, 2015). Henricks (2015) demonstrated how aggregate state data were used to define and enforce state policies that led to disproportionate taxes and fines on Black communities. Similarly, Hogan (2017) used the American Community Survey (ACS) to illuminate how conventional reports that

conflate Latinx origin and race hide how poverty rates among Latinxs identifying as white are consistently lower than among Latinxs who identify as Black (López et al. 2018; Sáenz & Morales, 2015).

Despite the nefarious origin of statistics, Zuberi (2001), like Du Bois, embraced the use of statistics. By providing a blueprint for rectifying the mechanical and decontextualized use of data, Zuberi influenced social scientists to advance quantitative methods for racial justice (Morris 2015; Zuberi 2001; Zuberi & Bonilla-Silva 2008). Furthering this work in the field of education, Covarrubias (2011) advanced intersectional inquiry (Collins 1986; Crenshaw 1991) to examine interlocking systems of power among Chicanxs to display trends of "gender-based discrimination, patriarchy, class inequality, nativist racism and their interconnected effects" (p. 103). Author (2013) subsequently conceptualized *critical race quantitative intersectionality* to cross-examine how descriptive statistical data historically has advanced deficit perspectives affecting educational research, policy, and practice for Students of Color, their families, and their communities. And, most recently, the special issue in *Race, Ethnicity, and Education (2018)* that introduced QuantCrit and its guiding tenets (Gillborn et. al, 2018):

Early conversations in the development of QuantCrit expressed a deep commitment to open a productive dialogue for considering anti-racist quantitative methodologies in educational research. We have taken up that task to explore the study of overrepresentation in special education. Educational scholars committed to anti-racist practices and policies should be deeply concerned about overrepresentation, which scholars equate to a form of *resegregation* (Authors et al., 2023). Black and Latinx students are forced into educational tracks that consist of oppressive experiences, leading to unjust outcomes. And now, the resegregation of students via special education is abetted by quantitative research (Morgan et al., 2015; Morgan et al., 2017). From a CRT perspective, the notion of identifying additional Black and Latinx students, which would amount to a greater extent of resegregation, is naïve, problematic, and dangerous (Cavendish et al., 2018; Collins et al., 2016; Connor, 2019). We felt compelled to intervene by conducting research *at the intersection of race and special education*, using QuantCrit.

**Advancing QuantCrit Principles of Practice**

After reviewing the emergent body of work on QuantCrit, we reflected on its application in our educational inquiry to address the overrepresentation of Black and Latinx students in

special education. We drew on CRT, QuantCrit, and statistical theory to advance three principles

of practice that extend QuantCrit and offer new insights for its application in research.

**Principle of Practice #1: Define a Political Purpose for Using QuantCrit**

Defining a political purpose for using QuantCrit establishes the critical nature of the

research and underscores a commitment to dismantling white supremacy throughout the research

process. Stemming from the literature, we discuss three purposes (Pérez Huber et al.. 2018;

Author, 2018; Gillborn et al., 2018; López et al., 2018; Sablan, 2019): 1) advocating for asset-

based research 2) exposing white supremacy in the uncritical use of statistics, and 3) making

methodological advances in the critical use of quantitative methods.

*Advocating for Asset-Based Research*

Asset-based research tells a different story about students institutionally marginalized in

schools. A quintessential example of asset-based research is Ladson-Billings' (1994) qualitative

research on culturally relevant pedagogy. She examined Black teachers' successful practices and

experiences in urban classrooms (Ladson-Billings, 2014) in opposition to the deficit-based

research focused on achievement. Similarly, QuantCrit should aim to produce (causal) evidence

of asset-based practices and policies that explicitly counter culturally deficit scholarship and

research.

Culturally relevant pedagogy also provides an example of how quantitative researchers

can use qualitative research to conceptualize empirical research of asset-based practices and

pedagogies. Emergent quantitative research has started to explore the outcomes of culturally

relevant pedagogy (Aronson & Laughter, 2016), following years of rich qualitative findings

(Duncan-Andrade, 2007; Howard, 2001; Tate, 1995; Milner, 2011). Asset-based research

becomes vital given the influence of causal research on educational policy and practice.

*Exposing white supremacy in the Uncritical Use of Statistics*

Given its anchor in CRT, a primary purpose of QuantCrit is to expose white supremacy in P-12 and higher education by critically intervening with the use of statistics, particularly when People of Color are the focus of inquiry. QuantCrit argues that white supremacy is maintained when the manipulation of statistics is supported by evidentiary claims of "objectivity" and "neutrality." These claims stem from how western[4] science "position[s] humans as separate from the natural world…transform[ing] non-human forms of life into objects for human use" (Bang, 2017). This abstract subject-object orientation is endemic in positivism – the notion that there is a physical world 'out there,' separate from human perception and culture, that can be known to some level of truth through the use of appropriate scientific or statistical methods. As Harding (1998) reminds us, "it is exactly the lack of cultural fingerprints that conventionally is held responsible for the great successes of the sciences" (p. 61). This is what gives statistics a perception of inherent universality, making it challenging to expose how it colludes with systems of power when applied uncritically.

We argue white supremacy is reproduced when quantitative *research infers* overstated conclusions from models statistically significant yet lacks an understanding of race as a social construction. Furthermore, without a critical theoretical orientation, these issues easily become invisible, masked in rhetoric of "objectivity" and "neutrality."  In response, researchers can and should conduct empirical research that refuses decontextualized and acultural approaches in

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[4] Here, our use of "western" does not refer to a geographic location, but instead to an ideological one, that signals how mainstream understandings of the world are not neutral and in fact reflect particular epistemologies, ontologies, and axiologies. According to Brayboy & Maughan (2009) western approaches to knowledge production look for "eternal truths, laws, and principles that may be proven through the posing of hypotheses, test construction, and 'scientific' experimentation" (p. 79). The use of the word "western" reflects their role in (European) settler colonialism (Battiste, 2002); in choosing this term, however, we risk overgeneralizing an oppressive ideology to the geographic "west," which includes South America and some African countries.

favor of providing a powerful quantitative counterstory (Covarrubias et. al, 2018), that merges critical theory with statistical and probability theory.

*Advancing Quantitative Methods, Methodological Applications, and Research Design*

Researchers can advance the field of educational statistics by applying QuantCrit, for example, to external validity, internal validity, causal frameworks, and applied methods.

