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First through Eighth Grade Retention Rates for All 50 States: A New Method and Initial Results

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Abstract

How many students repeat a grade each year? How do retention rates vary across states and over time? Despite extensive research on the predictors and consequences of grade retention, there is no systematic way to quantify state-level retention rates; even national estimates rely on imperfect proxy measures. We present a conceptually simple method—based on publicly available data that are routinely collected each year—that describes retention rates at the state and national levels. After describing and validating this method, we employ it to report first through eighth grade public school retention rates for 2002–003 through 2008–09 for the entire country and for each state.

How many students repeat a grade each year? How do retention rates vary across states and over time? Grade retention is a widely used policy tool; its relationship to academic achievement and high school completion has been the subject of a century of empirical scholarship; and the practice is increasingly part of states' accountability systems. However, we know surprisingly little about how many students repeat grades (Heubert and Hauser 1999; Ou and Reynolds 2010).¹ Along with dropout rates and test scores, retention rates might be considered a basic indicator of children's progress through the American education system. To be useful for academic and policy research, we should be able to quantify retention rates annually for each grade. Because retention rates vary across locales, we should also be able to quantify them at the state level as well as at the national level. There is currently no systematic, reliable, and well-validated way to quantify grade retention rates at the state level, by grade or otherwise; even national estimates rely on imperfect proxies.

We describe a new method for estimating annual, grade-specific retention rates at the state and national levels. Our conceptually simple method relies on publicly available data that are routinely collected each year. Our goal is to describe and validate this method. However, by way of example, we also report public school retention rates for grades one through eight for 2002–03 through 2008–09. We hope others will utilize the resulting estimates for academic research and policy evaluation.

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¹This is analogous to having rich theoretical and policy perspectives on the causes and consequences of mass incarceration without knowing how many people are in jail.

WHY MEASURE GRADE RETENTION RATES?

There are several reasons to study grade retention, all of which require better estimates of national and state level retention rates. First, retention is neither a rare event nor one that happens at the same rate across locales. For example, West (2009) reported that across several states, ninth grade retention rates ranged from 10% (Massachusetts) to 28% (South Carolina).

Second, there are unresolved empirical questions about the effects of retention on academic achievement, developmental outcomes, high school completion, and post-secondary outcomes. Researchers have often reported few beneficial effects of retention on *achievement* (e.g., Arthur 1936; Hong and Yu 2007; Jimerson 2001; Jimerson and Ferguson 2007; Silbergliitt et al. 2006; Wu et al. 2008) and negative effects on *high school completion* (Alexander et al. 2004; Eide and Showalter 2001; Jimerson et al. 2002; Rumberger and Larson 1998), *social adjustment* (e.g., Jimerson and Ferguson 2007; Nagin et al. 2003), *college attendance* (e.g., Fine and Davis 2003; Ou and Reynolds 2010), and *wages* (e.g., Eide and Showalter 2001). However, recent investigators—mostly using regression discontinuity or propensity matching procedures—have come to contradictory conclusions about each of these potential effects of retention (e.g., Allen et al. 2009; Babcock and Bedard 2011; Greene and Winters 2007; Hong and Raudenbush 2005; Hong and Yu 2008; Hughes et al. 2010; Jacob and Lefgren 2004; Jacob and Lefgren 2009; Mariano and Martorell 2011).

Finally, grade retention is a malleable social policy. Whether implemented semi-formally at the schoolhouse level or at the state level as part of broader accountability policies, retention is an intentional practice that can be used or not used with more or less frequency. Careful evaluation of the correlates and impacts of this policy requires information about the frequency with which it occurs, especially at disaggregated geographic and administrative levels.

EXISTING MEASURES

In a perfect world, all states would report grade-specific retention rates for multiple academic years, for subgroups of students, and using comparable data and measures. Unfortunately, most states do not report retention rates at all; those that do use different methods for calculating them. Consequently, researchers and policy analysts have typically made do with other sources of information.

The National Center for Education Statistics (NCES) has conducted several large longitudinal studies of single cohorts of students; these have been used to study the correlates of retention (e.g., Hong and Raudenbush 2005; Hong and Yu 2007; Rumberger and Larson 1998; Stearns et al. 2007). Studies beginning with high school-aged students (e.g., HS&B, NELS, or ELS) ask retrospective questions about retention; the validity of these retrospective reports is not clear. Studies beginning with younger students (e.g., ECLS-K, ECLS-B) allow for prospective observation of retention—but only through the early grades. Most importantly, none of the NCES studies are large enough to produce reliable state-level estimates; all suffer from sampling and attrition biases; and each can only speak to the experiences of students in single cohorts.

