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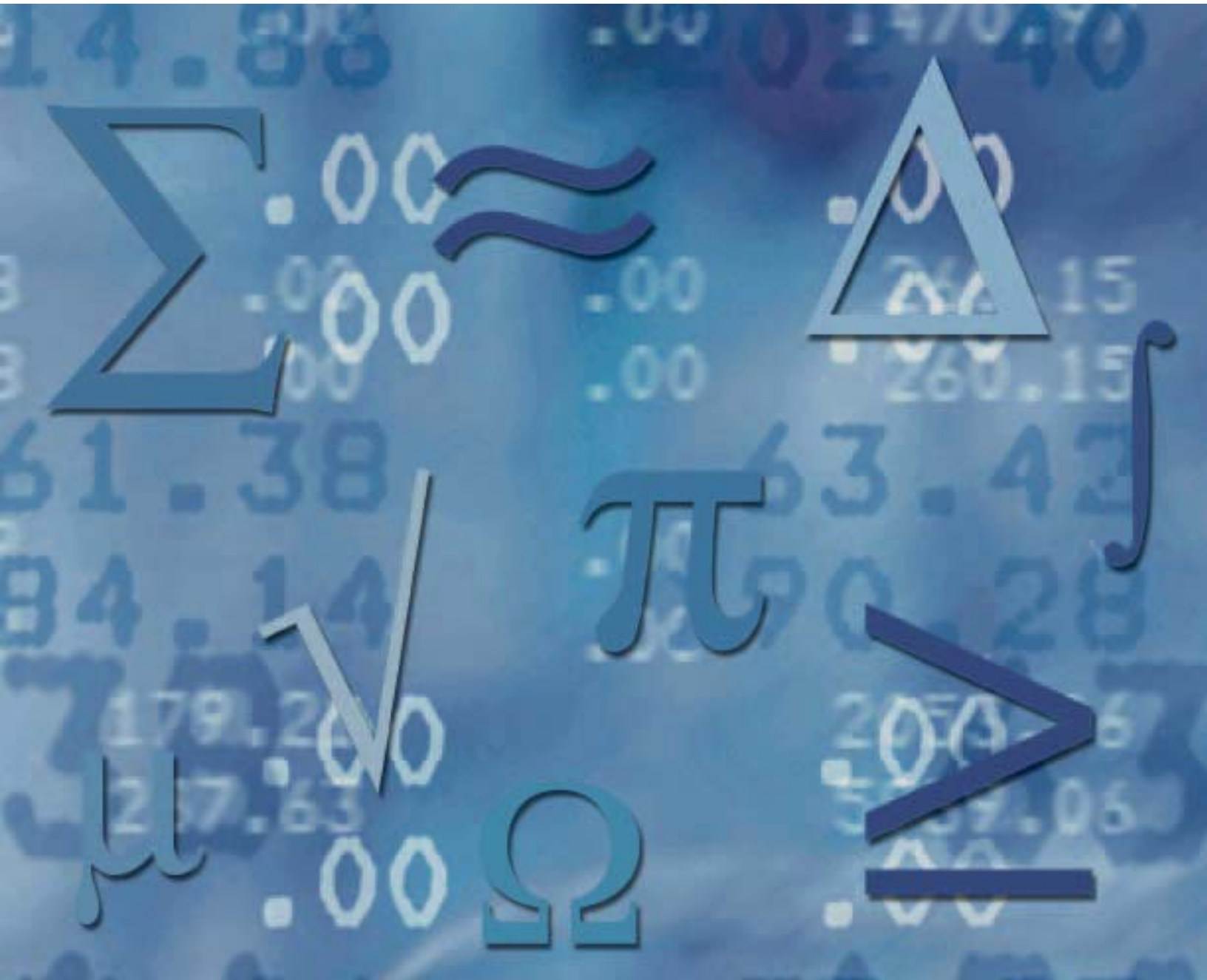
Final Report



CONTENTS

1. EXECUTIVE SUMMARY

This is the final report of the NISS/ESSI Task Force on Graduation, Completion, and Dropout Indicators,[1] which was convened by the National Institute of Statistical Sciences (NISS) at the request of the National Center for Education Statistics (NCES) to address conceptual, data, and implementation issues associated with calculation of graduation, completion, and dropout (GCD) indicators.[2] The charge to the Task Force, which is reproduced in full in Appendix B, was to examine the following:

Uses:	What GCD statistics are used by whom and for what purposes?
Current NCES Practice:	In view of criticisms that have been raised, is current NCES methodology for calculation of GCD indicators adequate?
Alternatives:	Are there alternative GCD indicators that can serve both school system needs and broader community-level needs? What are the associated data collection issues?

As described in more detail in §2, GCD indicators fall into two broad classes:

Performance Indicators describing the ultimate "outcome" — such as graduation,[3] completion by means other than or in addition to graduation,[4] dropout, etc. — of students, whose primary use is to assess performance of schools or higher-level units such as districts or states.