For external validity, defining the conditions when a critical researcher can generalize effects needs extensive development. Claims of external validity should consist of robust theoretical justifications and causal evidence with specificity about the population understudy. The intersectionality of participants' identities is an important, unexplored aspect when it comes to external validity (Collins & Blige, 2916; Covarrubias, 2011; Crenshaw, 1991).

Internal validity, allowing researchers to infer statistical effects due to a cause, can be threatened even with stringent designs that utilize causal frameworks. When thinking about critical research, the current identified internal validity threats in the extant literature need further development, and the conceptualization of additional threats may be necessary. For example, preexisting conditions historically grounded in racial injustices likely threatens the internal validity of studies on institutionally minoritized populations and researchers' abilities to make causal inferences.

Additionally, the interactions of threats require more attention such as the interaction between selection and history. For instance, groups in a research investigation could experience different confounders, or unexpected events, at the same time of the presumed cause, which then leads to an uninterpretable effect.

Frequently, researchers hope to gather evidence from causal research (e.g., experimental research). We question if even experimental designs suffice without a qualitative component to

verify the findings, such as groundtruthing (Authors, 2017), cultural intuition (Delgado Bernal, 1998), and /or qualitative research. New causal frameworks for QuantCrit research will help set a new standard for causal evidence. Lastly, researchers should apply the most appropriate and rigorous statistical methods for analyzing the theoretical underpinnings of models. Building statistical models that accurately measure constructs involving Black and Latinx populations requires the field to move beyond the current application of methods.

**Principle of Practice #2: Align Critical Theory with the Research Design**

Every aspect of a QuantCrit research design should be theoretically driven (Garcia & Mayorga, 2018). Four considerations are provided for the conceptualization of research to support critical analyses of data.

First, research is contextualized with critical theory to fully understand the injustice, prior to statistical analyses. The entry point for statistical analyses should never be methodological, but rather political, grounded in and guided by a theoretical framework. Critical theory is absolutely necessary for any research, but especially quantitative research, given problematic claims to "neutrality" and "objectivity" often associated with statistics, as noted above. And if justice is what we seek, then we have to insist on the contextualizing of our study within a landscape of power - historical, economic, social, etc. Further, scholars explicate the potential outcomes of their research, while also considering limitations. Limitations, and consequences, are stated at the forefront of the paper, so scholars can problematize their research and discuss how these limitations affect methodological decisions and analyses.

Second, research questions and hypotheses typically involve a linear process that results in findings and conclusions, following analyses. We argue that research questions should support a dynamic process, when appropriate, that consists of several iterations, using theory and

qualitative research to further understand quantitative results and ask follow-up research questions (Covarrubias et al., 2018; Pérez Huber et al., 2018). While the initial findings may render exploratory question(s) unnecessary, these questions serve as a reminder – at the very least – of using theory to align the findings.

Third, quantitative data (i.e., experimental data, simulated data, and secondary data) provide ample opportunities to conduct asset-based research, expose white supremacy, confront uncritical uses of data, and/or contribute to methodological advancements. Yet despite the opportunities, the data should be interrogated prior to analyses (Gillborn et al., 2018). Secondary data require the most scrutiny since the researcher was not involved in the construction of the data, and presumably the data was created devoid of a critical lens (Garcia & Mayorga, 2018; Gillborn et al., 2018). The uncritical construction of secondary data presents limitations in categorical labels absent of Intersectionality (Collins & Blige, 2916; Crenshaw, 1991) that may conceal racism, without the interrogation of labels (Covarrubias, 2011; Garcia & Mayorga, 2018; Lopez et al., 2018).

Along those lines, Intersectionality in data analytical models can be applied to specify independent variables, interactions of independent variables, and centering of the reference group. This application provides a deeper theoretical understanding, rather than analyses of isolated identities (Covarrubias, 2011; Lopez et al., 2018), of how identities converge on individuals. Exploring the effects of individuals at the intersection of multiple identities with independent variables requires attention when constructing data, whether researchers collect their own data or analyze secondary data, to create an independent variable representing multiple categories of differences. The researcher explicitly chooses the reference group, represented by multiple identities, with a justification. For example, scholars may want to explore the effects of

culturally relevant teaching on students' engagement in the classroom and development of their critical consciousness, choosing the reference group to be Latinx girls, or Latinx boys and girls. Intersectionality naturally requires in its statistical application, a theoretical explanation.

Lastly, the inclusion or consideration of qualitative approaches in some fashion alleviates issues expressed by scholars about the sole usage of quantitative methods (Covarrubias, et al., 2018; Pérez Huber et al., 2018). Scholars discuss the advantages of grounding statistics in the experiences of communities to develop a more complete understanding of the data (Covarrubias, et al., 2018). Pérez Huber et al. (2018) used qualitative methods (e.g., cultural intuition, groundtruthing, and qualitative research), which revealed a part of the story not told by the numbers. At the same time, Sablan (2019) pushed back on this notion (i.e., the sole usage of advanced quantitative methods), providing an example of asset-based research and a counterstory. QuantCrit studies may necessitate entire manuscripts. In these circumstances, the absence of qualitative research methods could be noted as a limitation, but there are potential ways of grounding statistical findings with qualitative research. Existing qualitative research could support the conceptualization of research design and situate the research and findings.

**Principle of Practice #3: Data Sensitivity Approaches for Anti-Racist Research**

We argue for the need to use *data sensitivity approaches,* defining this term as the statistical approaches that researchers use to incorporate and test critical theory, formulated and backed by qualitative inputs in the development of models. These analytical approaches are sensitive enough to detect the theoretical underpinnings of CRT underlying models and test the assumptions of that theory.

According to Delgado Bernal, the Chicana feminist scholar draws on four sources of cultural intuition in her research: her personal experience that shapes how she understands,

interprets, and makes sense of the data she collects; a sensitivity to identify and analyze relevant data and literature to her work; her professional experiences working with the community; and her analytical intent in bringing meaning to the data by including her informants in data analysis (Delgado Bernal, 1998). We present four data sensitivity approaches with the potential to accomplish just this in QuantCrit research. First, we present Critical Structural Equation Modeling (CritSEM), an overall analytical approach that could (should) be used in conjunction with the three other modeling approaches. Then, we discuss three other data sensitivity approaches: Bayesian modeling, phantom variable modeling, and Critical Race Spatial Mapping.