The annual October Supplement to the Current Population Surveys (CPS) facilitates estimates of national grade-specific retention rates using two different techniques. First, because all students are observed in two consecutive Octobers and because students are asked about grade of enrollment in both the current and the previous October, it is possible to observe which students are in the same grade in both years. To our knowledge, there are

no published studies using this technique. Second, in some years the October CPS has asked parents retrospective questions about children's histories of retention (e.g., U.S. Department of Education 1997: Table 24). The quality of the resulting data is unknown, and the focal survey items have not been asked in a decade. With either technique, the size of the CPS samples is such that they cannot be used to estimate reliable state-level rates. For example, in the 2010 October CPS there were fewer than 30 first graders observed in 28 of the states.

Because of these limitations of NCES and CPS data, many scholars use proxies for retention based on the distribution of students' ages within grades (e.g., Bianchi 1984; Frederick and Hauser 2008; Hauser et al. 2007; Hauser et al. 2004; Heubert and Hauser 1999). These proxies define students as "delayed" if they are enrolled below the modal grade for their age. Because both age and grade of enrollment are observed annually in the CPS since 1968 and the American Community Survey (ACS) since 2008, it is possible to use this proxy to describe retention rates at the national level, in each year since the late 1960s, and for broad subgroups of students (e.g., by students' race/ethnicity). However, as noted above the CPS sample is not large enough to support state-level analyses, and the ACS has included information about exact grade of enrollment only since 2008. Moreover, age-grade delay can only be taken as a loose conceptual proxy for retention. For one thing, there are *two* modal ages for each grade (and thus *two* modal grades for each age). A six year old second grader who is retained will not appear to have been "delayed" because she will simply be the elder of two modal ages for second graders. This problem should not affect inferences about temporal trends or about intergroup differences in retention rates. However, as we demonstrate below, this problem prevents the accurate and reliable quantification of the numbers of retained students.

In the end, there is currently no reliable, well-validated way to quantify the grade retention rate at the state level, and even national-level estimates are based on imperfect proxies and/or on the experiences of single cohorts of students.

MEASUREMENT STRATEGY

How can we quantify the retention rate annually, by grade, and at the state and national levels? To explicate our strategy, we begin with the simulations in Table 1. In Panel A, we simulate fall enrollments in grades one through four across 14 academic years in one jurisdiction. In this simulation 5% of first graders are retained at the end of each academic year; no other students are retained. Annually, 1,000 new students enter first grade for the first time and no students ever leave the system (e.g., through death, migration, or dropout). At equilibrium, there are 1,053 students enrolled in first grade each year: 1,000 first-time first graders and $1,053 \times 0.05 = 53$ students who were in first grade the previous year. Because 95% of those 1,053 first graders are promoted at the end of each year, $1,053 \times 0.95 = 1,000$ first graders advance to second grade (where there is no grade retention). In Panel B, we simulate enrollments in which 10% of first graders, 2% of second graders, and 1% of third and fourth graders are retained each year; as in Panel A, there are 1,000 first-time first graders annually.

Regardless of what we assume in our simulations about first grade retention rates, we can always recover that rate from the observed data as:

$$\text{Retention Rate}_{X-Y}^{\text{1st Grade}} = \frac{\text{Enrollment}_{\text{Fall } Y}^{\text{1st Grade}} - \text{First-Time 1st Graders}_{\text{Fall } Y}}{\text{Enrollment}_{\text{Fall } X}^{\text{1st Grade}}} \times 100 \quad (1)$$

where $\text{RetentionRate}_{X-Y}^{1^{\text{st}} \text{ Grade}}$ is the percentage of first graders retained at the end of the X-Y academic year; $\text{Enrollment}_{\text{Fall } Y}^{1^{\text{st}} \text{ Grade}}$ is the number of students enrolled in first grade in the fall of Year Y; “First - Time 1st Graders_{Fall Y}” is the number of first-time first graders in the fall of Year Y; and $\text{Enrollment}_{\text{Fall } X}^{1^{\text{st}} \text{ Grade}}$ is the number of students enrolled in first grade in the fall of Year X. For example, based on the simulated enrollments in Panel B of Table 1, we can accurately recover the first grade retention rate in any academic year (once equilibrium has been reached) as $\text{RetentionRate}_{\text{Grade}}^{1^{\text{st}}} = [(1,111 - 1,000)/1,111] \times 100 = 10\%$. That is, the first grade retention rate can be determined using only three pieces of information: first grade enrollments in the fall of two consecutive years and the number of first-time first graders in the second year.