Population-Based Indicators describing the prevalence within a population of individuals with particular levels of educational attainment, whose primary uses relate to workforce characterization and improvement.

We now summarize key recommendations.

[1] In this document we often use the term "indicator" rather than "rate" to emphasize the statistical nature of graduation, completion, and dropout (GCD) estimates and to avoid confusion arising from multiple meanings of "rate."

[2] Task Force members are listed in Appendix A.

[3] Throughout this report, we define this to mean award of a state-recognized diploma.

[4] For example, the General Educational Development (GED) credential.

1.1 Performance Indicators

We propose four performance indicators, corresponding to outcomes of graduation, completion by alternative or additional means, transfer, and dropout, that are functions of a *cohort year* Y_C and *indicator year* Y_I . All of these principal indicators are of a single generic form:

$$\frac{\text{Students in year } Y_c \text{ cohort for whom the specified outcome occurs by year } Y_i}{\text{Students in year } Y_c \text{ cohort} \;-\; \text{Students excluded from year } Y_c \text{ cohort}}. \tag{1}$$

Note that these indicators are *cumulative*, representing what happens *by* rather than during Y_I .

In indicators based on (1), the cohort year is defined in such a way that each student always remains in the same cohort. Typically, as in §4.1, the cohort year is defined by "on-time graduation," but may for convenience be expressed as the associated year of entry. Moreover, only in exceptional circumstances does a student move from one cohort year to another.

Implicit in (1) and explicit in §4 is that the cohort associated with Y_C increases as the result of transfers into schools or larger educational units.

Our recommended indicators incorporate narrowly defined sets of exclusions, with documentation required for invocation, that "remove" certain students from cohorts. Because they decrease the denominators of GCD indicators, as in (1), these exclusions increase the numerical values of *all* indicators.

Thus, for example, our recommended graduation indicator (§4.1) is a cohort-based, cumulative indicator derived from student-level information and reported as a function of entry year and graduation year. We also recommend analogous completion (§4.3), transfer (§4.5), and dropout (§4.4) indicators. We believe, however, that the dropout indicators make more sense in noncumulative form, reporting what happened *during* year Y_I .

It is not clear that all states, especially those without student tracking systems, can calculate the preferred indicators within the near term. Therefore, alternatives with less stringent data requirements, but also more shortcomings, are discussed in §4.2.

The Task Force anticipates that performance indicators will be derived from school-level data submitted through public school universe data collections such as the Common Core of Data (CCD). While there may be questions of data quality, there will not be substantive issues of uncertainty. Indicators at all levels of aggregation, such as school, district, or state, can be calculated from the same school-level data, although which students are excluded varies with the level of aggregation. For example, a documented intrastate transfer is excluded from the school out of which he or she transferred and added to the cohort for the receiving school, but is neither an exclusion nor an addition at the state level.

1.2 Population-Based Indicators

The Task Force recommends population-based indicators having the form

$$\text{Attainment indicator for population } P = \frac{\text{Number in individuals in } P \text{ with specified attainment}}{\text{Number of individuals in population } P}. \tag{2}$$

Implicit in (2) is a qualification "as of some fixed point in time." Therefore, population-based indicators of the form (2) are in principle comparable from one time point to another.

To illustrate, the population-based completion indicators of §5.2 are ratios of numbers of individuals in some population who have completed high school by one or more specified means to the population size. Population-based dropout indicators (§5.3) are of the same form as population-based completion indicators.

Most population-based indicators currently in use are of the general form (2). Many of these indicators are, however, derived from survey data, for example, the Current Population Survey (CPS), and the Task Force does raise several issues in this regard in §5.4.

1.3 The Role of NCES

Without NCES leadership, states will not act to implement our recommendations, or if they do, they will act less effectively. The Task Force urges that NCES provide leadership in expansion of federal-state cooperative programs to develop the data needed and to establish guidelines for their use. The Task Force recognizes that such a program will require resources both for the states and for NCES. Existing state coordinators for CCD would be a natural base on which to create state or regional NCES coordinators with broader responsibilities that would include GCD indicators.

1.4 Organization of the Report

The remainder of this report is organized in the following manner. Background and assumptions that underlie the report are presented in §2. Some general findings that frame the specific recommendations appear in §3. Performance indicators are addressed in §4. Population-based indicators are discussed in §5. Although the Task Force did not address implementation or cost issues in detail, we recognize that implementation of our recommendations would require financial and personnel resources, so these issues are considered briefly in §6. A number of broader recommendations appear in §7, the most important of which is that NCES play a leadership role, working with states to implement the Task Force's recommended graduation, completion, and dropout indicators.