***Critical Structural Equation Modeling (CritSEM)***

Structural equation modeling (SEM) is an applied methodological approach that incorporates and tests *a priori* theory (Bollen & Pearl, 2013; Kline, 2016; Montfort, 2010; Morgan, 2013). With SEM, researchers use theory and prior research to conceptualize structural paths to indicate the causal directionality of measured and/or latent variables, which represent theoretical constructs defined by the correlations among measured, dependent variables, in the case of reflective models (Bollen, 1989). Bollen and Pearl (2013) wrote, "Structural equation modeling is an inference engine that takes in two inputs, qualitative causal assumptions and empirical data, and derives two logical consequences of these inputs: quantitative causal conclusions and statistical measures of fit for the testable implications of the assumptions" (p. 309). Theory is explicated up front in the form of hypothesized path diagrams that indicate based on the theoretical underpinnings of the model directionality between the [latent] variables. To test that theory, models produce fit statistics to evaluate the overall structure of the model, in addition to statistical estimates. Poor fit statistics require a reevaluation of the overall structure, involving an iterative approach to further understand the data and theory.

SEM is a robust data sensitivity approach to extend the methodological application of QuantCrit. We define this application as *Critical Structural Equation Modeling* (CritSEM)- an analysis combining the tenets of Critical Race Theory with the methodological considerations of SEM. Structural equation modeling is not a singular statistical technique, but rather, is an analytical process including the conceptualization of the model, identification, and estimation of parameters and assessment of model fit (Mueller & Hancock, 2018). The combination of SEM and CRT offers researchers several major benefits. First, it presents counternarratives using path models and measurement models (Kline, 2015). The application of theory in full structural equation models could tell a powerful counterstory to discredit deficit-based research lacking theory. Scholars posit and explicate critical theory in their construction of structural equation model(s) as an alternative explanation, that if confirmed, repudiates opposing forms of uncritical research. Second, it establishes external validity of models that investigate the structural connections between latent variables underlying the observed data. Third, CritSEM tests the theoretical underpinnings of models, in which, researchers construct these models using Critical Race Theory, qualitative research, and justice-based scholarship. As an overall analytical approach, we recommend CritSEM which could (should) be used to incorporate other statistical models. For example, the three other data sensitivity approaches below if applied within a CritSEM approach would have the added benefits of structural equation modeling.

### Bayesian Modeling

A frequentist approach[5] to statistics is fraught with issues (Kruschke, 2013). The underlying premise of frequentist statistics is often misunderstood, therefore misused in the

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[5] "The conception of probability underlying NHST is called frequentism. The frequentist interpretation of the probability of occurrence for an event is the long-term relative frequency of its occurrence. When using NHST, we make a decision based on a p-value—on the prob- ability of the data under the assumption that the null hypothesis is true—rather than on the more desired and intuitively appealing option—the probability that the null hypothesis is false given the data" (Peterson & Kaplan, 2016, p. 131).

application and interpretation of statistical results, leading to incorrect inferences and conclusions (Kruschke, 2010, 2013; Kruschke & Liddell, 2018a, 2018b; Greenland, 2019).

A Bayesian approach offers numerous advantages over a frequentist approach to statistics because of the incorporation of priors, defined by previous research and scholarly work, in relations to the data, together resulting in a Bayesian inference that is based on mathematical probabilities (Jackman, 2009; Peterson & Kaplan, 2014). In essence, a Bayesian inference is the reallocation of credibility across parameter values combined with the likelihood function to produce a posterior distribution.

Bayesian modeling addresses some of the issues associated with frequentist statistics, providing a logical, intuitive interpretation of findings, based on probabilities, in a way that frequentists statistics often get [incorrectly] interpreted in research (Kruschke & Liddell, 2010). Bayesian modeling permits the inclusion of previous research, known as priors. Priors, defined and justified by the researcher, influence the estimation to produce a Bayesian inference. The inclusion and justification of priors is beneficial for understanding the reality of data in the context of past quantitative and qualitative work; these estimations provide a confirmatory way to evaluate prior information with new data. The interpretation of results naturally foregrounds the estimates, when priors are defined, instead of treating the effects as isolated events.

From a measurement perspective, the mathematical composition of Bayesian models helps preclude the sensitivity issues associated with sample sizes, large and small, in frequentist research. Additionally, Bayesian models offer a measurement benefit above and beyond most classical approaches to statistics, in that the overall specification of Bayesian modeling can be measured to detect misspecification or poor model fit, testing the theory of the model. The

inclusion of priors, interpretation of estimates, measurement advantages, and fit assessment in Bayesian modeling advantages critical researchers in telling a comprehensive story.

### *Phantom Variable Approach: State-of-art Uncertainty and Sensitivity*

Specific data sensitivity approaches also assess how fragile a result is against the possibility of unobserved confounding (Cinelli & Hazlett, 2020). We make the case for researchers to examine the sensitivity of their findings to data initially omitted from SEM analyses by generating a phantom variable. By definition, the phantom variable is a latent variable with a mean of zero, a variance set to one, and no manifest indicators (Harring et al., 2017). In the context of SEM, this approach first identifies a phantom variable that confounds the relations among variables specified in the initial model (Leite et al., 2022). The path coefficients from the phantom variable to the other variables quantify the hypothetical linkages between a previously unidentified confounder and the original variables in the model. Varying these parameters can allow researchers to investigate the results' trustworthiness and generalizability. That is, the sensitivity to a missing confounder and other forms of external misspecification (Harring et al., 2017).

Connecting the phantom variable approach to critical analyses may prevent simply encoding the funding agencies' and researchers' beliefs about critical research problems. Additionally, it directs attention to variables that were not collected or accessible to the researcher(s) performing the analysis. Thus, it acknowledges and potentially reduces unrealistic expectations that quantitative analyses include all the appropriate and relevant variables needed to control for social and political conceptions of race and ethnicity.