Once we know the *first grade* retention rate at the end of the X-Y academic year, the *second grade* retention rate at the end of that year can be calculated as:

$$\text{Retention Rate}_{X-Y}^{2^{\text{nd}} \text{ Grade}} = \frac{\left[\text{Enrollment}_{\text{Fall } Y}^{2^{\text{nd}} \text{ Grade}} - (1 - \text{Retention Rate}_{X-Y}^{1^{\text{st}} \text{ Grade}}) \times \text{Enrollment}_{\text{Fall } X}^{1^{\text{st}} \text{ Grade}} \right]}{\text{Enrollment}_{\text{Fall } X}^{2^{\text{nd}} \text{ Grade}}} \times 100 \quad (2)$$

where $\text{RetentionRate}_{X-Y}^{2^{\text{nd}} \text{ Grade}}$ is the percentage of second graders retained at the end of the X-Y academic year; $\text{Enrollment}_{\text{Fall } Y}^{2^{\text{nd}} \text{ Grade}}$ is the number of students enrolled in second grade in the fall of Year Y; $(1 - \text{Retention Rate}_{X-Y}^{1^{\text{st}} \text{ Grade}}) \times \text{Enrollment}_{\text{Fall } X}^{1^{\text{st}} \text{ Grade}}$ is the number of first graders *not* retained at the end of academic year X-Y (and thus reflects the number of first-time second graders in the fall of Year Y); and $\text{Enrollment}_{\text{Fall } X}^{2^{\text{nd}} \text{ Grade}}$ is the number of students enrolled in second grade in the fall of Year X. For example, based on Panel B of Table 1, and estimating the first grade rate as 10%, the second grade retention rate is $\text{RetentionRate}_{\text{Grade}}^{2^{\text{nd}}} = [(1,020 - (0.90 \times 1,111))/1,020] \times 100 = 2\%$. That is, the second grade rate can be determined using only three pieces of information: second grade enrollments in the fall of two consecutive years and the first grade rate in that same academic year. Likewise, the third grade rate is based on third grade enrollments and the second grade rate, the fourth grade rate is based on fourth grade enrollments and the third grade rate, and so forth—at least until dropout begins to affect enrollments at about grade nine.

DATA

Using the logic described above, we can compute grade-specific retention rates at the end of academic year X-Y if we know (1) grade-specific enrollments in the fall of X and the fall of Y and (2) the number of first-time first graders in the fall of Y. What data can we use to measure these two things annually and at the state and national levels?

Annual grade-specific fall enrollments in *public* schools at the local, state, and national levels come from NCES’s Common Core of Data (CCD). For decades, the CCD has collected annual fall enrollments for all U.S. public schools from state education agencies. Grade-specific *private* school fall enrollments at the state and national levels can be estimated from NCES’s Private School Survey (PSS), which has been administered bi-annually since 1989.

There are no direct measures of the number of first-time first graders. Instead, we use the number of six year olds to approximate the number of first-time first graders. The U.S. Census Bureau produces annual estimates of the numbers of people at each age for each state and for the country as a whole. These estimates begin with the most recent decennial

census enumeration, and are updated based on estimates of mortality and net migration; intercensal estimates are then updated when a new decennial enumeration is completed.

First-time first graders are *not* all exactly six years old. What is more, the average age of first-time first graders at the start of that grade varies somewhat across states given differences in states' compulsory schooling laws and rules about minimum enrollment ages. However, turning six and starting first grade for the first time are both events that happen only once for each child. As long as there are not substantial amounts of mortality or net migration between the average child's sixth birthday and the day on which first grade begins, or massive year to year changes in the birth rate that differ from state to state, the number of six year olds in a jurisdiction is a sound estimate of the number of first-time first graders in that jurisdiction. This is true regardless of differences across states in the mean ages of first-time first graders.²