The report contains several appendixes. Some of these are administrative, such as the membership of, and charge to, the Task Force. Others are technical, including a discussion of Yearly Status Summaries (Karr, 2004), a means of conceptualizing student-level data summaries for multiple purposes (Appendix D), their relationship to recommended graduation indicators (Appendix E), and a catalog of graduation, completion, and dropout indicators (Appendix F).

2. BACKGROUND

Since the end of World War II, and probably before that, the economic and social benefits to individuals of graduation from high school have been recognized widely. Quantitative measurements relating to high school graduation have been a natural means of understanding from two perspectives:[5]

School: What percentage of students graduate, within what period of time?

Population: What percentage of people in a given population are high school graduates?

Perhaps even from the first use of quantified "graduation rates," they have not necessarily addressed well a third, crucial perspective, that of students. This failing[6] is both structural, because extremely fine-grained data are required, and systemic, in the sense that it is not clear what actionable insights would result.

Regardless of whether computation of GCD indicators was ever straightforward, it is clear to the Task Force that a number of recent developments have raised the scientific urgency of having sound, defensible, well-understood indicators.

The first of these developments, which precedes but has gained in importance as a result of the No Child Left Behind Act (NCLB), is use of GCD indicators for public school accountability purposes, at the school, district, or state level. Inevitably, accountability considerations lead to comparisons among different institutions and, therefore, to incentives on institutions that may be "perverse" relative to the scientific purposes of the indicators. To illustrate, suppose that, as in §4, schools are not held responsible in computation of graduation indicators for students who transfer to other schools. Then care must be exercised to be sure that schools do not classify dropouts as transfers,[7] because this distorts the indicators. A more subtle incentive, not preventable by data definitions alone, would be for schools to pressure students who are in danger of not graduating to transfer, or even transfer them involuntarily. As discussed in §4.5 and 4.6, multiple indicators for graduation and transfer are a means of at least detecting these kinds of behaviors.

A second development is the increased diversity of student bodies, which now include special education students, students whose native language is not English, and other groups once less common in high schools. Among consequences are pressures for GCD indicators for subgroups within schools and an increased use of cross-institution comparisons.

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[5] Corresponding to the performance indicators of §4 and population-based indicators of §5, respectively.

[6] It is a failing to the extent that the principal goal of the educational system is to improve the lives of students.

[7] Our strong recommendation in §4 is that transfers must be documented, which prevents schools from using transfer as a default classification.

A third factor is the growing multiplicity of means for completion of high school, which in addition to "traditional" diplomas now include equivalency examinations such as the GED, home schooling, and distance learning. The Task Force believes that distance learning, in particular, is growing rapidly and may be beyond the "reach" of existing means of data collection employed by NCES.[8] We do not offer specific recommendations other than that NCES evaluate whether existing means of data collection can cope with the increasing scale of these alternative means.

The collective impact of these and other forces, coupled with growing data collection capabilities in the states, constitute the impetus for this report. The Task Force specifically cautions that nothing in this report should be construed as meaning that GCD indicators are the only or even the best means of assessing either school performance or population characteristics. We have simply addressed the question, if GCD indicators are to be calculated, what is the best way, scientifically and in view of current and prospective data systems, to do so?

[8] However, some data may be available already through data collections such as CCD and the National Household Education Surveys Program (NHES).

3. General Findings

The specific recommendations in this report are driven by a number of general findings.

First, no single indicator of graduation, completion, or dropouts can serve all purposes. The Task Force has, in general, refrained from recommending multiple, possibly conflicting indicators. Instead, the indicators we recommend are flexible and can be customized to specific purposes.

Second, the Task Force has discussed at length the possibility, and in many cases reality, of "perverse" incentives, primarily to schools, associated with particular GCD indicators.[9] We conclude that no indicator that involves exclusions from cohorts can be entirely free of perverse incentives. At the same time, there do exist effective strategies, such as use of multiple indicators, that can detect behavior that may result from perverse incentives.

Third, uniformity across states in reporting graduation, completion, and dropout indicators is desirable-to-essential in the long run. The Task Force acknowledges that NCLB does not mandate uniform reporting of GCD indicators, but nevertheless believes strongly that NCES should both recommend uniform methods for calculating indicators to states and other organizations, and work with the states to implement them. On the other hand, attempts to enforce uniformity in the short run, for example, by means of "lowest common denominators" such as the unadjusted graduation indicators described in §4.2, may be counterproductive.

Fourth, the availability and quality of data are central considerations in assessing the feasibility of GCD indicators. The Task Force is convinced that the future of data collection and assembly lies in state-level student tracking systems, and that these systems will be universal within the next five years, if not sooner. The recommendations reflect this.

Fifth, a federal "overlay" requiring sharing of student-level data by states is not feasible economically or politically. This raises issues regarding verification of interstate transfers, which are discussed in §4.1.