### *Critical Race Spatial Analysis*

Like QuantCrit, Critical Race scholars in education are considering whether spatial tools – like *the map* – could be employed conceptually and methodologically for analyzing race and racism (Author, 2017). These scholars introduced Critical Race Spatial Analysis (CRSA) to extend map-*making* from its home in geography and urban planning and imagine its use for critical race educational inquiry. A mostly quantitative praxis, CRSA engages computerized mapping technologies known as geographic information systems (GIS) to study the relationship between race and space and how it affects educational (in)opportunities for People of Color. According to Elwood and Leitner (2003), "GIS is a computer technology that enables storage, analysis, and mapping of a wide range of geographic information, including demographic, socio-economic, housing, crime, environmental, and land-use data" (p. 140). Though other statistical tools that analyze space can provide the what, how, and why of research questions, they often fall short of adequately answering and conveying the *where*.

We argue QuantCrit advances quantitative applications in CRSA to produce data visualizations capable of contextualizing the role of race and racism in the educational trajectories of Communities of Color. For example, analyzing and visualizing geographic color-lines that refuse causal understandings of racial inequity that promote culturally deficit analyses or challenging race-neutral representations of space by insisting on data sources, data mining, and statistical techniques that make evident how race, racism, and white supremacy have been structurally and systematically deployed. Quantitative methodologies used to study space must first recognize the depth to which space is informed by particular histories, social and political processes, and the forces affecting those processes. Anchored in that understanding, spatial features such as *distance, density, scale*, and *"hot spots,"* all of which are measured quantitatively, can be applied as measures of racial inequities.

**QuantCrit Methods: Investigating Overrepresentation at the Intersection of Race/Ethnicity and Special Education**

We discuss how we applied our principles of practice in different methodological phases to examine the causes of overrepresentation and culturally relevant teaching as an anti-racist way to disrupt overrepresentation, building off our previous research.

**Planning Phase 1: Applying Principle #1**

In the first phase, we conceptualized and defined a purpose for our research, after reviewing prior scholarship. Qualitative researchers have conducted historic, groundbreaking studies to reveal and elucidate key findings about overrepresentation (Connor, 2009, Harry, 1992; Harry et al., 2005; Harry et al., 2008; Harry & Klingner, 2014; Hart et al., 2010). Using descriptive and inferential statistics, researchers also aided these findings by showing the magnitude of the problem. These studies helped adjudicate laws and federal policy. Yet, researchers are now using achievement covariates in their statistical modeling to make claims that these same students are underrepresented, reinforcing arguments of eugenics ideology (Gould, 1996; Selden, 1999). Recent CRT scholarship problematizes their misuse of inferential statistics (Cavendish et al., 2018; Collins et al., 2018; Connor, 2019).

From a QuantCrit perspective, we used data analytical modeling for the purposes of understanding why Black and Latinx students are overrepresented and how to disrupt overrepresentation. Our investigation was meant to counter uncritical forms of research (Morgan, et al, 2015; Morgan, Farkas, Cook, et al., 2017; Morgan, Farkas, Hillemeier, et al., 2017; Shifrer, et al., 2011; Wiley et al., 2013) on representation in special education (Cavendish et al., 2018; Collins et al., 2018; Connor, 2019).

In our investigation, we wanted to expose the hidden forms of white supremacy that continue to allow overrepresentation to persist and think about culturally relevant teaching, an asset-based approach, as a way to confront and disrupt the overrepresentation of Black and Latinx boys and girls in special education (Author, et al., 2023). We asked two research questions: (a) Why are Black and Latinx boys and girls still overrepresented in special Education? (b) To what extent do teachers' usage of culturally relevant teaching disrupt overrepresentation for Black and Latinx boys and girls?

**Planning Phase 2: Applying Principles #2 and #3**

In the second phase, we used CritSEM as our data sensitivity approach to analyze secondary data from the ECLS-K Study (e.g., Early Childhood Longitudinal Study-K 201,1 Restricted Data). We hypothesized *a priori* structural equation models, hoping to garner evidence from these models, on reducing overrepresentation (Bollen, 2014; Kruschke, 2010, 2013; Kruschke & Liddell, 2018a, 2018b; Greenland, 2017a, 2017b, 2019; Morgan, 2013). Our hypotheses focused on the causes of special education referrals in early elementary school and ways to disrupt this unjust process. Specifically, we hypothesized that (a) teachers' deficit-based assessments and usage of early achievement scores, during kindergarten, will result in overrepresentation; and (b) teachers' usage of culturally relevant teaching, during kindergarten, will reduce overrepresentation of Black and Latinx boys and girls.

We constructed four structural equation models to test our hypotheses, incorporating the phantom variable approach for two of the models.

*Limitations*

We made the conscious decision to discuss the limitations of our research at the forefront, prior to presenting the structural equation models. A major limitation of our study was the analysis of secondary data. The ECLS-K Study was designed to collect longitudinal data on students, kindergarten to fifth grade, representative of student demographics in the United States. While this data provides opportunities for analyses, it also has limitations. From a Critical Race Theory perspective, the ECLS-K Study precluded key data for exploring the phenomenon of overrepresentation, such as teachers' usage of culturally relevant teaching and social justice beliefs. Further, our analyses involved secondary analyses, which caused us to pause, given the potential risks of (mis)representing the issue of overrepresentation and perpetuating harmful research. To alleviate these limitations, in part, we took several steps. We applied CRT and Intersectionality in the formation of structural equation models. Additionally, we used a data analytical approach (i.e., phantom variable approach) in attempts to measure teachers' usage of culturally relevant teaching as a way to reduce overrepresentation. Finally, in phase 3, we decided early on in this investigation the need to merge our data analyses with a qualitative meta-analysis of overrepresentation.

### *CritSEM: Examining Reasons for Overrepresentation*

In Figure 1, we show two of the structural equation models, denoted by solid and dotted lines. We examined teachers' deficit-based assessments and inappropriate usage of early achievement scores, during kindergarten, as predictors of Black and Latinx students' identification for special education in early elementary school (i.e., third grade).

From a Critical Race Theory perspective, the causes of overrepresentation in these models represent the normalized, but pervasive and racist, functions in schools that permit, even encourage teachers to use in their pursuit to identify Black and Latinx students. Scholars discuss teachers' deficit-based and subjective assessments of students and usage of biased, achievement scores (e.g., intelligence tests) as major causes of overrepresentation (Ahram et al., 2011; Blanchett, 2006; Craft, 2018; Darling-Hammond et a., 2022; Ford & Russo, 2016; Harry & Klingner, 2014; Harry et al., 2008; Hart et al., 2010; Kearns et al., 2005; Klingner et al., 2006; Knotech, 2003; Orosco & Klingner, 2010). In these instances, teachers fail to consider the structural inequalities, masked in classrooms, that manifest into the appearance of disparate outcomes, according to White middle-class norms. In fact, [perceived] learning and behavioral difficulties may result from limited access to academic opportunities, a lack of culturally relevant teaching, low quality teaching, and structural inequalities (i.e., lack of resources).