Below we report estimated retention rates for *public* school students in grades one through eight in 2002–03 through 2008–09. Consequently, we rely on CCD first through eighth grade enrollments for fall 2002 through fall 2009.³ However, we cannot simply use the Census Bureau's estimated numbers of six year olds as a proxy for the number of first-time *public* school first graders. Census estimates pertain to *all* six year olds, not to those who attend *public* schools when they first enroll. Thus, we adjust the number of six year olds in each jurisdiction in each year by multiplying that number by the percentage of all first graders who attend public schools in that jurisdiction in that year. We compute that percentage by comparing CCD (public) first grade enrollments to total (public *plus* private) first grade enrollments in the CCD and PSS.⁴

CONSTRUCTING AND VALIDATING ESTIMATES

Using the formula in Equation 1 and the data described above, we calculated first grade retention rates at the end of the 2002–03 through 2008–09 academic years.⁵ How can we assess the validity of these calculated first grade rates? Several states have reported first grade public school retention rates for various academic years. For rhetorical purposes, *we begin by treating states' reports of their public school first grade retention rates as perfectly accurate.*⁶ We then compare our calculated first grade rates to states' reported rates. For 2002–03 through 2008–09, we have located 61 reports of states' first grade retention rates.⁷ At least at the outset, we treat differences between our calculated rates and states' reported rates as entirely due to errors in *our* measures.

²To understand state-to-state variation in age at first enrollment in first grade, we conducted separate analyses of October 2010 CPS data. There, we selected enrolled public school first graders who either (1) did not attend school the preceding fall or (2) attended kindergarten the preceding fall; we then weighted the data using the CPS supplement weight. In the U.S. as a whole, 79% of those students were age 6. Their mean age was 6.14. More importantly, though, the mean ages of enrolled, first time, public school first graders across states fell outside of the range 6.00 to 6.30 in only 11 states. In other words, the CPS data provide empirical evidence that the mean age of first-time public school first graders is about six and does not vary markedly across states.

³For each state and year, we have allocated "ungraded" students in the CCD to grades based on the distribution of all students across grades in that state and in that year. Future researchers might improve on this procedure by using schoolhouse level data to allocate ungraded students based on their distribution across schools spanning different grade levels.

⁴For years without PSS data, we take the average of the two adjacent years. Because the percentage of first graders who attend public school has remained quite stable for many years, this makes little practical difference for our estimates.

⁵We have also experimented with measures that adjust for net migration using Census Bureau single-year-of-age state-level estimates. However, we have found no reliable way to do so. Alternative measures that adjust for migration using state-specific single year of age estimates suffer from the unreliability inherent in those estimates.

⁶By employing this rhetorical strategy, we are almost certainly understating the accuracy of our method and the resulting rates, at least at the outset. We prefer to begin with this overly conservative approach to the alternative, which would be to try to quantify the validity and reliability of each states' reported rates.

⁷We list states' reported rates—as well as hyperlinks to reports containing these rates—in Appendix Table A1, which is provided in print for peer review but which will only be available electronically upon publication.

Panel A of Figure 1 is a scatterplot showing the relationship between states' reported first grade retention rates (on the *Y* axis) and our first grade rates calculated as described above (on the *X* axis) for these 61 state-years. A few things are worth noting. First, the association between these measures is very strong ($r=0.78$). Second, despite this strong association, the slope of a bivariate regression of states' rates on our calculated rates would be less than one. Third, the range of our calculated rates (-3.9% to 13.7%) is wider than the range of states' reported rates (1.1% to 11.7%). We believe that random measurement error—in CCD enrollment counts and in the number of six year olds—is responsible for these observations.⁸

Because our calculated first grade rates are subject to random measurement error, we regress states' reported first grade rates for these 61 state-years⁹ on our calculated rates¹⁰ and then compute predicted values for all $50 \times 7 = 350$ state-years based on this regression equation. That is, our "best guesses" about first grade retention rates—which we can compute for all 50 states¹¹ and for 2002–03 through 2008–09—are based on the prediction equation from the regression of states' reported first grade rates on the rates calculated as per Equation 1. Panel B of Figure 1 is a scatterplot showing the relationship between states' reported first grade rates (on the *Y* axis) and *predicted* first grade rates (on the *X* axis) for the 61 state-years for which the former is observed. The association is still remarkably strong ($r=0.85$) but now the ranges (and the means) of the two variables are nearly identical; a regression line drawn through the plot would have a slope of ~ 1 and an intercept of ~ 0 .