Finally, we stress the importance of viewing our recommendations within the large context of educational systems whose goal is to prepare students for further study and lives as productive citizens. In particular, this reduces implementation burdens, because, for example, GCD indicators are only one of many stimuli for state-level student tracking systems. Similarly, a broader partnership between NCES and the states would have benefits far beyond calculation of GCD indicators. We urge NCES, therefore, not to rely on calculation of GCD indicators as the sole justification for some of our broader recommendations.

[9] See §4.1 and 4.6 for examples.

4. Performance Indicators

In §4.1 we present the Task Force's preferred graduation indicator. We recommend that NCES

- Move toward using this indicator in its own reports and studies;
- Urge states to do the same, especially in reporting high school graduation information for NCLB; and
- Work directly with states, and indirectly with districts and schools, to ensure that the required data are available and of high quality.

The Task Force recognizes that some time may pass, in particular because statewide tracking systems may be the most efficient way to assemble the data, before the preferred indicator can be implemented on a widespread scale. We also believe, however, that some states can employ it almost instantly. Therefore, we describe alternative indicators that require less data but have manifest shortcomings, which might be used as alternatives during the process of implementing the preferred indicator. The Task Force specifically *does not*, however, recommend that NCES suggest, let alone "require," that states use these alternative indicators. The reason for this is that we believe that NCES recommending multiple indicators for different time scales may be confusing and wasteful to the states. How, and with what caveats, NCES might choose to make states aware of these alternative indicators is a challenging issue.

Given the availability of appropriate data, performance indicators can be calculated in the same way for any educational unit, be it school, district, state, or the entire United States. For simplicity, the unit is taken to be a school in this report, and S is used in the notation.

4.1 Graduation Indicators

Our preferred school-based graduation indicator has three key properties. First, it is derived from student-level information collected and reported as a function of entry (cohort) year *and* year of graduation. It is a cohort-based indicator (see Appendix F.4). Second, it is reported as a function of entry year and graduation year, in *cumulative form* of "graduation by" rather than "graduation during." This is consistent with widespread practice, for example, that of the National Collegiate Athletic Association (NCAA) and other organizations. Finally and most important, there is a narrowly defined set of exclusions, with documentation required for use, that "remove" some students from the cohort associated with the indicator.

The preferred indicator is of the generic form (1). Specifically, it is the *exclusion-adjusted cohort graduation indicator* (EACGI), which is a function of school S, cohort year Y_c and graduation year Y_g . It accounts in a principled manner for in-transfers, out-transfers, retentions, and other exclusions. The mathematical representation is

$$\text{EACGI}(S, Y_c, Y_g) = \frac{\begin{array}{l}\text{Students entering 9th grade for the first time in } Y_c \textit{ and} \text{ graduating by } Y_g \\ + \text{ Students transferring into 10th grade in } Y_c + 1 \textit{ and} \text{ graduating by } Y_g \\ + \text{ Students transferring into 11th grade in } Y_c + 2 \textit{ and} \text{ graduating by } Y_g \\ + \text{ Students transferring into 12th grade in } Y_c + 3 \textit{ and} \text{ graduating by } Y_g\end{array}}{\begin{array}{l}(\text{Students entering 9th grade for the first time in } Y_c) - (\text{those excluded in } Y_c, \ldots, Y_g) \\ + (\text{Students transferring into 10th grade in } Y_c + 1) - (\text{those excluded in } Y_c + 1, \ldots, Y_g) \\ + (\text{Students transferring into 11th grade in } Y_c + 2) - (\text{those excluded in } Y_c + 2, \ldots, Y_g) \\ + (\text{Students transferring into 12th grade in } Y_c + 3) - (\text{those excluded in } Y_c + 3, \ldots, Y_g)\end{array}}. \quad (3)$$

A conceptual scheme for student-level status data underlying graduation indicators, as well as a variety of other data summaries, is the Yearly Status Summary described in Appendix D. However, less than the full Yearly Status Summary is needed to calculate EACGI; see Appendix E.

We note several properties of EACGI:

1. It is calculated in the same manner at all levels, from the school (indeed, even for subgroups within a school) to national.
2. It is based on data anticipated to be available in all states within 3–5 years.
3. It allows inclusion of in-transfers, and places them in the proper cohort.
4. It does not classify any students specifically as "dropouts." Functionally, all departing students who are not graduates or exclusions become *de facto* dropouts, but without being labeled as such.
5. It supports calculation of a variety of derived indicators to allow for diversity of goals across or within states.

Note that we do not provide a definition, for instance, of "Students entering 9th grade for the first time in Y_c," which NCES would need to do if EACGI were to be implemented, or possibly has done already in the context of data collections such as CCD. Moreover, EACGI does not differentiate among students who spend an entire year in a school and those who transfer in during a year.[10]

A central aspect of the EACGI indicator is the exclusions. These represent students whose failure to graduate is deemed not to be appropriate — or not informative — in describing the school or assessing its performance. The definition of "not appropriate" or "not informative" may, of course, be contextual. Reflecting the nature of high schools and anticipated uses of EACGI, the Task Force recommends that the following ordinarily be exclusions:

1. Documented transfer to an institution offering a state-designated diploma-granting program. That institution may be public or private, and may not necessarily be in the same state or country.
2. Imprisonment, also with appropriate documentation.
3. Death, again with appropriate documentation.

