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ABSTRACT

The No Child Left Behind Act (NCLB) of 2001 requires that public elementary and secondary school systems be held accountable for achieving high levels of educational proficiency for all students. While achievement testing is the central component of state accountability systems under NCLB, these systems must include graduation rates as an academic accountability indicator at the high school level. This study summarizes provisions in NCLB that pertain to high school graduation rates. It examines the changing role of high school graduation rates as accountability indicators, noting implications for racial and ethnic minority groups and their school systems. This study analyzes the differences that exist among the measurement of dropout, graduation, and completion rates; the way each is calculated may affect reported high school graduation statistics. Researchers calculated graduation rates using the Common Core of Data, U.S. Department of Education's census of local educational agencies and schools. Overall, graduation rates are likely to be much lower than the 85-90 percent that prevails in the conventional wisdom, with as few as two-thirds of high school students nationwide graduating with a regular diploma. Although a small number of states have graduation rates up to 80 percent, others have rates below 55 percent for average students. Graduation rates are close to 75 percent for white and Asian students but around 50 percent for average-performing Native American, Hispanic American, and African American students. Even in high-performing states, graduation rates are much lower for these minority students than for white and Asian students. (Contains 30 references.) (SM)

Keeping Count and Losing Count:

Calculating Graduation Rates for All Students under NCLB Accountability

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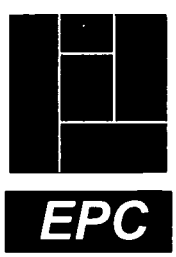
Education Policy Center

The Urban Institute



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EXECUTIVE SUMMARY

The No Child Left Behind Act of 2001 (NCLB) requires that the nation's public elementary and secondary school systems be held accountable for achieving high levels of educational proficiency for all students. Specifically, NCLB mandates that all states must establish performance-based accountability systems that include: clear standards and goals for improvement; rigorous methods of measuring progress towards established performance targets; and high-stakes consequences for both individual schools and school systems that fail to make sufficient progress in reaching the goal of universal student proficiency.

An important tenet of the law is that all students should be held to the same high standards. Toward this end, each state must establish an accountability system that has separate performance goals in reading and mathematics with all schools reaching 100 percent proficiency in each area within twelve years. Accordingly, to avoid identification as "needing improvement" school systems must meet annual academic proficiency goals established by the state that are designed to make steady progress toward the twelve year target of universal proficiency. In addition, the accountability system holds schools and districts responsible for the adequate yearly progress for students in specified subgroups, including the major racial and ethnic groups.

While achievement testing will be the central component of state accountability systems under NCLB, these systems must include graduation rates as an academic accountability indicator at the high school level. Earning a high school diploma is an important outcome in its own right and a strong predictor of future social and economic success. In addition, holding schools and districts accountable for academic achievement levels, based on both test scores and high school graduation rates is intended to help safeguard against an unintended negative incentive of high-stakes accountability systems – that pushing low-performing students out would raise test scores and help struggling schools meet test-based accountability benchmarks.

This study seeks to inform the on-going debate over accountability under these new NCLB requirements. Specifically, it examines the changing role of high school graduation rates with particular attention to the implications for racial and ethnic minority groups and the school systems that serve these students. We begin by outlining the accountability provisions of NCLB that pertain to high school graduation and then discuss their implications for developing empirical indicators to be used in high-stakes accountability systems. Several distinctive measurement strategies are examined: an approached used by the U.S. Department of Education's National Center for Education Statistics (NCES); an Adjusted Completion Ratio (ACR); and the Cumulative Promotion Index (CPI), a new indicator developed by the author that may offer particular advantages on both conceptual and operational grounds. These three methods were chosen for two main reasons. First, each adheres (at least in general terms) to the provisions of NCLB and, therefore, offers an alternative relevant to decision-makers designing state accountability systems. Second, each of these rates can be calculated using the kinds of non-longitudinal group-level data readily available in most states.

In the empirical portion of this study we calculate graduation rates based on these three distinctive methods using data from the Common Core of Data, the U.S. Department of Education's census of local educational agencies and schools. Rates are estimated for the nation as a whole and for each of the states, data and methods permitting. We then systematically compare the results generated by the three approaches, with respect to: the quality of the indicators from an informational perspective (i.e., coverage of school districts or student population) and differences in estimated graduation rates across methods.

The final set of empirical analyses examines national and state graduation rates disaggregated by major racial and ethnic categories, as is required under NCLB. Of the three alternative approaches explored, however, we find that only the CPI method is able to overcome the technical challenges involved in calculating reasonably reliable graduation rates for individual racial and ethnic categories.

The main results from this study indicate that graduation rates are likely to be much lower than the 85 to 90 percent that prevails in the conventional wisdom. In fact, as few as two-thirds of high school students nationwide may graduate with a regular diploma. Even that statistic, which would strike many observers as surprisingly and unacceptably low, overlooks truly abysmal performance that prevails in certain places. Although in a small number of states graduation rates reach as high as 80 percent, in other states the odds of graduating from high school fall below fifty-fifty for the *average* student. While the CPI and ACR methods typically generate very similar results, we find that the NCES indicator always produces a higher estimate of the state graduation rate than both of the alternative measures. This overestimation (about 10 percent on average) is likely to be attributable to the NCES method's heavy reliance on dropout counts, which tend to be underreported for any number of reasons. The other two indicators use information only on graduation and enrollment counts.

Findings for disaggregated graduation rates using the CPI method demonstrate well-known disparities among racial and ethnic groups. Nationwide, we find a graduation rate of close to 75 percent for White and Asian students (a level approaching the average graduation rate in the highest-performing states). By contrast, graduation rates for Native American, Hispanic, and African American students nationwide hover at around 50 percent (about same level found for the average student in the lowest performing states). Our results further suggest that, even in many generally high-performing states, students from these particularly disadvantaged minority groups often graduate from high school at rates as much as 20 to 30 percent lower than their White and Asian American peers.

In the final portion of the paper, we discuss the study's implications for the development high-stakes educational accountability systems like those required by NCLB. One clear and consistent theme that emerges from our findings is that graduation rate estimates (like the NCES indicator) that are heavily dependent on dropout counts should be viewed with considerable skepticism. One root of this problem is the largely inadequate state of our national systems for defining and collecting information about dropping out. We find that the NCES indicator cannot be calculated for the majority of states and districts nationwide due to a lack of consistent information on the number of students who drop out of high school. This problem takes on a particularly policy-relevant dimension when we realize that many of the states missing dropout data are also home to large and rapidly growing minority populations.

But beyond the issue of data availability, we also find that even in cases where values can be computed dropout-dependent measures appear to consistently and considerably overestimate graduation rates compared to other available estimates. The best evidence available clearly recommends a rapid move away from a reliance on graduation rates that employ dropout data and towards alternative strategies for more accurately measuring this key indicator of educational performance. Unfortunately, it appears that many states are proposing to use an NCES-like approach or other methods dependent on dropout data for calculating graduation rates as part of the statewide accountability systems they are required to implement under the terms of NCLB.

In conclusion, two recommendations are offered in the interest of promoting informed decision-making in this critical area of policy implementation. Ideally, we should establish scientifically-based standards for calculating graduation rate indicators consistent with the way NCLB requires that assessments be used for purposes for which they are valid and reliable, consistent with relevant, nationally recognized professional and technical standards. Therefore, as graduation rates must be included in AYP, states

should ensure that this indicator is made more reliable. Second, safeguards must be established to ensure that data reported about graduates, dropouts, and enrollments are not only complete but also accurate. After all, a graduation rate will only be as good as the data used to calculate it. The U.S. Department of Education could play a central role in supporting both of these efforts. Steps such as these will help to ensure that all states are held to the same high standards. This may, in turn, instill public confidence in the accountability regimes that will become a prominent feature of public educational landscape as the new law of the land is implemented in the coming years.

1. INTRODUCTION

The relationship between levels of educational attainment and individual economic and social outcomes has been well documented. Individuals with higher levels of education (and more advanced credentials) enjoy higher income, more stable employment, and less dependency on public assistance. The more well-educated are also less likely to experience a variety of detrimental social outcomes, including early childbearing, reports of ill health, incarceration, or criminal victimization. Until about the 1970s, a high school diploma was generally viewed as a credential that would ensure a reasonably secure and well-paying job. But with increasing regularity, discussions of the returns to education have focused on attaining a college education as a prerequisite for economic success in today's labor market. This shift of attention is largely justifiable. Rates of college matriculation have increased considerably over the past 20 years, as have the economic returns to a bachelor's degree (Murphy & Welch 1989; Juhn & Murphy 1995) often termed the "college premium." As a larger segment of the population completes college and enters the workforce with a postsecondary degree, it is reasonable to anticipate that the college degree will supplant a high school diploma with regard to hiring decisions and also as a more generalized indicator of educational and social status.

In light of the ascendancy of the college credential, there may be a temptation to view the high school diploma as becoming economically and socially obsolete. It is imperative, however, that we not loose sight of the relevance that a high school education continues to hold for young adults, even today. Much like the college premium noted above, high school graduates consistently outperform non-graduates on a variety of social and economic indicators, often by substantial margins (Chaplin & Lerman 1997). Obtaining a high school diploma represents a critical first step in gaining access to a college education and, eventually, earning the bachelor's degree that will further enhance an individual's prospects for advancement in an increasingly competitive society. The lower rates at which racial and ethnic minorities complete high school also parallel well-known patterns of racial disparity found across a variety of educational outcomes (Kaufman, Alt & Chapman 2001).

One of the reasons that the issue of high school completion has garnered relatively minor attention in recent years could be that widely-reported estimates place the dropout rate at about 11 percent nationwide in 2000, a level that some might view as nearing the limit of the high school dropout rate practically attainable (Kaufman, Alt & Chapman 2001). A growing body of research has challenged the accuracy and reliability of commonly-reported statistics on high school completion and dropout rates (see Chaplin 2002, Greene 2002a). These studies cite several factors that tend to systematically inflate the high school completion rates commonly reported by the U.S. Department of Education, Census Bureau and other authoritative sources, particularly when these estimates are based on survey data as is the case for the CPS.[1] These potential sources of bias include: the frequent decision to count GED's along with regular diploma recipients as high school graduates, sample undercoverage for certain segments of the population (e.g., those incarcerated), and self-reporting bias regarding levels of educational attainment.[2]

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[1] The CPS has provided the backbone of the annual dropout report of the National Center of Education statistics since 1988. For many decades, it was the only source of nationally representative data available.

[2] The issue of which credentials should be included in estimates of graduation rates is salient for several reasons. First, a great deal of evidence suggests that GED recipients do not fare nearly as well as regular graduates in terms of labor market and educational outcomes (Cameron & Heckman, 1993; Murnane, Willet & Tyler, 1998; and Boesel, Al Salam & Smith, 1998). In addition, different treatment of the GED credential is a major source of discrepancies in

Just as earning a high school diploma remains a well-established predictor of an *individual's* future educational opportunities and economic success, it also represents a key indicator of performance for educational *systems*. In addition to producing higher-achieving students, effective schools, districts or states are expected to have a high proportion of students earn high school diplomas. Public and scholarly interest in high school dropout and graduation has been rejuvenated in recent years as handfuls of states and large districts around the country have introduced new educational accountability systems. This attention has been largely motivated by the fear that imposing high stakes testing, exit exams for graduation, and promotion exams for certain grades would create pressure for low-performing student to exit (or be removed from) the system and result in increased dropout rates (Lillard & DeCicca 2001; Herbert & Hauser 1999; Bonsteel & Rumberger 1999; Haney 2000).

The trend toward more systematic forms of accountability on a national scale further raises the stakes for measuring high school graduation accurately and consistently. Specifically, the No Child Left Behind Act requires that all high schools explicitly take "graduation rates" into account (along with achievement test scores) when measuring their current level of performance and the progress they have made towards reaching their long-term performance goals. Not only are educational systems held accountable for overall graduation rates but they must also report whether goals are being met separately for groups of students defined on the basis of racial and ethnic group membership, and their disability, English language, and socioeconomic status.