These causes, while now implicit, were once explicit when notions of eugenics became prominent in education. Proponents of eugenics relied on the convictions of educators to classify students for special education, via their assessments and use of intelligence testing (Bruinius, 2006; Gould, 1996; Nielson, 2012; Selden, 1999; Osgood, 2000).

Additionally, we applied an Intersectionality perspective (Collins & Bilge, 2016; Hancock, 2016) to think about converging identities at the intersection of race/ethnicity and special education for Black and Latinx boys and girls. In our structural equation models, our reference group consisted of white girls, since this group has not been historically considered overrepresented in special education. We examined if teachers' assessments and early achievement predicted the educational placement of Black and Latinx boys and girls, in comparison to white girls. In the discussion section, our aim was to reflect on if and how these multiple layers of socially constructed identities, imposed on students, target Black and Latinx boys and girls.

**Figure 1: CritSEM: Examining Why Students are Overrepresented in Special Education**
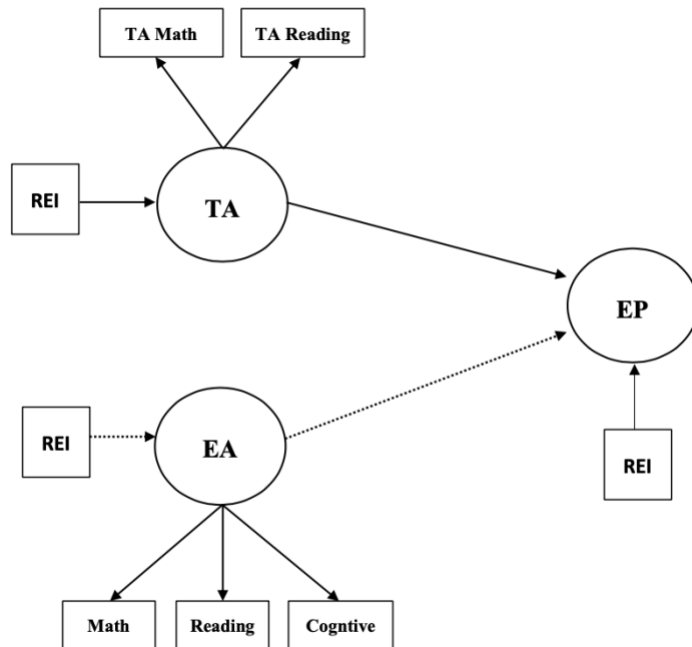


Note, in the figure, circles represented latent variables and squares were the variables. The arrows signified hypothesized paths.

*First Structural Equation Model: Teachers' Deficit-Based and Subjective Assessments.*
In the first structural equation model (solid line), we examined the probabilities of Black and Latinx boys and girls being referred for more restrictive educational placements via special education, during early elementary school (i.e., third grade), because of their teachers' academic assessments.  If [highly] significant, these [indirect] effects would suggest Black, Latinx, and Emerging Bilingual boys and girls are overrepresented in special education, due to teachers' assessments of their students. In other words, teachers' early assessments, in part, determined students' type of educational placement, or placement in special education, in elementary school.

The teacher assessment latent variable was defined by teachers' reading and math assessments of their students in kindergarten. We transformed the educational placement latent factor from a crude categorical variable into a latent response variable, allowing us to interpret this latent variable on a continuous scale. A *latent response variable transformation* changes a categorical dependent variable into a continuous latent variable, which deviates from a crude measurement of categorical variables, resulting in a substantive and meaningful interpretation, (Agresti, 2002; Lee et al., 2018; Masyn, Petras, & Liu, 2013; Muthén & Asparouhov, 2002).

Transformations have several distinct advantages in structural equation modeling: a) transformation represents the measurement of continuous latent variable, underlying a theoretical notion, that is not confined by raw categorical cut points; b) latent response variables can be used as independent and dependent variables; and c) the indirect effects, whether the latent response variable is an independent or dependent variable, can be estimated in structural equation models. Model statistics, involving the latent response variable as the dependent variable, were probit coefficients, because of the addition of the latent response factor (i.e., restrictiveness of educational placements latent factor).

***Second Structural Equation Model: Teachers' Inappropriate Usage of Achievement Scores***. In the second structural equation model, we wanted to understand the extent that early achievement predicted the restrictiveness of educational placements via special education for Black and Latinx boys and girls. If highly significant, this would suggest that teachers' perceptions of early achievement on assessments is one of the causes of overrepresentation. The early achievement latent factor was defined by academic (e.g., reading and math) assessments administered in early kindergarten.

***Phantom Variable within CritSEM: Exploring how to Disrupt Overrepresentation***

The next two structural equation models added culturally relevant teaching to the prior models as a way to prevent overrepresentation, incorporating a phantom variable approach (see Figure 2). Culturally relevant teaching (Ladson-Billings, 1995) has been lauded by scholars (Blanchett, 2006; Ford & Russo, 2016; Love, 2004; Voulgarides et al., 2017) to reduce overrepresentation. Students thrive in learning content and developing their skills, because of lesson design, empowering educational experiences, and a sense of classroom community. Culturally relevant teaching becomes the identity of teaching and learning in classrooms. As an asset-based pedagogy, culturally relevant teaching when used in the classroom is in opposition to the two causes of overrepresentation that result from a deficit-oriented approach.

Ladson-Billings formulated this pedagogy because she was tired of hearing in the dominant discourse of education, the purported deficits of African American students, such as achievement disparities, and the incorrect portrayal that these deficits were at the fault of students. Her groundbreaking research studied successful pedagogical practices of teachers that closely aligned to students' cultural assets in classrooms, where students experienced success. Ladson-Billings's research led to the identification of three tenets, comprising culturally relevant

teaching: (Ladson-Billings, 1995, 2014): academic success, cultural competence, and critical consciousness.

We examine the impact of culturally relevant teaching as a phantom variable to reduce overrepresentation. More specifically, we ran several models with varied magnitudes of the effect of culturally relevant teaching, to determine how large the relation between the culturally relevant teaching and deficit-oriented approaches would have to be for inference to be affected.