[10] While weights might be employed in an attempt to adjust for the fraction of a year spent in a school, the Task Force views this as neither desirable nor feasible, the latter because the required data seem unlikely to be available.

We recognize, however, that different sets of exclusions, with either more or fewer elements than the list above, may be appropriate for different purposes. For instance, long-term illness may be an appropriate exclusion in some contexts, but is more difficult to define and measure than the three exclusions listed here.

Some incentives associated with EACGI are sensible rather than perverse. Because documented exclusions increase EACGI, it is in a school's interest to pursue documentation, although as discussed in §6, there are associated costs. Other incentives may seem to, or actually, encourage less desirable behavior. For example, as discussed further in §4.6, suppose that students whom a school expects not to graduate can be transferred, either "voluntarily" or involuntarily, to other schools. This increases EACGI. To the extent that such behavior by schools is detrimental to students, there is a perverse incentive.

Implementation of each category of exclusions imposes both data and, in effect, metadata requirements. For example, for out-transfers, states would need to construct and maintain lists of institutions offering state-designated diploma-granting programs. States, perhaps with guidance from NCES, would have to develop standards for documentation. For example, transcript requests from the receiving school or enrollment verification by means of a state-level tracking system might be deemed the only acceptable forms of documentation. Analogous means would be necessary for verification of interstate transfers, especially in ways that preserve confidentiality of individual states' data. Methods would be necessary for dealing with situations such as imprisoned individuals who are able to enroll in a diploma-granting program or transfer to a school outside the United States.

It is not a logical necessity that there be exclusions. The National Collegiate Athletic Association, for example, permits no exclusions in its graduation rate calculations. The cohort graduation indicator CGI described below is, in effect, the indicator that results if no exclusions are allowed. This can be seen mathematically by comparing (3) to (4) below. Logical necessity notwithstanding, however, the Task Force believes strongly that for high schools and purposes such as compliance with reporting requirements of NCLB, *exclusions are appropriate and often necessary*.

In terms of data, the exclusion-adjusted cohort graduation indicator EACGI requires tracking students by year and status of entry and year of graduation. The Task Force believes that such data exist already in school records, but are not necessarily assembled in ways that permit calculation of EACGI even at the school level. Ultimately, these data will be maintained in statewide tracking systems, which seem likely to be of acceptably high quality.[11]

Consistent with general recommendations in §7, the Task Force recommends that NCES work with states and other organizations to develop lists of institutions offering state-designated diploma-granting programs, lists of exclusions to be implemented when EACGI is used for various purposes, standards for documentation of exclusions, and data standards.

4.2 Alternative Graduation Indicators

As discussed at the beginning of this section, the Task Force believes that these alternative indicators may be useful for interim purposes, until the full data required for the preferred indicator become available. We recommend, however, only that NCES make knowledge of their properties, especially their shortcomings relative to the preferred indicators, available to states or other organizations who might wish to use them.

It is true, we note, that the shortcomings of these indicators almost always decrease at higher levels of aggregation. For example, failure to account for transfers is most problematic at the school level, less so at the district level, and still less so at the state level. Although some empirical and simulation studies have been conducted, these effects are difficult-to-impossible to quantify.

We present these indicators in order of decreasing data requirements. Of the two principal data needs for EACGI — cohort information and documentation of exclusions — the latter seems more problematic and will take longer to attain. The first indicator presented here, the cohort graduation indicator (§4.2.1), assumes the ability to track students by year and status of entry and year of graduation, but *no capability* to document exclusions. The unadjusted graduation indicators (§4.2.2) assume that neither student-level tracking nor documentation of exclusions is possible.

[11] Although audits should be conducted by NCES; see §7.

As noted above, the Task Force does not believe that it would be an effective use of NCES resources to work to "improve"[12] these alternative indicators, at least at the school and district levels. Adjustments at the state level, however, may be feasible and useful.

4.2.1 Cohort Graduation Indicators

The *cohort graduation indicator* differs from EACGI only by the absence of exclusions. The mathematical representation, which is analogous to (3), is

$$\mathrm{CGI}(S,Y_c,Y_g)=\frac{\begin{array}{l}\text{Students entering 9th grade for the first time in } Y_c \textit{ and} \text{ graduating by } Y_g\\ +\ \text{Students transferring into 10th grade in } Y_c+1 \textit{ and} \text{ graduating by } Y_g\\ +\ \text{Students transferring into 11th grade in } Y_c+2 \textit{ and} \text{ graduating by } Y_g\\ +\ \text{Students transferring into 12th grade in } Y_e+3 \textit{ and} \text{ graduating by } Y_g\end{array}}{\begin{array}{l}\text{Students entering 9th grade for the first time in } Y_c\\ +\ \text{Students transferring into 10th grade in } Y_c+1\\ +\ \text{Students transferring into 11th grade in } Y_c+2\\ +\ \text{Students transferring into 12th grade in } Y_c+3\end{array}}. \tag{4}$$

The relationship of CGI to the Yearly Status Summary is described in Appendix E.