This study seeks to inform the on-going debate over school reform and accountability under these new NCLB requirements. Specifically, it examines the changing role of high school graduation rates with particular attention to the implications for racial and ethnic minority groups and the school systems that serve these students. Because our main interest is understanding the effects of these federal policies, we focus throughout the paper strictly on the public education system. We begin by briefly introducing the provisions of NCLB that pertain to high school graduation and discuss their implications from a measurement perspective. Next we present several distinctive strategies for developing a high school graduation indicator that are compliant with the new federal requirements for accountability. The advantages and disadvantages of each strategy are addressed.

In the empirical portion of this study we construct three alternative high school graduation indicators using information from the Common Core of Data, the U.S. Department of Education's census of local educational agencies and schools. These indicators are calculated for the high school class of 2000, the most recent year for which data are available. We then systematically compare the results generated by the respective measures, with particular attention to: the quality of the indicators from an informational perspective (i.e., how well they represent the target population of school districts and students); and differences in the estimates produced by these indicators when reported at both the national to state levels. In keeping with NCLB's focus on subgroup performance, we also compute high school graduation rates separately for major racial-ethnic groups. The paper concludes by addressing several lessons this study may offer for future research and the policy implications for measuring graduation rates under conditions of high-stakes accountability.

reported estimates of high school completion rates. Indicators that include GEDs produce far more positive results (i.e., higher completion rates) than more conservative estimates that exclude the GED (Chaplin, 2002; Cameron & Heckman, 1993; Kaufman, 2000).

2. No Child Left Behind, Accountability, and High School Graduation

The No Child Left Behind Act (NCLB), written into law in January 2002, is the most recent reauthorization of the Elementary and Secondary Education Act (ESEA), the federal government's most sweeping piece of legislation for public education at the elementary and secondary levels.[3] The provisions of NCLB strongly reflect the (George W.) Bush administration's broader policymaking philosophy of combining accountability with flexibility. This involves establishing high federal standards for performance-based accountability while allowing local actors significant flexibility in developing strategies for meeting these standards. Among the most ambitious and controversial elements of NCLB stands the requirement that each state will develop a comprehensive accountability plan detailing a strategy by which it will: (1) establish high academic standards, (2) ensure that every student attains educational proficiency, and (3) eliminate achievement gaps between high and low performing groups within 12 years (i.e., by the 2013-14 academic year).

2.1. Accountability Under NCLB

The No Child Left Behind Act is the most recent reauthorization of the Elementary and Secondary Education Act, which contained nearly identical goals for accountability and high standards. NCLB exceeds earlier attempts to raise standards in its specificity and the high stakes attached to failure to meet established goals. For instance, state plans must identify concrete annual performance targets or milestones for attaining their long-term goals – that is, they must meet an established definition of adequate yearly progress or AYP. Failure to meet performance goals for AYP in successive years will result in the imposition of progressively more severe sanctions. These include: identification of schools not meeting AYP goals as "in need of improvement;" restrictions on the use of certain federal funds; providing students in failing schools the option of transferring to another public school not identified as needing improvement (i.e., public school choice); and offering student from low-income families the option of using Title I funds to secure supplemental educational services (e.g., tutoring) from an approved public- or private-sector provider. In situations characterized by a chronic failure to meet AYP goals, more extreme sanctions may be applied, such as curriculum reform, reorganization of staffing and administration, and eventually more fundamental school restructuring. NCLB requires states to establish a statewide system of performance-based accountability that is aligned to high academic standards [20 U.S. C. 6316, 6317]. The federal government monitors compliance by each state in its implementation of the system. In turn, each state is expected to monitor and enforce this accountability system vis a vis districts and districts vis a vis schools. At each of these educational levels, goals for AYP must be met for all students and separately for specific segments of the student population defined on the basis of race and ethnicity, socioeconomic status, disability, and level of English language proficiency.

Large-scale student assessments represent the cornerstone of NCLB accountability and test scores must be the primary criterion for defining AYP at all levels of the public elementary and secondary education system. For instance, the law requires that by the 2005-06 academic year all students statewide will be tested in mathematics and reading annually in grades 3-8 and at least once in grades 10-12. States must also expand the scope of their assessment program over time by introducing testing in additional subjects

[3] The No Child Behind Act of 2001, was signed into law as Public Law 107-110 on January 8, 2002. The accountability provisions that are of concern in this paper are contained in Title I Part A of the act. More specifically, the graduation rate definition is located at 20 U.S.C. 6311((b)(2)(C)(vi); 115 STAT.1447.

at additional grade levels, as specified in the legislation. In addition, the material included in these assessments must be aligned with the state's subject-specific academic content standards. All states were required to (and did) submit NCLB accountability workbooks to the U.S. Department of Education by January 31, 2003. These plans, which outline state strategies for defining AYP and implementing the performance-based accountability plans required under the new law, must receive approval from the Secretary before they can be put into effect.

As of 2002, nearly all states had academic content standards in most core subjects and mandated statewide testing programs already in place (Editorial Projects in Education 2003). However, in many cases existing state accountability systems may not be compatible with specific aspects of federal requirements under NCLB, such as standards-assessment alignment, grade levels or subjects tested, and the ability to report disaggregated achievement results for specific demographic groups. For many states, considerable efforts will be required in order to bring their systems into compliance with the new law. Given the technical complexity and expense of instituting and maintaining a large-scale student testing system that meets the standards set by NCLB, a tremendous amount of time, energy, and debate have been devoted to the politics and mechanics of student testing.

2.2. An *Other Academic Indicator* – High School Graduation

In comparison to the debates that have raged over academic assessments, very little attention has been afforded in public forums to NCLB's requirements as they related to high school graduation. Although student test scores must be the primary performance measure at all schooling levels, definitions of AYP must incorporate at least one "other academic indicator" of educational performance. At the secondary level, this must be the high school graduation rate. Specifically, the legislation stipulates that the definition of AYP for high schools:

> "... includes graduation rates for public secondary school students (defined as the percentage of students who graduate from secondary school with a regular diploma in the standard number of years) ."
>
> --Section 1111(b)(2)(C)(vi)

All indicators of academic performance employed in state accountability system (including achievement test scores, graduation rates and other measures) are required to meet acceptable standards of statistical validity and reliability. States must:

> "ensure that the indicators described in those provisions [defining Adequate Yearly Progress] are valid and reliable, and are consistent with relevant, nationally recognized professional and technical standards, if any."
>
> --Section 1111(b)(2)(D)(i)

As is often the case, statutory language establishes only rather broad parameters with respect to defining and measuring high school graduation rates. The U.S. Department of Education provided additional guidance for implementing the letter of the law through the regulatory process. The final regulations for

Title I offer additional clarification on several specific points that bear directly on methods for calculating graduation rates for purposes of accountability under NCLB.[4] First, graduates are to be defined strictly as students receiving *regular high school diplomas*, which must be fully aligned with the state's academic content standards. Students receiving a GED or a state-issued credential that fails to meet all state academic standards (such as a certificate of attendance or recognition for completing an IEP program) will not be counted as a graduate. Second, graduation must be in the *standard number of years*. On-time completion of high school would typically be four years from the point a student enters the 9th grade (for the first time). However, allowances could be made to accommodate systems with other configurations. Finally, federal guidance also explicitly stresses that states must *avoid classifying dropouts as transfer students* for purposes of calculating the high school graduation rate.

Although these provisions offer more explicit guidelines, the federal regulations nevertheless extend states substantial freedom in the ways they are allowed to define and measure high school graduation rates. Perhaps most significantly, the final regulations interpret the law as permitting to permit the Secretary to approve a graduation rate calculation that is more accurate than the calculation required by the statutory language. The regulations provide allow states to employ:

> "(B) Another definition [of the high school graduation rate], developed by the State and approved by the Secretary in the State plan, that more accurately measures the rate of students who graduate from high school with a regular diploma as defined in paragraph (a)(1)(i)(A) of this section."[5]
>
> --§200.19(a)(1)(i)(B)

The regulatory provision above does not explicitly state what would constitute a "more accurate" measure of the high school graduation rate. It is possible, therefore, that states might interpret this regulation as allowing them considerable license in choosing an approach for calculating graduation rates. A review of the conference committee notes accompanying the legislation, however, suggest that this provision was intended to apply in a more narrow set of circumstances where presumably more accurate data on individual students tracked over time is available:

> "States that have or could have a more accurate longitudinal system that follows individual student progress through high school may use that system if approved by the Secretary as part of the State's Title I plan."[6]

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[4] Final Title I regulations were published in the Federal Register on December 2, 2002 (Vol. 67, No. 231). These provisions are associated with part 200 of title 34 of the Code of Federal Regulations (34 CFR Part 200).

[5] Sec. 200.19 (a)(1)(i)(A) of the regulations addresses Other Academic Indicators and defines the high school graduation rate as follows: "(a) Each State must use the following other academic indicators to determine AYP: (1) High schools. (i) The graduation rate for public high schools, which means--(A) The percentage of students, measured from the beginning of high school, who graduate from high school with a regular diploma (not including an alternative degree that is not fully aligned with the State's academic standards, such as a certificate or a GED) in the standard number of years."

[6] Excerpt from the Joint Explanatory Statement of the Committee of Conference to House Report 107-334 at note 137 accompanying the Conference Report.

As the discussion above suggests, the final regulations permit states to use data from longitudinal student tracking systems in order to calculate graduation rates because such information would be likely to provide a more accurate estimate than calculations based on group-level aggregate data. It is important to note, however, that NCLB does not require states to implement a longitudinal data collection system for use in determining gradation rates or for measuring student achievement.

2.3. Flexibility for Graduation Rates

In many respects, NCLB epitomizes the administration's approach to public policymaking, which might be characterized as a marriage between federal accountability and local flexibility. This flexibility is especially pronounced with respect to the way the law incorporates graduation rates into state accountability systems. As noted above, regulations issued by the Department of Education suggest that a definition of the high school graduation rate other than the one explicitly specified in the law could win approval, provided that it provides a more accurate means of measuring the percent of high school students who graduate on time with a regular diploma. The authority to approve such a definition, however, rests in the hands of the Secretary of Education. This flexibility also extends to other considerations of a more technical nature. States designing their accountability systems have important choices to make about the kinds of data, operational definitions, and computational methods they will use to generate a graduation rate. The legislation and subsequent regulations offer little in the way of concrete guidance to the states in any of these areas.

Flexibility can be a double-edged sword. On the one hand, it puts decision-making more firmly in the hands of actors familiar with local conditions. From a political perspective, flexibility also smoothes the way for local implementation of federal regulation. On the other hand, however, flexibility can be taken too far. States could propose a variety of distinctive approaches to measuring their graduation rates for purposes of NCLB accountability. If this happens, it could become difficult (if not impossible) to effectively hold states to the same common standards of performance. Moreover, because the stakes attached to low performance are so high, if given a choice states could be tempted to adopt a graduation rate indicator that casts its performance in the best possible light.

One of the main objectives of this study is to gain some appreciation of the consequences that the decision to choose one graduation rate indicator over another may carry for the implementation of high-stakes accountability systems. We begin by taking a broad perspective on the task of calculating graduation rates as a general measurement issue. We then discuss in more detail several different approaches that states could potentially adopt to measure their graduation rates under NCLB. The later empirical portions of the paper examine the results produced by these various approaches, particularly with respect to the practical implications that differences in the graduation rates estimated according to these methods may have for actual accountability regimes.

3. MEASUREMENT CONSIDERATIONS

In comparison to the psychometric intricacies of measuring student achievement, the challenges associated with counting the number of students who complete high school in a given school or district may at first appear trivial. Here we are attempting to measure a very clear and (in theory) observable outcome – whether or not a student graduates from high school. Even so, the endeavor of calculating high school completion rates with an acceptable degree of validity and reliability is not without its own challenges and subtleties. In certain respects the difficulties associated with measuring high school completion bear a striking resemblance to those encountered when assessing student achievement. A comprehensive treatment of all the conceptual and technical considerations involved in the measurement of graduation rates is beyond the scope of the current paper. We will, however, touch upon several key issues that bear directly on the development of valid graduation rate indicators that might be used the kinds of high stakes accountability regimes required by NCLB. Interested readers are directed to the works cited for more detailed discussions of these and related topics.

The field of psychometrics, which deals with cognitive performance, is like other fields concerned with measurement in that it seeks to obtain an imperfect but observed estimate (i.e. test score) of a more fundamental but unobservable construct of interest (i.e. academic achievement). Some methods of measuring achievement will be more or less valid and reliable, or better suited to certain situations or groups of students. As a result, there is no single, universally-accepted way to measure achievement. That is, it is possible to design variety of different instruments (i.e., tests) that each adequately capture the same underlying achievement construct, from theoretical and technical points of view.