To construct *second* grade retention rates, we begin with Equation 2 and two pieces of information: second grade enrollments from the CCD and *predicted* first grade rates constructed as described above. This yields *calculated* second grade rates for all 50 states and for 2002–03 through 2008–09. Across the 61 state-years for which we observe states' reported second grade rates, states' rates and our calculated rates are highly correlated. Again, a scatterplot (not shown) relating states' reported second grade rates to our *calculated* rates suggests the presence of measurement error in our calculated rates. So, our "best guesses" about second grade rates for each state-year are based on the prediction equation from the regression of states' reported second grade rates on our rates calculated as per Equation 2; we use this prediction equation¹² to obtain *predicted* second grade rates for all 50 states for 2002–03 through 2008–09. The resulting predicted values are extremely highly correlated ($r=0.71$) with states' reported rates, and have approximately the same mean and range as states' reported rates.

We construct third through eighth grade retention rates using parallel procedures. For the 61 state-years with state-reported rates, correlations between states' reported rates and our rates calculated as per Equation 2 are quite high. We then apply prediction equations from regressions of states' reported rates on our *calculated* rates to construct *predicted* rates for all state-years. In the end, our predicted rates for grades one through eight are very highly

⁸In any bivariate regression of *Y* on *X*, random measurement error in *X* results in an expanded range of *X* and a slope that is biased toward zero (and thus an intercept that is biased upward).

⁹We began by estimating this regression model including all 61 state-years. We then used regression diagnostics to identify and remove a handful of observations with undue influence on parameter estimates and model fit. We then re-estimated the model using only this subset of state-years; our predicted values for all state-years are based on coefficients from this final model.

¹⁰In this regression model, we also included dummy variables representing academic years. Although it has little practical impact on our estimates, the inclusion of these dummy variables accounts for the fact that we do not observe states' reported first grade retention rates for the same set of states in each year.

¹¹We do not include the District of Columbia in our analyses. We suspect that DC either has exceptionally high first grade retention rates or else has especially error-ridden values in the CCD.

¹²As with the model for first grade rates, we also include year dummy variables in this model and exclude a small number of state-years with undue influence on parameter estimates and model fit. Again, we do not construct rates for DC.

correlated with states' reported rates,¹³ and they are on the same metric. They rarely differ from states' reported rates by more than a percentage point.

RESULTS

In Panel A of Figure 2 we present first through eighth grade public school retention rates for 2002–03 through 2008–09 for the entire United States. Retention rates are highest in first grade—at 3.5% in 2008–09—and may have declined slightly across this narrow timeframe. Between 1 in 20 and 1 in 30 first graders were held back over this period—an average of about one per classroom across the U.S. each year. Retention rates are lowest in grades four through six, and higher in grades two, three, seven, and eight.

Of course, not all states exhibit the same grade retention patterns or trends. In Appendix Table A2 (available here for peer review, but intended for web dissemination upon publication) we report public school retention rates for grades one through eight, for 2002–03 through 2008–09, and by state. We have not performed formal analyses of the trends, predictors, or consequences of retention rates across states or years—we leave that for future investigators—but some descriptive patterns emerge. First, overall and grade-specific rates vary considerably across states. Second, although retention rates tend to be highest in first grade, this is not always the case. For example, as shown in Panel B of Figure 2, Florida's rates are as high or higher in the second and third grades. Third, even when states have similar rates in some grades, they may have different rates in others. For example, as shown in Panels B and C of Figure 2, Florida and Mississippi have similar first and seventh grade rates but different rates in other grades. Finally, in most states retention rates declined across the several years we observe; however, this is not true for all grades or states.

In Figure 3 we display first grade public school retention rates for all states (and the U.S.) for 2008–09. We have sorted the states by their predicted retention rates. In some states (mainly in the northern plains) first grade rates are effectively zero. They approach or exceed 5% in other (mainly southern) states. Figure 4 provides a parallel display of third grade public school retention rates. In more than half of the states, third grade rates are at or below 1%. In other states, they exceed 3%. As described above, our predicted equations are based on models that exclude state-years that appear to be serious outliers (and thus that lead to violations of the assumptions of the regression model) in the relationship between observed and calculated retention rates. Most of the state-years in which our predicted rates differ from states' reported rates by more than a percentage point appear to be outliers. Although we begin by operating under the assumption that states' reports are perfectly accurate and that any prediction error is due to shortcomings of our method, the fact that these state-years show up as outliers suggests that at least in these instances there may be errors in states' reports.