It is clear from the definitions that

$$\mathrm{EACGI}\geq\mathrm{CGI}. \tag{5}$$

Therefore, to the extent that EACGI is the "true" graduation indicator, CGI underestimates it. The degree of underestimation is, of course, not uniform across schools, districts, or states. For example, schools with high out-transfer rates may show large differences between EACGI and CGI.

While CGI does not explicitly account for out-transfers, it still reflects them: CGI decreases as out-transfers increase,[13] so that if CGI were used in an accountability system it would encourage schools to reduce their out-transfer rates, which some feel can be accomplished by increasing school quality. The "explicit" transfer indicators of §4.5 represent an alternative approach to this issue.

[12] An example suggestion: use Census, CPS, or other exogenous data to attempt to adjust rates that ignore transfers for regional-level migration.

[13] Students who transfer out do not graduate, decreasing the numerator. By contrast, out-transfers decrease both the numerator and the denominator of EACGI, so that their overall effect is not certain.

4.2.2 "Unadjusted" Indicators

The indicators presented here might be used in circumstances when neither of the two data capabilities in §4.1 exists. Each has significant shortcomings, however, not only relative to EACGI and CGI but also absolutely.

The *In-Transfer Adjusted Graduation Indicator* (IAGI) requires student transfer counts, but does not require a breakdown (entry year, graduation year) at the student level. The mathematical representation is

$$\mathrm{IAGI}(S,Y) = \frac{\text{Graduates in } Y}{\begin{array}{l}\text{Students enrolling in 9th grade for the first time in } Y-3 \\ \quad + \text{ Students transferring into 10th grade in } Y-2 \\ \quad + \text{ Students transferring into 11th grade in } Y-1 \\ \quad + \text{ Students transferring into 12th grade in } Y\end{array}}. \tag{6}$$

Unlike the indicators in §4.1, IAGI can assume values exceeding 1.0, because of early and late graduates.

We stress neither IAGI nor unadjusted graduation indicator UGI, introduced below, is a cohort-based indicator. An important difference between these two unadjusted indicators and the cohort-based indicators is that the unadjusted indicators are not computable on a cumulative basis, but rather only on an annual basis. Therefore, the indicators in (6) and (7) are not strict analogs of those in (3) and (4).

Two other rates are even more problematic than IAGI, and appear to be useful, if at all, should they be the only common denominator by which comparisons can be made. These are *unadjusted graduation indicators* (UGI) given (assuming a four-year high school) by

$$\mathrm{UGI}(S,Y) = \frac{\text{Graduates in } Y}{\text{Students enrolling in 9th grade for the first time in } Y-3} \tag{7}$$

and

$$\mathrm{UGI}_0(S,Y) = \frac{\text{Graduates in } Y}{\text{Students enrolled in 9th grade in } Y-3}. \tag{8}$$

The difference between these is that UGI_0 omits the "for the first time" qualification. Therefore $\mathrm{UGI}_0 \le \mathrm{UGI}$.

4.3 Completion Indicators

These indicators differ from the graduation indicators of §4.1 only in that the numerator contains *school-based* forms of completion other than or in addition to graduation. Examples include certificates of attendance and, for states where the option exists as a school-based program, the GED. The Task Force emphasizes that this class of indicators is not appropriate for means of completion that cannot be linked to schools or other educational units. Thus, for example, they would in general not make sense at the school level for the GED, although they *might* make sense at the state level.

Analogs to all of the indicators in §4.1 are possible, subject to obvious changes in the mathematical formulas and — which is more important — availability of the alternative or additional completion data at the level of resolution associated with the indicator.

For example, an *exclusion-adjusted cohort completion indicator* (EACCI) analogous to the exclusion-adjusted cohort graduation indicator (EACGI) of (3) is defined by

$$\underset{(S,M,Y_c,Y_g)}{\text{EACCI}} = \frac{\begin{array}{l}\text{Students entering 9th grade for the first time in } Y_c \textit{ and} \text{ completing via means } M \text{ by } Y_g \\ + \text{ Students transferring into 10th grade in } Y_c+1 \textit{ and} \text{ completing via means } M \text{ by } Y_g \\ + \text{ Students transferring into 11th grade in } Y_c+2 \textit{ and} \text{ completing via means } M \text{ by } Y_g \\ + \text{ Students transferring into 12th grade in } Y_e+3 \textit{ and} \text{ completing via means } M \text{ by } Y_g\end{array}}{\begin{array}{l}(\text{Students entering 9th grade for the first time in } Y_c) - (\text{those excluded in } Y_c,\ldots,Y_g) \\ + (\text{Students transferring into 10th grade in } Y_c+1) - (\text{those excluded in } Y_c+1,\ldots,Y_g) \\ + (\text{Students transferring into 11th grade in } Y_c+2) - (\text{those excluded in } Y_c+2,\ldots,Y_g) \\ + (\text{Students transferring into 12th grade in } Y_c+3) - (\text{those excluded in } Y_g)\end{array}}. \quad (9)$$

In (9), *M* is the set of one or more means of completion of interest.