Despite the obvious differences between achievement and an outcome like completing high school with a diploma, the task of constructing a rate to quantify the phenomenon of high school graduation poses similar challenges. For instance, analysts are faced with the likelihood that relevant information regarding students' enrollment status, dropout experiences, or kind of high school completion outcome (e.g., regular diploma, certificate or GED) may be inaccurately or incompletely reported. That is, relevant aspects of the phenomenon will be unobserved, at least for some cases. It follows, therefore, that it will be difficult if not impossible to measure the rate of high school graduation for a school, district, or state without some degree of uncertainty. As with any empirical indicator designed to produce an estimate of an underlying construct, the quality and accuracy of information generated regarding rates of high school graduation will hinge on several factors, including: the operational definitions adopted, simplifying assumptions made, and the types of data employed.

The debate over the measurement of dropout, graduation, and completion rates has raised a number of issues (e.g. who counts as a high school graduate, what counts as a diploma, data sources, computational methods) The way each is resolved may affect reported high school graduation statistics (Chaplin 2002; Haney 2000; Greene 2002a, 2002b; Kaufman 2000, 2001; Winglee & al. 2000). At least for the purposes of measuring high school graduation under the current federal law, certain past areas of inquiry have been rendered moot while the profile of other issues has been raised by NCLB.

For instance, analysts have debated the relative merits of calculating high school graduation and completion rates based on data reported by youth (or their parents) residing in a particular geographical area (e.g., CPS or Census) as opposed to administrative data tied more directly to educational units like districts or schools (e.g., the Common Core of Data). An indicator computed using geographically-based population data may be acceptable for some research and reporting purposes, but would likely be viewed

as inappropriate for use in the context of a high-stakes educational accountability system. An indicator capturing the percent of young adults currently living the catchment area of a public school district who had completed high school would arguably constitute too blunt an instrument for measuring the performance and effectiveness of that district. This would be particularly true in localities where there are high rates of private school attendance, migration, and residential mobility, and where many young adults did not attend local high school.

NCLB would appear to offer fairly clear guidance with respect to another issue that has been the subject of considerable debate – who should be counted as "high school graduates." A variety of high school completion outcomes have been employed in existing indicators, including: regular high school diplomas conferred to students meeting state requirements for high school graduation; state-issued high school credentials other than a diploma (e.g., issued to individuals meetings some but not all graduation requirements); and the General Education Development certificate or GED. More restrictive definitions of a "high school graduate" will necessarily result in a lower estimate of the completion rate by excluding recipients of certain credentials. The statutory language of NCLB and in particular subsequent regulatory guidance indicate that only regular high school diplomas should be counted for purposes of accountability, while individuals receiving other state-issued credentials or the GED should not be considered graduates. This, however, does raise an ancillary although perhaps not inconsequential issue. Under our federalized system of governance, it is the state rather than the federal government that holds the final authority to define the requirements for a high school diploma. As a result, the standards of performance and educational requirements attached to a diploma or other credential may in fact vary considerably from one state to another. This situation may pose a particular challenge for attempts to compare high school graduation rates across states, whose individual standards for issuing a high school diploma may differ.[7]

In the past, high school graduation rates have typically been calculated and reported at highly aggregated levels, most often appearing as estimates for the nation as a whole or in some cases for states or large districts. Under the terms of NCLB, however, the school represents the most basic educational unit for purposes of accountability. Accordingly, graduation rates must be calculated for each secondary school, separately for the entire student body and for individual student categories defined by race and ethnicity, socioeconomic status, disability, and English language proficiency. Efforts to measure graduation rates at the district and state level have been faced with a variety of challenges, including inconsistent definitions of indicator components (e.g., what constitutes a "high school" graduate) and the lack of systematic data at the appropriate levels of aggregation. Available estimates suggest large variations in graduation rates across the states and districts for which information is available (Green 2002a). However, the true values across the nation as a whole and at the school level remains largely unknown.

[7] It should be recognized, of course, that a similar situation exists with respect to statewide achievement testing. Under NCLB, states are required to administer student assessments that adhere to accepted technical standards and that are aligned with a state's own academic content standards. Each state is able to determine which test(s) to use in order to meet these requirements and, in fact, a wide array of assessments are used across the nation. As a result, student test scores are generally not directly comparable from state-to-state.

4. ALTERNATIVE GRADUATION INDICATORS

While on its face the task of developing an indicator to capture high school graduation rates might appear to be a relatively straight-forward proposition, the discussion above suggests at least some of the complexities that underlie this undertaking from a methodological perspective. In addition, while the provisions of NCLB do provide some guidelines for calculating these rates for accountability purposes, these guidelines are sufficiently broad that a variety of approaches to measuring graduation are likely to meet standards for compliance with the law.

A review of NCLB accountability plans approved for the 50 states and District of Columbia suggests that states are planning to take advantage of the flexibility afforded by the administration in this area.[8] Indeed, states have proposed a wide variety of methods for measuring graduation rates. The most common approach, pursued by 30 states (including the District), adopts a method developed by the National Center for Education Statistics, the U.S. Department of Education's statistical agency (see Figure 1). This method is discussed in greater detail below. In the initial stages of implementing their NCLB accountability systems, only 10 states intend to use a true longitudinal graduation rate calculated using data from individual students tracked over time. The accountability workbooks for the remaining 11 states include a diverse array of strategies for meeting compliance with the law. These approaches range from using a dropout rate rather than a graduation rate per se, to calculating completion ratios, to estimating grade-to-grade promotion ratios.

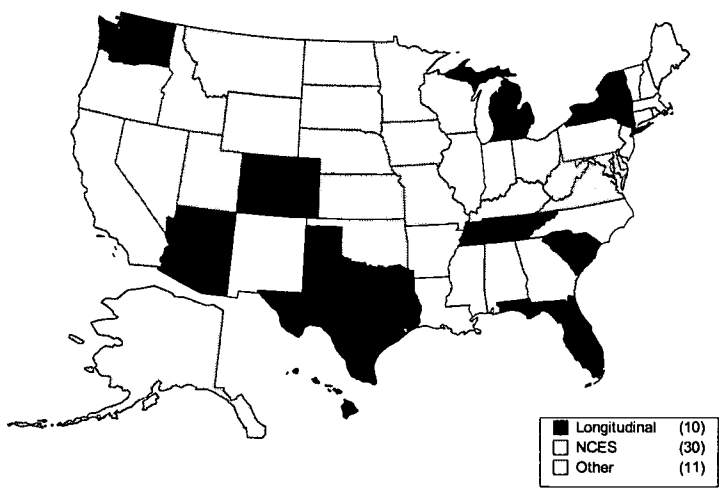

Figure 1: State Approaches for Calculating Graduation Rates for NCLB Accountability

Below we examine four distinctive approaches to constructing graduation indictors that reflect the range of alternatives proposed in the state accountability plans. For simplicity of presentation and to maintain consistency with the empirical portion of this paper, we will describe the computation of graduation rate indicators for school "systems" as an exemplar in the discussions below. These four general approaches could be employed to construct measures for educational systems at various levels of aggregation,

[8] Reports have indicated that the approval received by many states for their accountability plans is provisional, subject to further revision based on negotiations between the state education agencies and the U.S. Department of education. In fact, only 11 states had received full approval as of June 10, 2003, the date on which the Department announced that the last of the state plans had passed federal peer review (Education Week August 6, 2003). A comprehensive analysis of state plans (including any further revisions) is currently underway by the author.

including states, districts, and schools. Indeed, the provisions of NCLB do call for performance-based accountability at all of these levels.

We have chosen to concentrate in this paper on the main features that broadly distinguish these approaches from one another. All of these measurement strategies introduce non-trivial assumptions that enable the use of a simplified functional expression for computational purposes. These might include speculations regarding: the quality of the data utilized for calculations; net stability of population size or in- and out-migration over time; and the comparability of attrition patterns due to dropout and transfer across grade levels, and over the period of time being observed. Although these issues are worthy of systematic investigation, for the purposes of this study we will simply remind the reader that the indicators discussed below generally require that the analyst make similar kinds of assumptions. In later sections of the paper we use three of these measurement approaches to construct empirical indicators for the purpose of comparing their statistical properties.

4.1. Longitudinal Graduation Rate (LGR)

It could be argued that, although not explicitly required, the spirit of accountability under NCLB calls for student performance to be assessed by tracking individual students over time. This is a proposition that could apply to measuring both academic achievement and high school completion.[9] Given such a tracking system, the percentage of public school students from a particular school system who successfully complete high school could be computed as a true longitudinal graduation rate (LGR), shown in Equation 1. For illustrative purposes in this section we will take the high school class of 1999-2000 as our point of reference and assume that graduation in the standard number of years means that students who enter 9th grade in 1996-97 should complete high school four year later in 1999-2000.

$$LGR = \frac{G^{long}_{1999}}{E^{9}_{1996} - L^{9}_{1996-99}} \qquad [1]$$

where:

G^{long}_{1999} is the count of individual students from the entering 1996 high school cohort who graduated with a regular diploma four years later in 1999-2000;

E^{9}_{1996} is the count of students enrolled in the 9th grade in 1996-97 (the entering high school cohort); and

$L^{9}_{1996-99}$ is the count of students from the entering 1996 high school cohort who legitimately left the focal school system by 1999 as a result of: mobility (to another public school system), transfer to a private school, death, etc.

Although this equation is parsimonious in form, its simplicity is only attainable through the implementation of a rigorous tracking system that is capable of following individual students over time and able to

[9] Tracking individual students over time enhances the ability to create "value-added" indicators of student academic performance as described by Meyer (1996).

accurately distinguish among a number of student outcomes (e.g. diploma recipient, recipient of other credential, dropout, transfer to another public school, or exit from the public school system altogether). In practice it may be very difficult to make such determinations with certainty. This, of course, raises important operational issues like how school systems decide to classify entering cohort members whose status cannot be readily ascertained four years later when they should be completing high school (e.g., as dropouts, transfers, or unknowns).

In theory the use of longitudinal data would appear to offer an ideal means of measuring high school graduation. However, some analysts have suggested that the benefits associated with this methodological approach in principle may not actually materialize in practice because of technical hurdles involved in actually following students over time and incentives to count students whose status is unknown as transfers by default (Haney 2001). Such challenges may be particularly notable in educational systems that serve a highly mobile student population. These, incidentally, are also the types of systems that will tend to have lower completion rates for a variety of other reasons related to actual educational conditions rather than methodological considerations. For these reasons, it has been suggested that indicators based on group-level data that approximate student cohorts tracked over time (rather than following a true cohort of individual students) may actually produce more statistically sound estimates under certain conditions (Green 2002a).

The individual-level longitudinal approach to measuring graduation rates is important to acknowledge from a conceptual perspective and developing such data systems capable of calculating such rates should not be abandoned as a longer-term goal for accountability systems. The remainder of this paper, however, deals with indicators constructed from group-level data. There are two reasons for this decision. The first, a practical one, is that we did not have access to the systematic individual-level longitudinal data needed to construct such an indicator for educational systems nationwide. In fact, most states and districts do not maintain longitudinal databases of this kind.[10] The second related consideration deals with the implications for policymakers. Because at present most state accountability systems lack comprehensive longitudinal data, the adoption of a group-level indicator is likely to be an attractive option for maintaining compliance with NCLB, at least in the short term. For many states this will be a necessity.

4.2. National Center for Education Statistics (NCES) Rate

The National Center for Education Statistics (NCES), a branch of the U.S. Department of Education, annually collects extensive information on high school dropout and completion as part of the Common Core of Data. The CCD is a census of public sector state and local educational agencies and schools across the nation. Dropout and completion data are reported at both the state and district levels. In addition to its data collection efforts, NCES publishes widely-cited reports of dropout and completion rates for the nation as a whole and for states and has also sponsored technical studies examining the methodological issues involved in developing statistically valid estimates for these rates (see Winglee & al. 2000; Young 2002; Bose & Hoffman 1997).

The high school completion rate indicator recommended by NCES has often been described as a "leaver rate." As formulated in Equation 2, this statistic estimates the percent of students who leave high school with a diploma as opposed to dropping out.