Taken altogether, in 2008–09, about 447,000 public school students in these grades were retained. About 3 in 10 retained students—roughly 130,000—repeated the first grade. We make no claims about whether these numbers are higher or lower than they *ought* to be, but we would note that 447,000 is many students in just one year. The fact that so many students are retained—at some expense to their school districts and to the students themselves—should motivate additional research on the predictors and consequences of this public policy-controlled educational intervention.

¹³Across all 61 state years, the correlations between our final predicted rates and states' reported rates are 0.85, 0.71, 0.82, 0.77, 0.37, 0.70, 0.40, and 0.48, respectively, for grades 1 through 8. However, those correlations include the handful of state-years that were excluded from the regression models used to estimate the prediction equation because they were outliers. Across the 49 to 61 (depending on the grade) observations included in the final models, the correlations between our final predicted rates and states' reported rates are 0.88, 0.85, 0.97, 0.81, 0.90, 0.75, 0.55, and 0.84, respectively, for grades 1 through 8.

COMPARISON TO MEASURE BASED ON AGE-GRADE DELAY

As noted above, some researchers use “age-grade delay” as a proxy for grade retention, at least at the national level. Could this method be extended to the state level? How would resulting estimates compare to those that we have produced? To investigate, we extracted data on public school kindergartners and first graders in the 2008 and 2009 ACS (the only year for which it is possible to use ACS data for this purpose). For each state, we computed the percentage of students in each grade who were above the modal age for their grade (above age 6 and 7 for kindergartners and first graders, respectively). To estimate the first grade retention rate at the end of the 2008–09 academic year, we subtracted the percentage of kindergartners who were over age for grade in 2008 from the percentage of first graders who were over age for grade in 2009.

Panel A of Figure 5 is a scatterplot showing the relationship between states’ reported first grade retention rates in 2008–09 and both our state-level predicted rates and state-level over age for grade rates for that year; this comparison is possible for 10 states. Panel B is a scatterplot showing the relationship between our predicted state-level rates and the over age for grade measure for all 50 states in 2008–09. In both cases, two things are clear. First, the over age for grade measure is only weakly associated with the other measures. Second, over age for grade rates tend to be lower than either states’ reported rates or our predicted rates. This may result from the fact that over age for grade rates do not count a student as retained if they move from one modal age to another for the same grade. Coupled with the issues outlined above, these findings raise serious concerns about the validity and reliability of state-level retention rate estimates that use this methodology.

DISCUSSION

We have presented a technically simple method for estimating state-level retention rates that relies on routinely collected and publicly available data. The resulting estimates reliably predict what states report their rates to be, at least for public schools, for recent years, and for grades one through eight. Although we argue that this new method should facilitate a new wave of *substantive* and *policy* research, we also recognize numerous *methodological* refinements that would expand the scope and utility of our method.

Quantifying uncertainty

We have done nothing to quantify the uncertainty of our estimates. Our estimates typically “miss” states’ reported rates by less than a percentage point, but substantive or policy research will require formal variance estimates in order to draw valid inferences (e.g., about differences across states or over time). Beyond sampling error in the data used to build our *calculated* rates, our *predicted* rates are subject to model-based uncertainty.

Kindergarten and High School

Kindergarten enrollment patterns are more complicated than those in subsequent grades, and so our methods may not be well suited to estimating kindergarten retention rates. High school students’ “grades” are often based on the accumulation of course credits and the completion of core courses. For example, a student may be in their second year of high school while still being counted as a ninth grader for administrative purposes. Consequently, our methods may not work well for high school retention. Nonetheless, future investigators may find ways to expand our method to estimate and validate rates for kindergarten and/or high school.

Migration

Net interstate and international migration rates among school-age children are generally low—about 85% of school-age children remain in the same house from year to year, and 85% of movers remain in the same state. Nonetheless, it would be worth developing refinements of our method that account for migration (and perhaps mortality). Although such adjustments may not substantially affect estimates for the nation or for some states, they may matter more for states along the border with Mexico or for sub-groups of students with higher rates of migration.

Temporal Trends

Because we validate our estimates using states' reported rates, and because we begin by assuming that those rates are accurate, we are not confident that our method would produce valid estimates for years much before those included in our analyses. Most of the states for which we have obtained reported rates use longitudinal student tracking systems; those systems have only come on line recently. Also, recall that our estimates are based on prediction equations from regressions of states' reported rates on our rates calculated as per Equations 1 and 2. If the strength of relationships between our calculated rates and states' reported rates has changed over time, then our method would produce invalid inferences about temporal trends. This may occur, for example, if the validity and/or reliability of CCD enrollment counts or Census population estimates has improved *or* declined over time. It may be possible to utilize our method to construct estimates that go back further in time, but that effort would need to be preceded by methodological work on changes over time in the measurement properties of the data resources that underlie our estimates.