4.4 Dropout Indicators

The Task Force recommends use of school-based dropout indicators that are true rates in the sense of measuring numbers of events per unit of time; in this case, the unit is a year. The most basic form is the *unadjusted dropout rate* (UDR) given as a function of population *P* (example: tenth graders) within school *S* during year *Y* by

$$\text{UDR}(S,P,Y) = \frac{\text{Number of dropouts from } P \text{ during } Y}{\text{Size of } P \text{ during } Y}. \quad (10)$$

An analogous *exclusion-adjusted dropout rate* (EADR) is given by

$$\text{EADR}(S,P,Y) = \frac{\text{Number of dropouts from } P \text{ during year } Y}{(\text{Size of } P \text{ during } Y) - (\text{Exclusions from } P \text{ during } Y)}. \quad (11)$$

Clearly, UDR(*S, P, Y*) ≤ EADR(*S, P, Y*).

Both the unadjusted dropout rate in (10) and the exclusion-adjusted dropout rate in (11) require a "direct" classification of dropouts.

NCES has employed a definition of dropouts (see, for example, Young [2003][14]) that in many ways is functionally equivalent to the Task Force's preference of classifying all students who are neither exclusions nor remain in school throughout the year as dropouts. This latter definition would require replacing the numerators in (10) and (11) by

$$(\text{Size of } P \text{ during } Y) - (\text{Exclusions from } P \text{ during } Y) - (\text{Members of } P \text{ remaining throughout } Y). \quad (12)$$

The Task Force has discussed at length the possibility of "perverse incentives" in graduation, completion, and dropout indicators.

[14] In this report, a dropout is a person who "1) was enrolled in school at some time during the previous school year (e.g., 1999– 2000); and 2) was not enrolled at the beginning of the current school year (e.g., 2000–01); and 3) has not graduated from high school or completed a state- or district-approved educational program; and 4) does not meet any of the following exclusionary conditions: a) transfer to another public school district, private school, or state- or district-approved educational program (including correctional or health facility programs); b) temporary absence due to suspension or school-excused illness; or c) death."

For example, if students who appear unlikely to graduate are involuntarily transferred to adult education programs and therefore excluded from calculation of graduation indicators, schools may engage in this practice, possibly to the detriment of the students involved. Similarly, any scenario in which the default classification[15] for students who are no longer enrolled is anything other than dropout, is subject to manipulation. Thus, while seemingly harsh, the methodology in (12) is less likely than alternatives to create perverse incentives.

The Task Force recommends categorically that NCES both not use and actively discourage states and other entities from using dropout "rates" calculated by inverse relationships of the form

$$\text{Dropout rate} = 1 - \text{Graduation rate}. \tag{13}$$

Such calculations may be flawed conceptually even in the presence of data of adequate quality. For example, if EACGI were used as the graduation indicator, then use of 1 – EACGI as a dropout rate would treat students who do not graduate on time but remain in school as dropouts.

4.5 Transfer Indicators

The primary indicators EACGI in §4.1 and EACCI in §4.3 would exclude, in most settings, documented out-transfers. There may, however, be independent interest in understanding which schools have high rates of out-transfers (and, ultimately, of course, why). For example, if, as noted above, such transfers can occur involuntarily, then they become a mechanism whereby schools can manipulate graduation indicators.[16]

For such purposes, the Task Force recommends use of school-based transfer indicators that, like the dropout indicators in §4.4, are true rates in the sense of measuring numbers of events per unit of time. The principal form is the unadjusted transfer rate (UTR) analogous to the unadjusted dropout rate of (10). This indicator is the function of population P (example: tenth graders) within school S during year Y given by

$$\text{UTR}(S,P,Y) = \frac{\text{Number of documented out-transfers from } P \text{ during } Y}{\text{Size of } P \text{ during } Y}. \tag{14}$$

An analogous *exclusion-adjusted transfer rate* (EATR) makes sense only if exclusions do not include transfers.[17] It is given by

$$\text{EATR}(S,P,Y) = \frac{\text{Number of documented out-transfers from } P \text{ during year } Y}{(\text{Size of } P \text{ during } Y) - (\text{Exclusions } \textit{other than transfers} \text{ from } P \text{ during } Y)}. \tag{15}$$

4.6 Relationships Among Indicators

The necessity for four indicators — for graduation, completion, dropout, and transfer — may not be clear. Even if history is not overwhelmingly compelling, it does provide some justification: all except transfer indicators have extensive histories. More important, it is likely that no single indicator will serve all of the purposes for which GCD indicators are used. In particular, use of multiple indicators is simply illuminating in ways that individual indicators cannot be.