**Figure 2: CritSEM (with Phantom Variable): Examining How to Disrupt Overrepresentation in Special Education.**
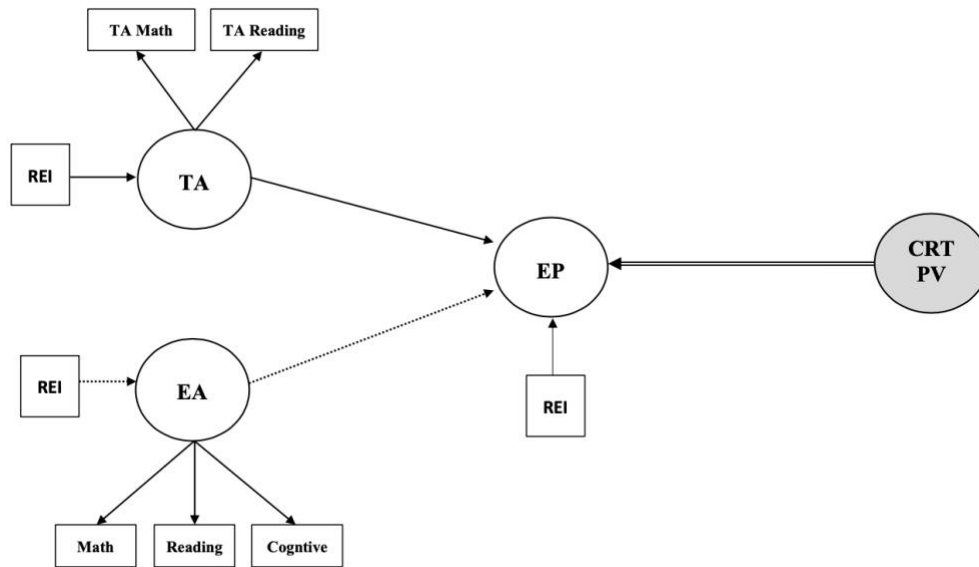


Note, in the figure, circles represented latent variables and squares were the variables. The arrows signified hypothesized paths.

**Third and Fourth Structural Equation Models with Phantom Variable: Culturally Relevant Teaching as an Alternative to Special Education.** We examined the impact [direct effect] of culturally relevant teaching, during kindergarten, on reducing the restrictiveness of students' educational placement via special education by third grade (see Figure 2). Additionally, we examined if the latent propensity of receiving a more restrictive education placement decreased [indirect effect] for Black and Latinx boys and girls in comparison to white girls, due to their teachers' assessments and usage of early achievement scores during kindergarten. First, we examined the impact of culturally relevant teaching, in the teacher assessment model (solid line in Figure 2), and then the early achievement model (dotted line in Figure 2). We also interpreted estimates of the regression paths for the teacher assessment and early achievement latent factors leading to the educational placement latent factor. Examining changes in the

regression paths after systematically altering the effects of culturally relevant teaching allowed us to test hypotheses about the relations between these variables (i.e., the counterstory).

Traditionally, the culturally relevant teaching latent factor would be defined by teachers' usage of the three tenets of culturally relevant teaching (i.e., academic success, cultural competence, and critical consciousness). As aforementioned, the phantom variable approach does not require such manifest variables of the phantom variable to examine sensitivity associated with model structure and model parameters. Rather, researchers need to have a clear understanding of the types of uncertainty that the phantom variable approach addresses, to give a correct interpretation of the model results. In our illustration, we investigated three sources of sensitivity due to external misspecification:

1. Changes in path coefficients from educational achievement to educational placement (EA -> EP)

2. Changes in path coefficients from teacher assessments to educational placement (TA -> EP)

3. Changes in indirect effects of race, ethnicity, and gender (REI)

### Guidance to Generate a Phantom Variable within CritSEM

Below we provide general guidelines for researchers seeking to generate their own phantom variable within a structural equation model:

Step 1) Determine if literature suggests a potential moderating variable that affects the strength of the effect of a path of interest. For example, in our illustration we investigated sensitivity of TA -> EP.

Step 2) Perform a meta-analysis to determine potential path coefficients between the phantom variable and the other variables previously specified in the initial SEM. In our illustration we test for small, medium, and large effects.

- We acknowledge that this may be a daunting task, particularly for large, complex SEMs. However, difficulty of manual specification in any sensitivity analysis can be overcome by using metaheuristic optimization algorithms—such as simulated annealing (Leite et al., 2022).

Step 3) Specify characteristics of the phantom variable. The phantom variable was latent, with no manifest variables. The mean and variance of the phantom variable were constant values (i.e., =0 , =1), which is recommended by Leite et al. (2022).

Step 4) Run the new structural equation model to investigate potential changes in the strength of the effect of a path (or multiple paths) of interest.

There are five logical steps in SEM: **model specification, identification, parameter estimation, model evaluation, and model modification** (Kline 2010; Hoyle 2011; Byrne 2013). The phantom variable falls under the umbrella of "model evaluation." Model evaluation assesses model performance or fit, with quantitative indices calculated for the overall goodness of fit (Fan et al., 2016).

**Analysis Plan of Structural Models: Evaluating Model Fit, and Estimates**

For each structural equation model, we assessed model fit to see if the statistics met our *a priori* thresholds: RMSEA<0.06, CFI >.90, TLI>0.90, and SRMR<0.06 (Hu & Bentler, 1999; McDonald & Ho, 2002; Kenny & McCoach, 2003; Lai & Green, 2016). Acceptable fit indicates that the theoretical and hypothesized models explained the relationships set forth in our models. Next, if fit was deemed acceptable, we reviewed parameter coefficients in each model. We interpreted model statistics under the set condition that statistical estimates were highly significant (p<0.001).

**Planning Phase 3: Applying Principle #2**

In the third phase, we felt compelled to synthesize our findings from the structural equation models with a qualitative meta-analysis on overrepresentation (Authors et al., 2023). While the primary purpose of qualitative meta-analyses is to uncover unique and standalone findings, scholars have applied meta-analyses for functions, in conjunction with statistics (Harden & Thomas, 2015; Timulak, 2013). The application of qualitative meta-analyses in statistics, from a Critical Race Theory perspective, can help ensure research is advancing racial and social justice.