Subgroup Analyses

It may be feasible to construct valid estimates that pertain to racial/ethnic, gender, or socioeconomic groups, but this effort would also face additional challenges. All of the component data (including states' reported rates) would need to utilize comparable systems for classifying subgroups. For example, the CCD, PSS, Census, and states all use different racial/ethnic classifications; this makes it difficult to construct meaningful racial/ethnic group-specific estimates. For recent years, it may be possible to use the ACS to produce sex, racial/ethnic, or other group-specific national estimates, but it is not obvious how resulting estimates could be externally validated.

Sub-State Estimates

It may also be possible to produce school- or district-level estimates. The challenge here would be estimating the number of first-time first graders at that level of geographic specificity. One option might be to rely on special tabulations of decennial census data for school district geographies or for school catchment areas.

Private Schools

It would be straightforward to calculate retention rates for *all* students or for just *private* school students (as opposed to just *public school* students) using Equations 1 and 2 above and supplementing CCD enrollment counts with PSS data (and then not adjusting the number of six year olds to account for private school enrollment). However, this would complicate the effort to validate the resulting estimates since states' reports generally only pertain to public schools.

Although the method we describe can (and should) be expanded and refined, the estimates that we have produced are uniquely valuable. Unlike estimates of age-grade delay, they are available (and reliable) at the state and national levels. Unlike states' reported rates, they are

available for all states using a consistent methodology. Unlike measures based on cohort data like the ECLS-K, they can be produced for multiple cohorts. Unlike estimates based on CPS data or data from NCES's high school longitudinal surveys, our estimates do not rely on self-reports of retentions.

These virtues of our estimates should facilitate new substantive and policy research on the correlates of grade retention. Using our state-level estimates it is possible to model the social, economic, political, and policy factors that shape states' retention rates. It is also possible to model the effects of state-level retention rates on state-level dropout rates, test scores, college enrollments, and labor force outcomes. Nearly 450,000 first through eighth graders are retained each year. Our methods should be extended and improved in the ways outlined above, but in the meantime, we should learn all that we can about this widely used policy intervention.

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Figure 1.
States Reported Retention Rates vs. Predicted Retention Rates, Grade 1, 2002–03 through 2008–09 (n=61)

Figure 2.
Grade Retention Rates, 2002–03 through 2008–09, US & Selected States

Figure 3.
Predicted First Grade Retention Rates, End of 2008–09 Academic Year, by State

Figure 4.
Predicted Third Grade Retention Rates, End of 2008–09 Academic Year, by State

Panel A. Observed vs Over Age for Grade & Predicted Rates

Panel B. Predicted vs Over Age for Grade Rates

Figure 5.
Retention Rates Based on Over Age for Grade vs States Reported and Predicted Rates,
Grade 1, 2008–09

Table 1
Simulations of Enrollments in Grades 1 through 4 Under Different Assumptions About Grade Retention Rates

	Academic Year													
	A to B	B to C	C to D	D to E	E to F	F to G	G to H	H to I	I to J	J to K	K to L	L to M	M to N	N to O
<i>Panel A. 5% of 1st Graders Are Retained; No 2nd-4th Graders Are Retained</i>														
New First Graders in Fall	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
1st Grade Fall Enrollment	1,000	1,050	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053	1,053
2nd Grade Fall Enrollment		950	998	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
3rd Grade Fall Enrollment		-	950	998	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
4th Grade Fall Enrollment		-	-	950	998	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
<i>Panel B. 10% of 1st Graders Are Retained; 2% of 2nd Graders Are Retained; 1% of 3rd & 4th Graders Are Retained</i>														
New First Graders in Fall	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
1st Grade Fall Enrollment	1,000	1,100	1,110	1,111	1,111	1,111	1,111	1,111	1,111	1,111	1,111	1,111	1,111	1,111
2nd Grade Fall Enrollment		900	1,008	1,019	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020
3rd Grade Fall Enrollment		-	882	997	1,009	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010
4th Grade Fall Enrollment		-	-	873	995	1,009	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010

Note: Simulation assumes no net migration and no mortality. Entries in shaded cells have not reached equilibrium.