[10] Certain states, such as Florida, Texas, North Carolina, and Louisiana, do have longitudinal student achievement data available. However, even these states may not track dropout and completion outcomes well and may have particular difficulty in determining the status of individual students who move across district or state boundaries.

$$NCES = \frac{G_{1999}}{G_{1999} + D^{12}_{1999} + D^{11}_{1998} + D^{10}_{1997} + D^{9}_{1996}} \quad [2]$$

where:

G_{1999} is the count of students who graduated with a regular high school diploma during the 1999-2000 school year, and

D^{12}_{1999} is the count of students who dropped out of grade 12 during the 1999-2000 school year.

It should be noted that the formula shown in Equation 2 is an adaptation of NCES's official four-year completion rate indicator. That statistic counts students who receive either a regular state-issued diploma or another type of completion credential as high school graduates. The latter category does not include GED certificates, which are not officially conferred by the public secondary education system. NCES chose this definition in order to maximize the compatibility of graduation rates across states which, as noted earlier, are free to establish substantially different requirements for the confirmation of a high school diploma. The current law, however, explicitly defines high school graduation in terms of receiving a regular diploma. Therefore, the NCES "completion rate" definition, developed prior to the current ESEA reauthorization, is in tension with the statutory definition required for purposes of NCLB accountability.

Several distinguishing features of the NCES approach deserve mention. As is the case for other group-level measures, one benefit of the NCES indicator is that it does not require the tracking of individual students over time and therefore makes relatively modest demands on data collection systems. Calculating a rate for an estimated grade cohort requires five pieces of information: completion counts from the reference academic year (1999) and cumulative dropout counts from each of the past four years (1996 through 1999). By comparison, calculating a similar estimate using the longitudinal method described above requires multiple pieces of information from each individual student in a grade cohort.

A final point to consider is that the NCES measurement approach relies very heavily on dropout counts. This is because the denominator of the expression approximates the size of the entering 1996 high school cohort by taking the sum of: (1) graduates in 1999-2000 (the expected year of graduation) and (2) the total count of dropouts at the cohort's modal grade level over the course of four years. Two major difficulties are often encountered with dropout data. The first is that systematic dropout statistics are often unavailable for a substantial number of states and districts, which raises the possibility of bias in coverage and further complicates efforts to produce state- or even nationally-representative estimates for high school completion rates (Young & Hoffman 2002; Greene 2002a).[11] Second, concerns have been raised that publicly reported dropout counts may substantially underestimate the true number of dropouts. We would anticipate this bias to be particularly severe for data generated in the context of high-stakes

[11] The Common Core of Data is the most comprehensive national source for dropout information currently available. Even so, for the 1999-2000 school year CCD reports dropout rates for only the 36 states (plus District of Columbia) that collect dropout data using the standard definition recommended by NCES (Young, 2002). The implications of this extensive amount of missing information are discussed in detail below.

state accountability systems, where there may be substantial incentives to administratively categorize students whose status is unknown as transfers rather than dropouts or to take other liberties with accounting procedures in order to avoid sanctions associated with high dropout rates (Haney 2001).[12]

4.3. Adjusted Completion Ratio (ACR)

Perhaps the simplest type of group-level rate is a completion ratio. This indicator can be represented as the number of graduates (regular diploma recipients) in a given year divided by the number of students enrolled in the 9th grade three years earlier. The Basic Completion Ratio (BCR) appears in Equation 3.

$$BCR = \frac{G_{1999}}{E^{9}_{1996}} \qquad [3]$$

where:

G_{1999} is the count of students who graduated with a regular high school diploma during the 1999-2000 school year, and

E^{9}_{1999} is the count of students enrolled in grade 9 in 1996-1997.

This basic indicator can be refined in any number of ways. One example of an Adjusted Completion Ratio (ACR) developed by Greene (2002a, 2002b) makes two major modifications to the Basic Completion Ratio in order to refine the estimate of the enrollment base. First it calculates a smoothed estimate for the size of the entering 9th grade cohort. Second, Greene's approach adjusts the smoothed enrollment base for overall changes in student population. This indicator is illustrated in Equation 4.

$$ACR = \frac{G_{1999}}{E^{9s}_{1996} + \left[E^{9s}_{1996} * \frac{E^{9-12}_{1999} - E^{9-12}_{1996}}{E^{9-12}_{1996}} \right]} \qquad [4]$$

where:

G_{1999} is the count of students who graduated with a regular high school diploma during the 1999-2000 school year,

E^{9s}_{1996} is the smoothed estimate of enrollment for the 9th grade cohort in 1996-1997

[12] Recently the Houston Independent School District, whose performance has often been held up as an emblem of the "Texas Miracle," has undergone investigation and intense public scrutiny stemming from accusations that the school system severely and systematically undercounted dropouts. State audits of 12 high schools and 4 middle schools have revealed that over half of the students leaving during the 2000-01 academic year should have been classified as dropout but were not. The academic rankings of all but one of these schools has been lowered as a result of the investigation. For representative coverage in the media, see: New York Times July 11 and August 8, 2003, Houston Chronicle July 30, 2003, and Education Week July 9, 2003.

E_{1999}^{9-12} is the count of student enrolled in grades 9-12 in the 1999-2000 school year, and

E_{1996}^{9-12} is the count of student enrolled in grades 9-12 in the 1996-1997 school year.

Assuming a standard progression through high school, the class of 2000 would have been 9th graders in 1996. The smoothed estimate of the approximated cohort's enrollment base is generated by taking the average of enrollments for grades 8, 9, and 10 from the 1995, 1996, and 1997 school years respectively. Because this indicator incorporates information on enrollment counts separated by a relatively wide span of time, it is possible that a school system could have experienced substantial shifts in its population due to migration or other causes. If present and unaccounted for, these population changes could distort the estimated graduation rate. Therefore an adjustment is made to the smoothed enrollment count in the denominator of the formulation to reflect the overall trend in total high school enrollment over the period of observation.[13] The estimated count of 9th graders enrolled in 1996 is adjusted (upward or downward) based on the percent change in the focal school system's total high school level enrollment between the 1996 and 1999 school years.

Unlike the NCES approach, the ACR method relies heavily on enrollment counts. ACR avoids becoming heavily dependent on data that are often directly implicated in accountability systems and may be especially prone to biased reporting (e.g., dropout counts). This measurement strategy also makes moderate demands on data availability, requiring information on: the number of diploma recipients for a target year, the total high school-level enrollment for the focal and base years, and grade-specific enrollments over a three-year period for estimating the smoothed enrollment base.

4.4. Cumulative Promotion Index (CPI)

Finally, as a somewhat differently oriented approach to the problem of estimating graduation rates we propose a new indicator for consideration – the Cumulative Promotion Index (CPI). This approach bears some resemblance to measures of holding or promoting power that have at times been employed at the school level, although rarely used for higher-order educational units (Balfanz & Legters 2001). As illustrated in Equation 5, the value of the CPI indicator approximates the probability that a student entering the 9th grade will complete high school on time with a regular diploma. It does this by representing high school graduation rate as a stepwise process composed of three grade-to-grade promotion transitions (9 to 10, 10 to 11, and 11to 12) in addition to the ultimate high school graduation event (grade 12 to diploma).

[13] To the extent that dropout rates change over the period of observation , the population adjustment strategy recommended by Greene (2002b) will probably underestimate variation in graduation rates to some degree. An increase in a system's dropout rate between 1996 and 1999, for example, would influence the graduation rate calculations in two ways. All else being equal, an increased dropout rate will result in a lower number of graduates by 1999 (the numerator of the equation). The impact of this decrease in the numerator, however, would be partially counterbalanced by a change in the denominator. Specifically, a higher dropout rate will also cause the system's high school enrollment base to decline between the time the focal cohort enters 9th grade and its expected completion year. In turn, this would reduce the size of the adjustment factor for change in enrollment (captured in the equation's denominator).

$$CPI = \left[\frac{E^{10}_{2000}}{E^{9}_{1999}}\right] * \left[\frac{E^{11}_{2000}}{E^{10}_{1999}}\right] * \left[\frac{E^{12}_{2000}}{E^{11}_{1999}}\right] * \left[\frac{G_{1999}}{E^{12}_{1999}}\right] \quad [4]$$

where

G_{1999} is the count of students who graduated with a regular high school diploma during the 1999-2000 school year,

E^{9}_{1999} is the count of students enrolled in grade 9 during the 1999-2000 school year; and

E^{10}_{2000} is the count of students enrolled in grade 10 during the 2000-01 school year.

This indicator differs from the others discussed above in several respects. As before, the graduation outcome for the high school class of 1999-2000 remains our point of reference. Unlike the earlier indicators that incorporate data retrospectively to 1996, the CPI is prospective, effectively *looking forward* from the focal year. For instance, the first of the four promotion ratios incorporated into the CPI estimates the proportion of 9th graders who are promoted to the next grade, using data on 9th grade enrollment at the start of the 1999-2000 school year and 10th grade enrollment at the beginning of the following school year (2000-01). Comparable promotion ratios are also constructed for the 10th and 11th grades. The final element of the index is computed by dividing the number of students who receive a high school diploma at the end of 1999-2000 school year by the number of 12th graders at the start of that year. This component represents the promotion rate for grade 12, where successful "promotion" is defined as receiving a regular diploma.

By multiplying these grade-specific promotion ratios together, the CPI estimates the likelihood that a 9th grader from a particular school system will complete high school with a regular diploma in four years *given the conditions prevailing in that school system during the 1999-2000 school year.* Rather than following a single estimated cohort over a long period of time, the CPI adopts a synthetic method that follows multiple cohorts over a short period of time.[14] The CPI's synthetic, present-focused approach may have decided advantages when used to construct indicators for purposes of accountability.

The CPI method, for example, requires data over a shorter period of time than the other approaches examined above. Data are required from only two observations separated by one year in time – from the beginning of the focal school year to the beginning of the next. An estimate using the CPI method can be computed after only two years of data collection, as opposed to four years for the longitudinal (LCR) and NCES indicators and five years for ACR. At least in the short term, the CPI may be a particularly attractive option for states or districts that are implementing new data collection systems because it will provide information about graduation rates that might be incorporated into accountability systems after only a relatively brief start-up period.

[14] Interestingly, Winglee et al. (2000) find little difference between synthetic and non-synthetic estimates at the state level.

In addition, the CPI places a strong conceptual emphasis on current educational conditions. This is operationalized empirically by using data on grade-specific promotion rates over a one-year period to estimate the performance of an educational system for a particular year of interest. By comparison, the NCES and ACR approaches effectively use past conditions (e.g., data from 1996) to estimate current system performance (e.g., graduation in 2000). The CPI's measurement strategy of heavily weighting contemporary conditions may provide a more appealing (if not actually more legitimate) basis for calculating *current* levels of educational system performance and, also, for imposing sanctions that are experienced in the *present*. [15] We would expect differences between estimates produced by present- versus past-weighted indicators to be most pronounced in situations where educational conditions have changed dramatically for the better or worse over the years.

[15] Although we have focused here on group-level indicators, the synthetic CPI approach to measuring graduation rates could also be applied to individual-level longitudinal data. The benefits of CPI relative to other indicators may be particularly noteworthy in this case. A longitudinal CPI indicator would require tracking individual students over a rather short span of time. As a result, the data necessary for calculating a graduation rate could be obtained with substantially less effort and would place fewer demands on state and district data collection systems. A shorter tracking period may also provide more accurate and complete information.

5. DATA AND METHODS

As suggested above, the dual challenges facing efforts to develop and validate indicators for high school graduation rates are a lack of a comprehensive, authoritative source for information on high school graduation combined with a lack of consensus over how to best define and compute such an indicator. Since no established standard exists against which to test proposed indicators, analysts might pursue two general approaches to better understand high school graduation as an educational phenomenon and to explore alternative measurement strategies for developing accurate and reliable indicators. First, one might use a single computational approach to calculate graduation rates for a particular set of educational units, but do so using different data sources. Of interest here would be the stability of an indicator given variations in the types of data used, such as federally-sponsored data collections like the Common Core of Data versus information collected and reported by state or local accountability systems. An alternative approach would be to employ a single data source and compare high school graduation rate estimates calculated using multiple computational approaches. The current paper pursues the latter strategy and specifically examines the three group-level indicators described above – NCES, ACR, and CPI.