In the synthesis, we wanted to reflect on points of divergence and convergence in the integration of quantitative and qualitative findings. Further, we felt that the quantitative findings could be amplified and substantiated if we found points of convergence. For the synthesis, we followed a systematic set of methodological steps outlined by Johnson et al. (2019). Overall, our overarching aim for the synthesis, within the context of this study, was to implicate how to advance an anti-racist special education system.

<div align="center"><b>CritSEM: Results and Discussion</b></div>

**Why are Black and Latinx boys and girls still overrepresented in special Education?**

For this first research question, we hypothesized that teachers' deficit-based assessments and usage of early achievement scores, during kindergarten, will result in overrepresentation (see Figures 1 and 2). Our first finding shows that in comparison to white girls, Black boys ( 0.17 units, p=0.003), Black girls (0.13 units, p=0.029), Latinx boys (0.20 units, p<0.001), and Latinx girls (0. 12 units, p<0.001) had increased propensities to receive more restrictive educational placements via special education in early elementary school (i.e., by third grade), due to their teachers' assessments in math and reading during kindergarten. Similarly, our second finding suggests that early achievement scores, during kindergarten, predicted students identification for more restrictive educational placements via special education in early elementary school, in comparison to white girls (Black boys: 0.57 units, p<0.001 ; Black girls:  0.52 units, p<0.001; Latinx  boys: 0.55 units, p<0.001; and Latinx girls:  0.48 units, p<0.001). The fit of the first structural equation model (RMSEA=0.04, CFI=0.98, TLI=0.93, SRMR=0.01) and second structural equation model (RMSEA=0.04, CFI=0.98, TLI=0.95, SRMR=0.05) was acceptable, confirming how well our hypothesized models as shown in Figures 1 and 2 generalize to observations in the dataset.

**To what extent does teachers' usage of culturally relevant teaching disrupt overrepresentation for Black and Latinx boys and girls?**

In our second research question, we hypothesized that teachers' usage of culturally relevant teaching, during kindergarten, will reduce overrepresentation in special education for Black and Latinx boys and girls (see Figure 2). We compared models that varied the magnitude of effects from culturally relevant teaching to educational placement and deficit-based approaches. We manipulated the effects of culturally relevant teaching by setting values of 0.25, 0.5, and 0.8. The results of our analysis are presented in Tables 1 and 2, which provide a comparison of the path estimates under each of these conditions. Of particular relevance to our research question were the changes in the indirect effects of educational placement on teaching assessments and educational achievement. As can be seen in both tables, the path estimates for white boys remained relatively stable and close to zero- suggesting little to no difference between white boys and white girls (the reference group). However, for Black and Latinx boys and girls, the indirect effects moved closer to zero, indicating that the use of culturally relevant teaching in kindergarten may help to reduce the overrepresentation of minoritized students in

special education. We present the results of the CritSEM with Phantom Variable approach in Tables 1 and 2.

**Table 1: Changes in Standardized Path Estimates for Different Magnitudes of Effects using the Phantom Variable Approach (Teacher Assessments Model)**

| SEM Direct and Indirect Effects | Small Effects (.25) | Medium Effects (.5) | Large Effects (.8) |
|---|---|---|---|
| CRT → EP | -.18*** | -0.39*** | -0.72*** |
| CRT → TA | 0.20*** | 0.45*** | 0.84*** |
| TA → EP | -0.60*** | -0.42*** | 0.01 |
| BFEM→TA→EP | 0.12** | 0.09** | -0.00 |
| LFEM→TA→EP | 0.11*** | 0.08*** | -0.00 |
| WMAL→TA→EP | 0.02 | 0.01 | 0.00 |
| BMAL→TA→EP | 0.16*** | 0.12*** | -0.0 |
| LMAL→TA→EP | 0.18*** | 0.13*** | -0.00 |

*P<0.05 **P<0.005, ***P<0.001
SOURCE: U.S. Department of Education, National Center for Education Statistics,
Early Childhood Longitudinal Study 2011(ECLS-K 2001) Kindergarten-Fifth Grade,
 2011-2016.

**Table 2: Changes in Standardized Path Estimates for Different Magnitudes of Effects using the Phantom Variable Approach (Educational Achievement)**

| SEM Direct and Indirect Effects | Small Effects (.25) | Medium Effects (.5) | Large Effects (.8) |
|---|---|---|---|
| CRT→EP | -0.21*** | -0.41*** | -0.81*** |
| CRT→EA | 0.02*** | 0.04*** | 0.07*** |
| EA→EP | -0.75*** | -0.74*** | -0.69*** |
| BFEM→EA→EP | 0.51*** | 0.50*** | 0.47*** |
| LFEM→EA→EP | 0.47*** | 0.47*** | 0.43*** |
| WMAL→EA→EP | 0.03 | 0.03 | 0.03 |
| BMAL→EA→EP | 0.57*** | 0.56*** | 0.52*** |
| LMAL→EA→EP | 0.54*** | 0.54*** | 0.52*** |

*P<0.05 **P<0.005, ***P<0.001
SOURCE: U.S. Department of Education, National Center for Education Statistics,
Early Childhood Longitudinal Study 2011(ECLS-K 2001) Kindergarten-Fifth Grade,
 2011-2016.

**Synthesis of Results**

The integration of findings from the synthesis confirmed why Students of Color are overrepresented in special education. Findings from the structural equation models and qualitative meta-analysis aligned to fully reveal and breathe life into our counterstory.

First, students were inappropriately referred to special education because of their teachers' unjust assessments, inappropriate usage of assessments scores, and the convergence of intersecting identities. Second, while the structural equation models showed that culturally relevant teaching is one way to disrupt overrepresentation, the qualitative meta-analysis showed a lack of culturally relevant teaching in classrooms as a cause for overrepresentation. These results make sense in their convergence, revealing a greater perspective. Culturally relevant teaching is essential for classrooms to prevent overrepresentation.

We felt comfortable with research evidence from the CritSEM, following the synthesis. In this study, we used the qualitative meta-analysis to validate the CritSEM results by looking for points of convergence and divergence and adding depth and richness to the findings. Our process of integrating the findings follows the steps outlined by Johnson et al. (2019) and can be described in detail, elsewhere (Authors et al., 2023). Once completed, a qualitative meta-analysis could ground multiple quantitative studies for QuantCrit research.