The most comprehensive source of data on various forms of high school completion and dropout currently available is the Common Core of Data. Conducted by the U.S. Department of Education, the CCD is a census of public sector local educational agencies (districts) and schools for the fifty states, the District of Columbia and several other non-state jurisdictions. Annual surveys of basic demographic and educational information at the state, district, and school levels are completed by staff of the respective state education agencies. The district-level CCD database reports the number of students receiving diplomas and other kinds of high school completion credentials as well as dropout counts by grade level. Grade-specific enrollment data are available only at the school level. This data structure has two consequences with respect to calculating group-level indicators. First, we must combine information from the CCD's district and school databases. Second, because completion and dropout counts are not reported for individual schools, the district is the most basic educational unit for which graduation rate indicators can be systematically constructed. Grade-specific enrollment counts at the district level are obtained by aggregating school data. High school graduation rates are first calculated at the district level and then aggregated upward to the state level (weighted according to the size of the district's high school enrollment) to produce national and state level estimates.

During the foal year for our analysis (1999-2000), there were 14,978 regular school districts in operation throughout the fifty states and District of Columbia. In defining our target population for analytic purposes, however, it will be necessary to introduce several additional restrictions. Our objective is to identify districts that (1) are eligible for the calculation of a graduation rate and (2) should in theory have the necessary information needed to calculate such a rate. It is reasonable to assume, for instance, that we can only calculate a meaningful graduation rate for districts that contain a full complement of secondary level grades (9-12). About 27 percent of regular school districts in the country do not meet this criteria, the majority of which possess only an elementary level grade span or have ungraded enrollment.

In addition, the three indicators of interest require various pieces of information from the 1995 through 2000 school years. Districts that were not in operation during this entire period of time will be legitimately missing some necessary information. Of the districts in operation during the focal year, a small fraction (3%) were not in operation during at least some part of our period of observation. Further, 4.5 percent of districts had undergone a significant change in boundaries over this period. Such events effectively change the identity of a particular district and produce large year-to-year fluctuations in enrollments,

which in turn produces invalid estimates of graduation rates. [16] Taking all of these selection criteria into consideration, we arrive at a target population of 10,836 school districts for which we should be able to calculate valid graduation rates. This is only a starting point, of course, which assumes that the information expected to be reported for these districts in the CCD is actually present. We will find below that this is often not the case.

As discussed earlier, one of the main points of contention in debates over measuring high school graduation rates is *which* credentials should be counted. The official NCES completion statistics, for instance, counts all state-issued completion credentials (although not the GED) as a means of providing a more consistent definition of a "high school completer" across states. The decision to count only regular diplomas when calculating graduation rates for the purposes of this study was motivated by two main considerations. First, this approach adheres to the definition of high school graduation stipulated in NCLB. Second, only a small percentage of high school completers nationwide (1.5%) were awarded a non-diploma credential in 1999-2000 and this rate never reaches 10 percent for any individual state (Young 2002).

Finally, the NCES indicator is formulated in such a way that its value is constrained to fall within the range of 0 to 100 percent, the minimum and maximum values for any percentage statistic. The same is not true for the ACR and CPI methods because values could exceed 100 percent. As a result, operational rules must be developed for handling cases in which their values exceed the maximum. This was accomplished through a combination of trimming and censoring district estimates. For the ACR method, districts with out-of-range values that fell within a reasonable margin of error (10%) were reassigned the maximum value (100%). Cases with more extreme values were assigned missing values. Similar rules were used to constrain the maximum value of CPI indicator's grade-specific promotion ratio components. Following a procedure recommended by Greene (2002b), cases are also assigned a missing value for ACR if the population adjustment factor indicates extreme growth or decline (a change of over 30%) in the district's high school enrollment between 1996 and 1999.

[16] Due to these procedures for weighting and sample exclusion, the NCES and ACR estimates reported in this study may not agree with values published elsewhere using similar methods (Young 2002; Greene 2002b).

6. RESULTS

In the following sections we compare the empirical properties of three group-level indicators of high school graduation rates generated using the NCES, ACR, and CPI methods as described above. Our goal is to provide evidence that can help inform the choice among graduation rate indicators for use in educational accountability regimes like those to be established under NCLB. Among the characteristics we examine, for example, is the coverage the respective indicators provide – the proportion eligible districts for which a graduation rate can be calculated. In addition to presenting results for the nation as a whole, state-level estimates of the high school graduation rate are also reported. A final set of analyses presents disaggregated rates by race and ethnicity. In this final portion of the study, however, we encounter significant limitations in data available with CCD and find that only the CPI method is able to produce reasonable estimates. Although a comparison among alternative estimation strategies is not feasible and a considerable number of state-by-race estimates are missing, the CPI rates may provide valuable insights into racial disparities in an important educational outcome and criterion of school system performance.

The analyses presented below are largely descriptive and, while suggestive, should not be considered a definitive treatment on the subject. At this point, we believe that the existing research base cannot provide conclusive evidence for endorsing a particular high school graduation indicator, including the ones examined in this study. Nevertheless, the reality is that the law requires graduation rates for use in operating accountability systems and choices must be made. The study begins to address two important questions the answers to which hold important consequences for the integrity of educational accountability systems that the states will be implementing. First, do alternative approaches to measuring graduation rates produce different estimates from one another? Second, are these differences larger enough to have a practical impact on the application of accountability provisions under the law? Put simply, is it possible that choosing one graduation rate indicator over another could results a larger (or smaller) number schools and districts being identified as needing improvement? Because with NCLB the stakes have become so high, this study seeks to start building a foundation of scientifically-based evidence that can inform the development of the educational accountability systems as required under the new law.

6.1. National Graduation Rates – Indicator Quality and Estimates

The first column of Table 1 presents the average of district-level graduation rates for the high school class of 2000. These values have been calculated using data from the CCD according to the three computational methods described earlier. It should be noted that these initial sets of estimates are not weighted for district enrollment. These values should, therefore, be interpreted as the graduation rate for the average district (where large and small districts are treated equally). Using the NCES method, we arrive at an average district graduation rate of 85 percent. Estimates using the ACR and CPI strategies, on the other hand, produce values that are much lower but similar to one another – graduation rates of 78 and 73 percent respectively.

As discussed earlier, the NCES measurement approach depends heavily on information about high school dropout to estimate a completion rate. The considerably higher value found for the NCES indicator would be consistent with the proposition that dropout counts are substantially underreported in practice. The finding that the ACR and CPI methods – despite differences in their computational approaches – produce very similar results and the fact that neither employs information on dropout

provides some support for this speculation. Naturally, making a more definitive determination will require further investigation and richer information than the CCD database is able to provide.

Table 1: Estimated National Graduation Rates and Quality Indicators for Alternative Measurement Approaches, High School Class of 1999-2000

Measurement Approach/Indicator	District Graduation Rate (%)	Indicator Coverage of Target Population		National Graduation Rate (%)
	unweighted	Districts (%)	Students (%)	weighted
NCES	85.4	38.2	28.4	—
ACR	77.6	83.5	84.8	69.3
CPI	72.9	86.2	92.6	66.6

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.

The high school graduation rate for the nation as a whole is, of course, a statistic of considerable interest to policymakers, researchers, and the public at large. But before attempting to generate an estimate for the national graduation rate, it will be necessary to determine whether the three approaches of interest are adequate to that task. To that end, we will examine two basic measures of indicator quality: (1) district coverage: the percent of eligible district for which an estimate can be calculated and (2) student coverage: the proportion of high school students in grades 9-12 nationwide attending districts with available estimates.

The middle columns of Table 1 report the levels of district and student coverage for the three graduation rate estimates. The results reveal, perhaps surprisingly, that the NCES indicator can be calculated for only 38 percent of districts nationwide. The student coverage rate is even lower (28%), suggesting that large districts are disproportionately undercovered by this indicator. The low coverage afforded by the NCES indicator can be largely attributed to its utilization of dropout counts, which are missing for a large number of districts.

Dropout information for a particular district could be unavailable for either of two reasons. The most significant cause relates to the procedures for publicly reporting dropout counts in the CCD. In the interest of maintaining data quality, the CCD database reports dropout data only for those states that adhere to a definition of dropout established by NCES in order to assure that relatively consistent information is being provided across states (NCES 2002). In our target academic year (1999-2000), for example, 14 states did not submit dropout data compatible with the CCD data standards. Several other states were non-reporters in at least one additional year between 1996 and 2000. Because the calculation of completion rates requires dropout counts from four consecutive years and because the group of non-reporter includes most of the largest states (e.g. California, Michigan, New York, Texas), missing data exert a very strong impact on the level of coverage the NCES indicator provides. The second reason that a district's rate may be unavailable using the NCES method is the district did not report its number of dropouts (although it resides in a state that uses CCD-compliant procedures). This possibility will be considered in the following section of the paper, where graduation rates are calculated separately for each state. Regardless of the specific reason for missing data, however, it is not possible

to produce a nationally-representative estimate of the graduation rate for the class of 2000 using the NCES method due to its very low level of population coverage.[17]

By contrast the ACR and CPI indicators both provide a very high level of coverage for district and student populations nationwide. Using the ACR method we obtain an estimate for 84 percent of districts and 85 percent of students across the nation. District and student coverage levels are even higher for the CPI index, at 85 and 93 percent respectively. For both of these measures (particularly the CPI), rates of coverage are somewhat higher for the student population than for districts. This indicates that these approaches provide effective coverage of larger districts (which serve greater numbers of students). These high levels of population coverage suggests that it should be possible to use these methods to produce national estimates of the high school graduation rate that are reasonably accurate and representative of students across the country.

National estimates are calculated by weighting individual district rates to reflect relative size of their high school-level enrollment. We find that the resulting national estimates are considerably lower that those for the average district, indicating that (as one would expect) graduation rates tend to be lower in larger districts. Using the ACR method, we project that 69 percent of students graduate from high school with a regular diploma in the standard number of years.[18] A similar rate is obtained using the CPI indicator, which estimates that only two-thirds (67%) of 9th graders nationwide will complete high school on time.

6.3. State Graduation Rates – Indicator Quality and Estimates

Tables 2 through 4 present state-by-state estimates of on-time graduation rates for the high school class of 2000 as produced respectively by the NCES, ACR, and CPI measurement approaches. Each table reports the proportion districts and students in the state for which a valid rate can be calculated as well as a weighted estimate for the average graduation rate for students statewide. The final column indicates how a state ranks in terms of its high school graduation rate when compared against the other states for which an estimate can be calculated.

As noted earlier, CCD does not report district dropout counts for states whose dropout reporting practices do not conform to NCES standards. As a result of missing dropout counts for at least one year between 1996 and 1999 or missing completion data (in a small number of cases), the NCES indicator the cannot be calculated in 26 states or the District of Columbia for the class of 2000 (see Table 2).[19] Among the remaining 24 states for which estimates can be computed, we find very high average levels of indicator coverage for both districts and the student population. While the within-state coverage levels for districts and students range as low as 67 and 83 percent respectively, the majority of states approach near-total coverage in both regards. Indeed, only two states report student coverage rates below 95%. Earlier we noted that the excessive amount of missing data for the NCES indicator prevented the calculation of a

[17] In fact, it is for this reason that the U.S. Department of Education relies upon other methods and data (e.g., the CPS) in much of its official reporting on high school completion and dropout rates.

[18] The estimates reported in this paper are based on completion counts from a non-longitudinal group-level database (the CCD) that does not provide information on the number of students who are retained (held back in grade), transfer (in or out), or graduate late (or early). Therefore, they can only approximate an on-time graduation rate, strictly speaking. The impact of retention and mobility on the accuracy of group-level estimates is an important issue that should be examined carefully in further research. While such factors may affect the level of rates reported, we anticipate a similar effect across the three indicators in this study since they all use the same data.

[19] In addition to states missing dropout data, Arizona did not submit district completion counts for the 1999-2000 CCD cycle. As a result graduation rates for this state are missing for all three indicators. New Jersey did not submit district or school level data for the 1996-97 reporting cycle, which affects the NCES and ACR approaches. A CPI rate can be computed for New Jersey because this method does not require information from 1996.

national graduation rate using this measurement method. We can now safely conclude that the reason these data are unavailable is almost entirely attributable to non-conforming state procedures for collecting dropout data, rather than district-specific non-reporting in conforming states.

Table 2: Estimated Graduation Rates and Quality Indicators by State using the NCES Method, High School Class of 1999-2000

State	District Coverage	Student Coverage	State Average (weighted)	Rank (out of 24)
ALABAMA	96.0	98.0	78.5	19
ALASKA	100.0	100.0	78.9	18
ARIZONA	—	—	—	—
ARKANSAS	100.0	100.0	79.3	17
CALIFORNIA	—	—	—	—
COLORADO	—	—	—	—
CONNECTICUT	100.0	100.0	85.4	4
DELAWARE	100.0	100.0	81.0	14
DISTRICT OF COLUMBIA	—	—	—	—
FLORIDA	—	—	—	—
GEORGIA	98.3	99.7	69.5	22
HAWAII	—	—	—	—
IDAHO	—	—	—	—
ILLINOIS	—	—	—	—
INDIANA	—	—	—	—
IOWA	99.7	100.0	88.8	2
KANSAS	—	—	—	—
KENTUCKY	—	—	—	—
LOUISIANA	100.0	100.0	62.9	24
MAINE	100.0	100.0	86.0	3
MARYLAND	—	—	—	—
MASSACHUSETTS	100.0	100.0	84.5	6
MICHIGAN	—	—	—	—
MINNESOTA	66.9	87.7	81.8	10
MISSISSIPPI	92.0	95.7	75.4	20
MISSOURI	99.8	100.0	80.3	16
MONTANA	71.0	82.9	83.3	8
NEBRASKA	97.3	100.0	85.0	5
NEVADA	100.0	100.0	69.1	23
NEW HAMPSHIRE	—	—	—	—
NEW JERSEY	—	—	—	—
NEW MEXICO	75.0	97.5	71.4	21
NEW YORK	—	—	—	—
NORTH CAROLINA	—	—	—	—
NORTH DAKOTA	100.0	100.0	90.4	1
OHIO	99.8	100.0	81.6	11
OKLAHOMA	—	—	—	—
OREGON	—	—	—	—
PENNSYLVANIA	100.0	100.0	84.5	6
RHODE ISLAND	100.0	100.0	81.2	12
SOUTH CAROLINA	—	—	—	—
SOUTH DAKOTA	—	—	—	—
TENNESSEE	—	—	—	—
TEXAS	—	—	—	—
UTAH	100.0	100.0	80.8	15
VERMONT	—	—	—	—
VIRGINIA	—	—	—	—
WASHINGTON	—	—	—	—
WEST VIRGINIA	100.0	100.0	82.7	9
WISCONSIN	—	—	—	—
WYOMING	100.0	100.0	81.1	13

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.
— Indicator is not calculated due to insufficient data.
* Low Coverage - Rate not reported because statistic covers less than 50 percent of student population.
† Moderate Coverage - Rate covers between 50 and 75 percent of student population.

The final columns of Table 2 report statewide graduation rates and ranks. State rates are calculated by weighting each district's estimate by its relative share of the within-state student population in grades 9-12. State graduation rates range from a low of 63 percent for Louisiana to a high of 90 percent for North Dakota. The majority of states, however, fall within a more narrow range of 75 to 85 percent. The average graduation rate across the 24 states with available estimates is 80 percent.

In Table 3, we find that the ACR method can be used to calculate graduation rates for districts in 48 states plus the District of Columbia. We also find that this indicator provides a generally high level of coverage within these jurisdictions. On average about 87 percent of districts within states have a valid estimate, with seven states falling below 75 percent coverage. Eighty-nine percent of the student population in the average state is represented by the ACR graduation rate. Four states display a moderate level of coverage, between 50 and 75 percent. Because student coverage is very low in Montana (11%) and the estimate is likely to be unreliable, the graduation rate for this state is not reported. ACR graduation rates for the individual states average about 71 percent, although values range considerably around this mean. The District of Columbia displays the lowest graduation rate using the ACR method, with just over half (53%) of the class of 2000 graduating from high school on time. At the other end of the spectrum North Dakota graduates nearly 85 percent of its high school students.

Using the CPI computational strategy (Table 4), we arrive at results very similar to those produced by the ACR method. With the exception of Arizona, the CPI indicator can be computed for all states and the District of Columbia. Levels of CPI indicator coverage for districts and students are consistently high (averaging 88 and 94 percent respectively) and exceed those reported above for the ACR indicator. In addition, the CPI estimates provides at least 75 percent coverage of the high school student population in every state. The average CPI graduation rate across states is 68 percent. Individual state values range from a low of 48 percent for South Carolina to a high of 82 percent for New Jersey. A closer examination of the results produced by the ACR and CPI methods reveals a high overall level of agreement between the two indicators at the state level. These measures display a very high correlation (r = .90) and also generate very similar rankings of states on the whole.

These three sets of estimates suggest that different approaches for calculating a high school graduation rate can sometimes produce rather different results. These differences are especially striking when comparing the NCES estimates against the values generated by the other two indicators. It is possible, therefore, that the choice of one method over another for calculating graduation rates could have important consequences when states use these estimates for purposes of accountability. We can place the practical implications of choosing among these three alternative graduation rates in a context relevant to NCLB. Suppose that, as part of their accountability plans, all state adopted a graduation rate of 75 percent as a performance goal. Among the 23 states for which our three rates are available, 19 would meet this performance standard if they calculated their graduation rate using the NCES method. But far fewer states would meet this standard if they used the ACR or CPI approach (11 and 8 states respectively).

Table 3: Estimated Graduation Rates and Quality Indicators by State using the ACR Method, High School Class of 1999-2000

	District Coverage	Student Coverage	State Average (weighted)	Rank (out of 48)
ALABAMA	96.8	98.3	65.7	36
ALASKA	82.0	94.1	63.0	41
ARIZONA	—	—	—	—
ARKANSAS	74.2	74.6	75.7†	17
CALIFORNIA	72.6	71.6	67.2†	32
COLORADO	85.6	94.0	68.8	30
CONNECTICUT	95.8	98.2	72.3	24
DELAWARE	84.2	83.1	62.9	42
DISTRICT OF COLUMBIA	100.0	100.0	53.4	48
FLORIDA	97.0	96.0	54.1	47
GEORGIA	96.5	96.2	57.1	46
HAWAII	100.0	100.0	70.7	29
IDAHO	86.7	95.0	79.0	10
ILLINOIS	74.6	57.2	73.3†	22
INDIANA	96.9	96.5	76.2	14
IOWA	86.5	94.5	83.8	2
KANSAS	89.7	96.7	74.2	20
KENTUCKY	96.4	98.4	71.8	26
LOUISIANA	93.9	95.3	66.2	34
MAINE	91.3	92.9	75.9	16
MARYLAND	91.7	92.8	71.7	27
MASSACHUSETTS	95.4	94.0	72.1	25
MICHIGAN	91.0	87.2	74.7	19
MINNESOTA	84.4	84.4	79.4	9
MISSISSIPPI	90.0	95.8	63.7	39
MISSOURI	91.1	95.9	74.9	18
MONTANA	22.2	11.4	—*	—
NEBRASKA	74.5	87.9	83.6	3
NEVADA	93.8	99.6	61.9	43
NEW HAMPSHIRE	86.3	82.0	73.8	21
NEW JERSEY	—	—	—	—
NEW MEXICO	85.2	95.0	66.1	35
NEW YORK	93.7	98.5	65.3	38
NORTH CAROLINA	94.8	87.2	63.2	40
NORTH DAKOTA	76.0	87.2	84.9	1
OHIO	95.2	96.6	77.2	13
OKLAHOMA	72.4	85.5	73.3	22
OREGON	88.2	97.8	66.9	33
PENNSYLVANIA	89.6	95.1	78.0	12
RHODE ISLAND	96.9	95.5	71.1	28
SOUTH CAROLINA	90.9	96.3	59.5	44
SOUTH DAKOTA	78.9	92.6	82.1	4
TENNESSEE	94.1	93.1	59.4	45
TEXAS	91.6	92.6	68.2	31
UTAH	72.5	82.5	80.4	8
VERMONT	81.3	71.3	78.6†	11
VIRGINIA	93.1	92.8	76.0	15
WASHINGTON	79.9	87.4	65.7	36
WEST VIRGINIA	89.1	88.2	81.6	5
WISCONSIN	89.7	89.4	80.7	7
WYOMING	87.0	95.2	81.5	6

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.
— Indicator is not calculated due to insufficient data.
* Low Coverage - Rate not reported because statistic covers less than 50 percent of student population.
† Moderate Coverage - Rate covers between 50 and 75 percent of student population.

Table 4: Estimated Graduation Rates and Quality Indicators by State using the CPI Method, High School Class of 1999-2000

	District Coverage	Student Coverage	State Average (weighted)	Rank (out of 50)
ALABAMA	100.0	100.0	61.3	38
ALASKA	66.0	95.4	59.3	43
ARIZONA	—	—	—	—
ARKANSAS	85.5	76.3	69.2	29
CALIFORNIA	88.9	92.8	68.3	30
COLORADO	71.8	94.5	70.3	27
CONNECTICUT	97.5	98.0	76.3	11
DELAWARE	89.5	93.3	67.0	32
DISTRICT OF COLUMBIA	100.0	100.0	53.5	46
FLORIDA	97.0	99.5	49.9	48
GEORGIA	97.7	98.5	53.5	46
HAWAII	100.0	100.0	62.3	36
IDAHO	81.9	95.8	74.7	14
ILLINOIS	93.6	96.8	73.9	17
INDIANA	95.9	96.9	70.8	25
IOWA	83.6	88.1	77.6	7
KANSAS	85.7	93.6	73.3	18
KENTUCKY	95.3	98.4	63.7	33
LOUISIANA	97.0	96.0	59.5	42
MAINE	86.1	89.6	72.5	23
MARYLAND	100.0	100.0	72.7	21
MASSACHUSETTS	97.1	96.7	75.5	12
MICHIGAN	86.5	89.2	74.0	16
MINNESOTA	85.4	86.7	79.5	3
MISSISSIPPI	94.7	88.9	59.2	44
MISSOURI	85.7	94.7	71.3	24
MONTANA	72.8	93.7	76.5	10
NEBRASKA	74.5	90.9	77.7	6
NEVADA	93.8	99.4	55.2	45
NEW HAMPSHIRE	94.5	96.6	72.8	20
NEW JERSEY	80.2	80.5	81.6	1
NEW MEXICO	81.8	96.1	60.1	41
NEW YORK	90.3	95.5	60.2	40
NORTH CAROLINA	99.1	99.9	60.3	39
NORTH DAKOTA	73.1	89.3	79.7	2
OHIO	93.4	91.8	70.7	26
OKLAHOMA	79.4	93.3	67.3	31
OREGON	79.9	94.1	62.6	35
PENNSYLVANIA	96.0	97.4	75.2	13
RHODE ISLAND	96.9	99.9	72.6	22
SOUTH CAROLINA	83.0	90.4	48.4	50
SOUTH DAKOTA	77.7	91.7	78.0	5
TENNESSEE	84.0	93.8	48.6	49
TEXAS	82.1	93.0	62.9	34
UTAH	97.5	99.6	79.4	4
VERMONT	85.9	91.2	72.9	19
VIRGINIA	86.3	90.8	77.5	8
WASHINGTON	75.8	84.7	62.3	36
WEST VIRGINIA	98.2	99.4	70.2	28
WISCONSIN	88.4	91.2	76.6	9
WYOMING	89.1	95.3	74.7	14

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.
— Indicator is not calculated due to insufficient data.
* Low Coverage - Rate not reported because statistic covers less than 50 percent of student population.
† Moderate Coverage - Rate covers between 50 and 75 percent of student population.

6.4. Graduation Rates for Racial and Ethnic Subgroups

The sections above have focused on the total graduation rate for all students. While the new law calls for raising overall levels of educational performance, NCLB also places a strong emphasis on reducing the disparities or performance gaps among individual subgroups of students identified on the basis race and ethnicity, and socioeconomic, disability and English proficiency status. Requiring that standards must be met for each of these subgroups individually is intended to ensure that an educational system does not improve outcomes for one group at the expense of another. This final analytic portion of the study, therefore, turns to the issue of calculating graduation rates for specific racial and ethnic subgroups, an important dimension along which academic indicators must be disaggregated for state accountability systems.[20]

Technical Challenges for Calculating Disaggregated Rates

Producing graduation rate estimates for specific racial-ethnic groups proves to be a particularly challenging undertaking. Because the NCES indicator could not be computed for the majority of states and also appears to substantially overestimate graduation rates (relative to the other methods), this approach will not be pursued for calculating rates disaggregated by race. The other two indicators examined above both provided high levels of coverage for the nation as a whole and the states individually. The ACR rate, however, cannot be calculated for specific racial categories for the class of 2000. This method requires grade-by-race enrollment data from the 1995 through 1997 school years. The CCD, however did not collect school enrollment data disaggregated by both race and grade until 1998-99. The CPI rate also incorporates disaggregated information on enrollment, but only back to the 1999 school year. So among the alternative methods, the CPI approach is the only one that can reasonably be used to estimate race-specific high school graduation rates for the class of 2000.