**Discussion of Results: What will it Take for an Anti-Racist Special Education System?**

We interpret results using CRT and Intersectionality. Results of the CritSEM suggest based on model estimates and fit, teachers' deficit-based assessments and usage of achievement scores, during kindergarten, are determining early on in elementary school a *de facto* segregated placement for Black and Latinx students. These students are targeted and separated from their white peers for special education. Teachers are permitted to carry out these processes under the guise and protection of white supremacy, resulting in the convergence of race/ethnicity and special education identities. As a result, students are subjected to the experiences associated with race/ethnicity and notions of (dis)ability in the United States. With these results, we confirmed the first hypothesis and answered the first research question. We have found similar findings in other studies (Authors et al., 2023).

The underlying question becomes what can anti-racist educators do to confront this process? The qualitative meta-analysis showed that culturally relevant teaching is just one way that educators can push back against an unjust special education system, using anti-racist

practices. This confirms what we saw in the CritSEM results. A kindergarten classroom teacher fully implementing culturally relevant teaching directly reduced overrepresentation of students. Yet, even with culturally relevant teaching in the classroom, Black and Latinx boys and girls still had increased propensities for being overrepresented in special education, depending on the amount of culturally relevant teaching in the classroom. Meaning, culturally relevant teaching mitigated the impact of teachers' assessments and usage of early achievement scores, but it was not enough to completely confront white supremacist structures in the educational system. Culturally relevant teaching will help advance an anti-racist special education system, but educators will need also use additional anti-racist practices and administrative policies for their classrooms.

## Implications

Previous research using achievement covariates to determine special education placement not only blamed Students of Color for academic disparities but justified their overrepresentation in these programs (Cavendish et al., 2018; Collins et al., 2018). Using QuantCrit to analyze this body of work makes clear that far from "neutral" and "objective," the (mis)use of statistics conceals racist assumptions. We agree with Gillborn et. al (2018), that "statistics are frequently mobilized to obfuscate, camouflage, and even to further legitimate racist inequities" (p. 160). This is made even more dangerous in the current context of neoliberalism, led largely by white liberals[6], that assumes "natural" differences in intelligence, motivation, and moral character (Gillborn, 2010) are what inherently explain differences in educational performance. We argue the absence of critical theories and approaches, like QuantCrit, not only create the potential for research to weaponize statistics to amplify culturally deficit rationales about the academic achievement of Students of Color but are contributing to what some scholars are calling a *new eugenics* (Gillborn, 2010; Baker, 2002). This violence is premised on quantitative research that fundamentally sees intelligence or ability as "generalized" (e.g., those with superior intelligence are assumed to be superior in all areas), "measurable" (e.g., ability is assumed to be uniform and easily quantified), and "relatively fixed" (e.g., those deemed "gifted" are assumed to remain so throughout their lives) (Gillborn, 2010).

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[6] white liberalism maintains the appearance of advancing civil rights for marginalized communities out of self-interests, and not core beliefs of racial and social justice, that only continues to cover up the underlying truths about the foundational racism and inequity in the United States" (Bell, 1976, Crenshaw, 1988; Delgado, 1984, 1988; Delgado & Stefancic, 2000).

Our application and extension of QuantCrit demonstrates a powerful *counterstory* to quantitative research that justifies the overrepresentation of Black and Latinx students in special education. We believe there is a need to rethink and reconsider research in special education. Therefore, **we call for anti-racist research in special education** that uses data sensitivity approaches (e.g., CritSEM) to advance social justice in special education by transforming, reshaping, and/or rethinking the status quo of the current special education system and the aspects of white supremacy that shapes it.

**What do we need to think about for the future of education research?**

Our collaboration to study the overrepresentation of Black and Latinx students identified for special education offered so much more than an affirmation that culturally relevant teaching *indeed* matters. It offered an opportunity to showcase the benefits of QuantCrit empirically, extending its reach into advanced statistical techniques, such as CritSEM. While we believe these developments are exciting and vitally important to further QuantCrit research, we refuse any methodological interest in statistical modeling before considering the theoretical frameworks and political anchors that guide our work. The desire to know the technical elements of methodological tools, particularly quantitative tools, cannot override the need to understand their epistemological underpinnings. Without attending to the white supremacist logics that shape statistical approaches, we are likely to reproduce them, even when our commitments to racial justice are clear.

Traditionally, the desire to know the technical elements of methodological tools often overrides the need to understand their epistemological underpinnings. Although one needs to consider the range of what quantitative research tools can do—the statistical computations, formulas, and analyses—we argue that it is imperative to center and amplify one's theoretical and political practices before imagining one's technical practices.

The bridging of qualitative and quantitative approaches can help researchers to produce more nuanced and accurate models of the relationships among variables and increase the understanding of the complex and multilayered systems in society and the implications of it. An implication of the current study's incorporation of Critical Race Theory to improve SEM (i.e., CritSEM) is to help quantitative researchers to be more aware of and explicitly examine how race and racism are likely to be operating in their data and models. In the context of Critical Race Theory scholars, CritSEM could be used to test hypotheses about the relationships between race,

racism, and other variables, such as socioeconomic status and education outcomes. By using CritSEM, researchers can examine the direct and indirect effects of race and racism on these outcomes and identify potential mechanisms through which these effects occur. This can help to inform interventions and policies that address the impacts of racism on marginalized communities. An intended outcome of our research is to improve the rigor and credibility of SEM research by ensuring that it is grounded in a deep understanding of the complexities of race and racism.

## Conclusion

We also recognize that the work we do is often met with opposition from the those that would claim our approach violates "objectivity" and "neutrality" in a methodological field that has traditionally prided itself on these characterizations. While QuantCrit scholars have adequately exposed the flawed arguments in defense of these claims, less sufficiently addressed have been those critiques from critical *qualitative* scholars, including Critical Race scholars, who are yet to be convinced that quantitative approaches can be rectified to support anti-racist ends. We agree with many of their critiques which have guided how we applied QuantCrit and refined principles of practice for its ongoing use in educational scholarship. Additionally, we also see their appraisals as an invitation to deepen our engagement with statistical methods. QuantCrit can and should work in solidarity with other research that seeks to end white supremacy and its intersection with all forms of subordination. There is much more work to be done. We humbly offer a step forward here, propelled by an unwavering commitment as Critical Race scholars to continue addressing the theoretical and methodological tensions in quantitative research on Students of Color, their families, and their communities.