Even with the CPI method, however, we encounter several major challenges when employing the CCD database. First, in a number of the states for which total graduation rates could be estimated, there were insufficient data to calculate rates disaggregated by race. Counts of graduates broken out by the CCD's race-ethnicity categories were not available for six states – New Hampshire, South Carolina, Tennessee, Vermont, and Washington. In addition Arizona did not report any completion data for the focal CCD reporting cycle. Two states (Idaho and Tennessee) did not provide grade-level enrollment counts separately by race. Tallying these instances together, we find that race-specific graduation rates are entirely missing for all districts in seven states. Second, the level of indicator coverage within racial subgroups was often rather low, even for states in which disaggregated data were reported and where, therefore, race-specific rates could potentially be calculated. This low coverage resulted from a combination of factors. Disaggregated data were sometimes missing for individual districts or schools within states that generally reported such information. Also some districts displayed large year-to-year fluctuations in disaggregated graduation and enrollment counts (and therefore in grade-specific promotion ratios), a likely product of error introduced by factors like inconsistent reporting procedures. Such districts were excluded from CPI calculations as a result of the data censoring procedures described above.

These two technical limitations substantially reduce the level of indicator coverage for many specific state-by-race estimates. The amount of confidence we should place in the accuracy of a particular

[20] Federal regulations issued for Title I accountability require states to calculate disaggregated graduation rates and to use the for purposes of public reporting and "safe harbor." States are *not* required to use disaggregated rates for determining AYP or identifying schools in need of improvement. This regulatory interpretation of the law may significantly weaken the practical impact of NCLB's accountability provisions for graduation rates, particularly their efficacy in reducing racial performance gaps.

statistical estimate naturally depends, in part, on an assessment of data quality using indicators like coverage of the target population. In some ways, the race-specific CPI graduation rates reported here represent the most comprehensive and reliable information currently available. Nevertheless, these estimates fall short of the ideal of full coverage for each racial group within each state. We must, therefore, interpret these estimates with considerable caution. To this end, we introduce a simple reporting convention to indicate three levels of confidence in these estimates. Rates that cover less than half of the respective student population will not be reported and are noted as providing low coverage in the results below. Estimates based on 50 to 75 percent of the student population are reported but flagged as reflecting a moderate level of coverage. Relatively high-confidence estimates covering over 75 percent of students in the target population are reported without qualification.[21]

National Graduation Rates by Race

Table 5 reports, for the nation as a whole, levels of district and student coverage and estimated graduation rates calculated using the CPI approach. Results are disaggregated by the five race-ethnicity categories reported in the CCD – Native American, Asian, Hispanic, African American, and White.[22] National estimates are calculated by weighting district-level graduation rates relative to their high school enrollment within each respective racial-ethnic group. As anticipated by the discussion above, the levels of coverage for the disaggregated indicators are considerably lower for the race-specific rates than was the case for the overall national estimate. This pattern applies to all racial-ethnic groups except Whites. For instance, we found earlier that 93 percent of students nationwide were represented in the total CPI graduation rate (see Table 1). Student coverage levels for racial minority groups, by comparison, range from 60 percent for Native Americans to just over 80 percent for the Hispanic and African American populations.

Table 5: Estimated CPI Graduation Rates and Quality Indicators by Race and Ethnicity, High School Class of 1999-2000

	Indicator Coverage of Target Population		National Graduation Rate (%)
	Districts (%)	Students (%)	weighted
Native American	69.2	59.7	47.9†
Asian	57.4	75.5	75.3
Hispanic	52.0	80.2	51.5
African American	63.4	82.9	49.1
White	79.1	90.1	73.5

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.

— Indicator is not calculated due to insufficient data.

* Low Coverage - Rate not reported because statistic covers less than 50 percent of student population.

† Moderate Coverage - Rate covers between 50 and 75 percent of student population.

[21] The benchmarks used for reporting here based only on coverage of the student population and could have been set at either more or less restrictive levels. Given a richer data source, more sophisticated criteria might use to reflect other characteristics of the districts examined. While admittedly rudimentary, the cut-points linked to student population coverage used here will provide a basic indication of data quality.

[22] The verbatim reporting categories for CCD are: (1) American Indian or Alaskan Native, (2) Asian/Pacific Islander, (3) Hispanic, (4) Black, not Hispanic, and (5) White, not Hispanic.

National estimates using the CPI method indicated that an average 9th grader (without regard to race) would have a two-thirds chance of graduating from high school with a regular diploma. The graduation rates calculated for specific racial groups, however, range considerably around this overall mean. These results follow well-known patterns of racial disparities found across a variety of educational outcomes. White students have an estimated graduation rate of 74 percent, a value considerably higher than the overall national average. A comparable level is found for Asian students (75%). In rather stark contrast, students from other racial-ethnic groups all have roughly a fifty-fifty chance of graduating from high school. The estimated graduation rates for Native Americans, African Americans, and Hispanics are 48, 49, and 52 percent respectively.

State Graduation Rates by Race

In Table 6 we find statewide graduation rates reported separately for each racial group. At this level of disaggregation, we are faced with significant limitations in indicator coverage. In fact, nearly every state has at least one race-specific graduation rate that displays a moderate or low level of coverage. In some cases, even the rates flagged as providing moderate coverage generate results that are almost sure to be inaccurate. Native American graduation rates, for instance, are estimated to be less than 20 percent in Indiana, New York, and Rhode Island. By contrast, graduation rates for Whites in these three states are very close at the national average, which is 74 percent for Whites. While we would expect Native American students to graduate at much lower levels than Whites, a disparity of this magnitude almost certainly (and hopefully) would be an artifact of data reporting or other technical inconsistencies. Certainly it is imperative that future research delves further into the causes underlying such extreme results. For the present, we will adopt a conservative approach to interpreting results, by limiting our discussions to findings based on high-confidence estimates with at least 75 percent within-group student coverage.

Setting this high level of coverage as a working standard to signal an acceptable degree of confidence in the reported estimates, however, severely reduces the number of cases we will be able to examine. High-confidence graduation rate estimates for African Americans and Whites are available for the majority of states (32 and 44 respectively). But far fewer estimates are available for the other categories. At the extreme, only 8 states have a Native American graduation rate based on a high level of student coverage. Different combinations of race-specific rates will also be available for individual states – with some having high-confidence estimates for all five racial-ethnic groups and others having only a graduation rate for Whites. This will necessarily limit our ability to make comparisons across the states.

Although limited in some respects, these results are nevertheless valuable. They provide us with at least a preliminary indication of the extent to which the outcomes of specific student groups can vary even within the same state. We can also explore the degree to which the size of the performance gaps between White students and members of racial-ethnic minorities varies across the states. The summary in Table 7 indicates that, for each racial group, the differences between the graduation rates in the highest and the lowest performing state range rather narrowly between about 30 to 37 percent. Paralleling the patterns for the nationwide results (Table 5), we find that state rates typically fall at the lowest levels for Native American, Hispanic, and African American students. For example, the graduation rate for Hispanic students in New York state is estimated at under one-third (30.9%) while the rate in Maryland (67.6%) slightly exceeds the national average for all students. Graduation rates are generally much higher for Whites and Asian Americans, with estimated state rates reaching as high as 85 and 92 percent respectively for these groups.

Table 6: CPI State Graduation Rates by Race-Ethnicity, High School Class of 1999-2000

	Native American	Asian, Pacific Islander	Hispanic	African American	White
ALABAMA	69.4	64.0†	—*	55.8	65.4
ALASKA	40.0	64.2†	50.4	48.8†	64.2
ARIZONA	—	—	—	—	—
ARKANSAS	58.5†	—*	—*	61.2	72.1
CALIFORNIA	46.9†	80.3	56.1	54.4	75.3
COLORADO	42.0†	74.7†	49.8†	48.7	76.2
CONNECTICUT	—*	—*	43.1	53.0	82.5
DELAWARE	—*	—*	52.0†	54.8	72.5
DISTRICT OF COLUMBIA	—*	62.7	43.5	53.1	85.0
FLORIDA	—*	76.5	50.6	37.8	54.8
GEORGIA	—*	75.1	38.9†	42.3	60.2
HAWAII	46.6	63.8	55.7	46.1	60.7
IDAHO	—	—	—	—	—
ILLINOIS	45.7†	88.8†	54.5	47.3	81.2
INDIANA	16.8†	—*	44.2†	45.9	73.1
IOWA	—*	66.39†	—*	39.9†	79.1
KANSAS	—*	—*	40.6	56.6	76.8
KENTUCKY	—*	60.8†	51.5†	42.0	64.7
LOUISIANA	49.1	65.6†	57.4	51.8	65.4
MAINE	39.8†	—*	—*	—*	72.4
MARYLAND	61.9†	92.1	67.6	61.8	78.4
MASSACHUSETTS	12.8†	71.6†	45.0†	71.1	76.0
MICHIGAN	38.1†	—*	—*	—*	75.5
MINNESOTA	32.1†	67.6†	—*	10.6†	81.3
MISSISSIPPI	19.8†	—*	—*	54.6	61.6
MISSOURI	—*	—*	—*	46.9	74.5
MONTANA	42.7†	—*	—*	60.5	78.8
NEBRASKA	20.5†	—*	51.9†	50.3	81.6
NEVADA	36.5	71.6	35.9	40.0	62.4
NEW HAMPSHIRE	—	—	—	—	—
NEW JERSEY	15.0†	—*	56.0†	56.3†	84.9
NEW MEXICO	55.7	63.2†	53.4	—*	69.6
NEW YORK	19.5†	61.0	30.9	34.7	73.4
NORTH CAROLINA	39.2	67.6	51.9†	49.1	66.4
NORTH DAKOTA	45.2	—*	—*	—*	83.2
OHIO	21.3†	—*	—*	42.5	74.2
OKLAHOMA	60.4†	69.5†	50.4†	55.6	71.4
OREGON	33.7†	—*	43.9†	34.0†	63.3
PENNSYLVANIA	43.3†	67.1†	39.6	51.2	80.3
RHODE ISLAND	12.0†	56.2†	53.0	59.0	73.8
SOUTH CAROLINA	—	—	—	—	—
SOUTH DAKOTA	32.6†	—*	—*	38.5†	81.1
TENNESSEE	—	—	—	—	—
TEXAS	—*	81.6	53.0	54.3	71.0
UTAH	53.3†	74.8†	63.7†	58.0†	84.3
VERMONT	—	—	—	—	—
VIRGINIA	58.8†	—*	—*	66.8	78.5
WASHINGTON	—	—	—	—	—
WEST VIRGINIA	45.5†	—*	—*	61.3	70.8
WISCONSIN	40.3†	64.0†	47.5†	33.7	81.3
WYOMING	35.5†	—*	—*	—*	76.4

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics. State statistics have been aggregated from district-level rates and weighted according to the district's share of state subgroup population.

— Indicator is not calculated due to insufficient data (i.e. state does not report completion or enrollment data disaggregated by race).

* Low Coverage - Rate not reported because statistic covers less than 50 percent of student subgroup population statewide.

† Moderate Coverage - Rate covers between 50 and 75 percent of student subgroup population statewide.

Table 7: Summary of Results for CPI Graduation Rates by Race and Ethnicity, High School Class of 1999-2000

	Highest State (%)	Lowest State (%)	Range High – Low (%)	High-Confidence Estimates (no. states)
Native American	69.4 (AL)	36.5 (NV)	32.9	8
Asian	92.1 (MD)	61.0 (NY)	31.1	10
Hispanic	67.6 (MD)	30.9 (NY)	36.7	16
African American	71.1 (MA)	33.7 (WI)	37.4	32
White	85.0 (DC)	54.8 (FL)	30.2	44

Source: Common Core of Data Local Educational Agency and School Surveys, National Center for Education Statistics.

Patterns of Racial Disparity

The state-level findings also hint at some intriguing complexities in the relationship between overall system performance and the outcomes experienced by specific student groups. The states with the lowest and highest African American graduation rates (Wisconsin and Massachusetts) both rank among the top quarter of all states in terms of their total graduation rates for all students (see Table 4). By contrast, Florida and the District of Columbia display, respectively, the lowest and highest graduation rates for White students. However these states both finish close-to-last in the nation in terms of their total graduation rates (with ranks of 48 and 46 respectively).

These illustrations suggest that gaps between White and minority student outcomes can be rather large even (perhaps particularly) within states with high average graduation rates. A tension may, therefore, exist between two overriding goals of NCLB – promoting high overall levels of educational performance and minimizing disparities in the outcomes of individual groups of students. It is possible that a state's average graduation rate may increase at the same time that graduation rates within certain racial-ethnic groups stagnate or even decline. It is also possible that the arguably weak regulations that release states from the requirement to use disaggregated graduation rates when determining AYP may fail to provide a vigorous safeguard against boosting average performance at the expense of equity. But how widespread is such a pattern likely to be?

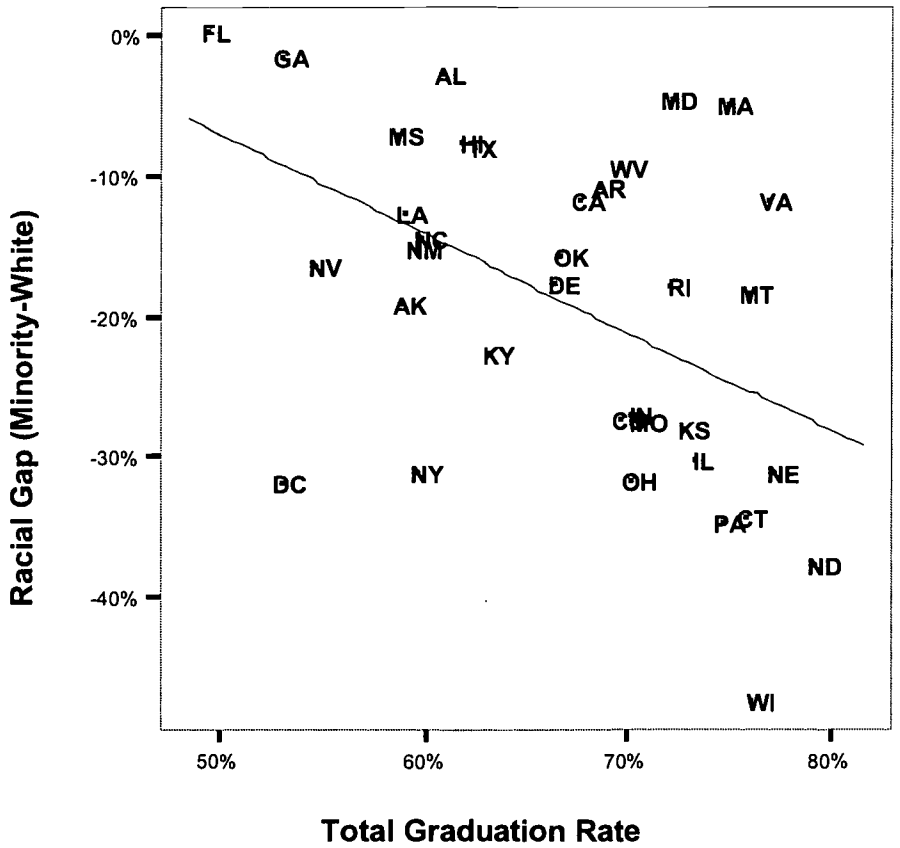

Figure 2: Racial Gaps versus Total State Performance for Graduation Rates

To gain a rudimentary sense of the general correspondence between overall performance and racial disparities, Figure 2 illustrates the relationship between a state's total graduation rate and the average gap between minority and white students.[23] As the consistently negative values along the vertical axis indicate, graduation rates for minority groups are systematically lower than those for Whites in all but one of the 35 states examined here. The single exception is Florida which, we recall, ranks 48 out of 50 in terms of its total graduation rate. In addition the size of this racial gap generally increases as the overall state graduation rate rises. That is, compared to whites, minority students tend to graduate from high school at lower rates in states where the average graduation rate is higher. This relationship exhibits a moderately sized and statistically significant correlation (r = -.48).

[23] Only states with high-confidence estimates for whites and at least one minority subgroup are included in this illustrative analysis. The racial gap is calculated by subtracting the White graduation rate from the average minority graduation rate (across available subgroups) in each state.

Some Words of Warning about Disaggregated Results

The findings reported above for graduation rates disaggregated by racial-ethnic categories are intriguing and certainly point future research and debate in useful directions. But even at the state-level the number of missing and possibly unreliable estimates for the specific subgroups should serve to temper the inclination to generalize these findings further than the data warrant. The technical difficulties encountered here also may be an ill omen for the feasibility of computing reliable disaggregated estimates of graduation rates (and possibly also achievement scores) in the context of actual state accountability systems. NCLB requires that academic performance indicators (including graduation rates) must be disaggregated for individual student groups (including racial categories) at highly localized levels of the educational system, where the numbers of students in these subgroups may be exceedingly small. The incidence of unavailable or sparse information encountered here at the state level is likely to be magnified many times over when performance indicators are calculated for districts and even individual schools.

In some respects these results also raise more questions than they answer. For example, few would argue with the basic proposition that members of racial and ethnic minorities tend to graduate from high school at lower rates than their White peers. That reality is clearly reflected in the CPI estimates reported above and by decades of research on the nation's public schools. But precisely how large are these disparities? Where and in what kinds of states, districts, and schools are these racial gaps most (or least) pronounced? To what extent are the low average graduation rates of minority groups a product of these students being disproportionately concentrated in school systems where performance is almost universally low across all racial groups? And how can we best use the answers to these questions to inform policymaking, to develop more effective strategies for educational reform, and to promote social justice?

Certainly many questions of importance still remain to be answered, while others have yet to be seriously raised in the first place. Resolving technical issues, such as developing methods for computing graduation rates that produce reliable estimates, will be a necessary prerequisite for addressing important issues of substance affecting public education in this nation and particularly for those school systems serving our most disadvantaged students. The research reported here can provide no final answers. But it will hopefully help shine a penetrating light on a serious educational problem that has, particularly of late, often been overshadowed by a consuming attention to raising test scores above all else.

7. Discussion and Conclusion

One of the objectives of this study has been to engage in a thoughtful consideration of the issues attendant to the measurement of an important indicator of educational system effectiveness – high school graduation rates – within the context of performance based accountability regimes. In particular we have been concerned with the implications of different measurement approaches under the recently-authorized and hotly-debated No Child Left Behind Act. To this end, we engaged in a brief review of the relevant law and policy guidance and attempted to explicate in at least some amount of detail several major empirical approaches that states may opt to pursue under NCLB. It is our hope that these discussions have been informative in highlighting some of the issues that are likely to be of major political and material consequence in the months and years to come as states continue to implement the new federal statutes. Although the empirical portions of this study have at times been largely exploratory in character, several important preliminary lessons can be gleaned from this work and fruitfully applied in future investigations.

The measurement of educational performance is a central component of accountability under the terms of No Child Left Behind. The majority of public attention in this regard has been devoted to the task of implementing state-mandated student assessment programs and the associated technical, fiscal, and political challenges. However, high school graduation is another essential component of educational performance under the new accountability regime, and one that in some respects is intended to serve as an important check with regard to achievement. Systems that may be tempted to boost achievement scores by eliminating low-performing students from the rolls will be able to do so only to the detriment of their graduation rates. At least that is how the system is supposed to operate. States or districts that continue to avoid devoting serious attention to the way they define and measure graduation rates may eventually find themselves in difficult straits with regard to maintaining compliance with the new law. As this paper has shown, calculating an apparently-simple value – the percent of student who graduate from high school – is anything but simple and the best way to go about it is anything but apparent.

Many otherwise well-informed parties generally hold the view that we are living in a golden age of educational attainment. More students than ever are attaining more years of education and the days in which large numbers of youth end their education before finishing high school are largely a thing of the past. To a certain extent this is true. However, recent investigations have begun to suggest, and results from the present study further confirm, that graduation rates are very likely to be much lower than the 85 to 90 percent that prevails in the conventional wisdom. At least with respect to four-year completion with a regular diploma, a growing body of work is pointing to a graduation rate as low as two-thirds percent nationwide. Even that statistic, which would strike many of us as surprisingly and unacceptably low, overlooks truly abysmal performance that prevails in certain places. In very large districts responsible for educating predominantly disadvantaged and minority populations and in states with historically struggling educational systems, the odds of graduating from high school for the *average* student lie well below fifty-fifty.[24] The results reported here using the CPI indicator suggest that in many generally high-performing states the graduation rates of racial minority groups may fall to similarly low levels.

Although the empirical results presented above should be interpreted cautiously, one clear and consistent theme that emerges from the findings is that graduation rates based on dropout counts are highly problematic. The root of this problem lies in the largely inadequate state of our national systems for

[24] See Swanson and Chaplin (2003a) and Greene (2002a) for analyses of graduation rates for the 100 largest districts in the nation.

defining and collecting information about dropping out. Although there are recent indications that the situation may be improving, for now it would be appropriate to describe this system as extremely limited for most practical intents and purposes. Even for the CCD, the nation's census of educational agencies and schools and most comprehensive source of basic educational statistics, dropout data goes unreported for large numbers of states and districts, and the data that are available may considerably understate the magnitude of the dropout problem.[25]

The fact that the largest of the states number among the non-reporters exacerbates the poor level of coverage that dropout-based indicators of graduation provide for the national student population. To further complicate matters, many of these same states are also home to large and rapidly growing minority populations. The challenges associated with educating these groups are of paramount importance to policymakers nationwide. In fact, concerns that the educational needs of these groups may be going unmet played a large role in motivating NCLB's requirement that performance gains must be demonstrated for all students, particularly those from racial and ethnic minority groups and those with limited English proficiency. As noted earlier, however, federal regulations may allow states to take a more lenient approach to applying accountability standards to individual student subgroup for graduation rates than they are required to adopt for achievement.

But even in situations where presumably valid dropout counts are available and can be used to calculate high school graduation rates, the estimates that incorporate such information appear to be implausibly low in many cases. That is, at least in comparison to rates based on enrollment counts. It is imperative that we develop more accurate information on the true dropout rates that prevail in schools and districts across the country. There is some reason to hope that the stronger and more systematic forms of accountability that will presumably accompany NCLB may promote some progress in that very direction. But in the meantime, the best evidence available clearly recommends a move, and a rapid one at that, away from a reliance on graduation rates using dropout data and towards alternative strategies for measuring this key indicator of educational performance.

There is much we still do not know about the true rates at which students graduate from or drop out of high school in this country. Although a clearer picture is emerging of broad national patterns, our perspective remains rather obscured at the level of individual states, particularly for individual racial and ethnic subgroups. We offer two recommendations that will promote the development of a knowledge base in this critical area. Ideally, we should establish scientifically-based standards for calculating graduation rate indicators consistent with the way NCLB requires that assessments be used for purposes for which they are valid and reliable, consistent with relevant, nationally recognized professional and technical standards. Therefore, as graduation rates must be included in AYP, states should ensure that this indicator is made more reliable. Second, safeguards must be established to ensure that data reported about graduates, dropouts, and enrollments are not only complete but also accurate. After all, a graduation rate will only be as good as the data used to calculate it. The U.S. Department of Education could play a central role in supporting both of these efforts. Steps such as these will help to ensure that all states are held to the same high standards. This may, in turn, instill public confidence in the accountability regimes that will become a prominent feature of public educational landscape as the new law of the land is implemented in the coming years.

[25] While 37 states reported dropout data for the 1999 school year, 46 states reported dropout counts for the most recent CCD reporting cycle in 2000 (Young 2003). But it may be several more years before these newly-reporting states have the four years of dropout data necessary to calculate the NCES graduation rate. A greater number of reporting state, of course, does not by itself guarantee that dropout counts will be accurately reported within states.

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