[15] In the absence of documented evidence to the contrary.

[16] The Task Force does not know the extent of this phenomenon, but given pressures associated with NCLB, it seems likely to become more widespread in the future.

[17] For example, if only death and imprisonment were deemed exclusions.

The following situations illustrate how multiple indicators can be useful.

- A school with a high graduation indicator and a high transfer indicator *may*, as noted above, be using transfers as a means of manipulating the graduation indicator. Neither indicator alone can suggest this.
- Some schools have the reputation, at least informally, of being the recipients of in-transfers who seem unlikely to be able to graduate, or may be established expressly to keep students who might otherwise drop out from doing so. Such schools may themselves have low graduation indicators, but may succeed nevertheless in the sense that many of their students complete high school by some means other than graduation. This would be reflected by an appropriate completion indicator.
- Important substantive issues require multiple indicators (and more). For example (see §7.2), it is not understood whether a high transfer indicator is, in itself, a symptom of poor performance by a school. As noted above, a high transfer rate coupled with a high graduation rate might represent a school's "dumping" students perceived as unlikely to graduate. It might also represent a "cutting of losses" that allows resources to be focused on students on whom they will have the greatest beneficial effect. The point is that multiple indicators are needed to address these kinds of important questions.

Finally, although this point is somewhat generic, use of multiple indicators is a prudent defense against reducing benefits to students to single numbers.

5. Population-Based Indicators

As noted in §1, population-based indicators have the generic form given in (2), which we repeat here in slightly different form:

$$\text{Indicator for population } P = \frac{\text{Number of individuals in } P \text{ with characteristic } C}{\text{Number of individuals in population } P}. \tag{16}$$

Each is defined by

- A population *P*, typically defined by a combination of geography (e.g., a state) and an age range (e.g., 18–24 years old). Additional qualifications include, for instance, restriction to non-institutionalized individuals.
- A characteristic *C*, in this report having to do with educational attainment or status.
- Implicitly, a qualification "as of some fixed point in time."

Population-based indicators measure important population characteristics, and are particularly appropriate for attainment outcomes that cannot be linked to educational units, especially the GED and possibly credentials earned by means of distance learning. They are used and useful principally for purposes other than evaluation of the performance of educational units, for example, labor force characterization and defining and characterizing the population eligible for postsecondary education.

The Task Force believes that current population-based indicators are conceptually sound, although they may not reflect completely the rapidly changing nature of high school education, which now includes such paths to completion as diplomas from Internet-based organizations. Concerns of the Task Force regarding population-based indicators are largely statistical, and span all classes of indicators. These concerns are discussed in §5.4.

5.1 Population-Based Graduation Indicators

The indicator for graduation from high school within population *P* is

$$\text{High school graduation indicator } (P) = \frac{\begin{array}{c}\text{Number of individuals in } P \\ \text{who have graduated from high school}\end{array}}{\text{Number of individuals in population } P}. \tag{17}$$

5.2 Population-Based Completion Indicators

The indicator for completion of high school within population *P* by one or more means *M* — for example, graduation by means of exit examination leading to a state-approved diploma — is

$$\text{High school completion indicator } (P, M) = \frac{\begin{array}{c}\text{Number of individuals in } P \\ \text{who have completed high school by means } M\end{array}}{\text{Number of individuals in population } P}. \tag{18}$$

Although some states may link the GED to schools, not all do, so the Task Force recommends that NCES use population-based indicators for the GED.

5.3 Population-Based Dropout Indicators

The indicator for having dropped out of high school within population *P* is

$$\text{High school dropout indicator } (P) = \frac{\begin{array}{c}\text{Number of individuals in } P \\ \text{who have dropped out of high school}\end{array}}{\text{Number of individuals in population } P}. \tag{19}$$

5.4 Task Force Concerns

The primary current source of data for population-based indicators such as (17), (18), and (19) is cross-sectional sample surveys, especially the CPS and American Community Survey (ACS). These are conducted by agencies other than NCES, principally the Census Bureau (Census). In some cases, these agencies report the results as well, which does raise some issues. The Task Force does not, however, see justification for NCES to develop its "own" alternative surveys addressing only education. There are, though, some issues of consistency; see §7.3.

Many of our concerns arise from a common source: *population-based indicators are statistical estimates determined from surveys.* The first concern is associated uncertainties. Certainly, the numerator in an indicator such as (17) — and possibly the denominator as well — is a statistical estimate. Minimally, there are uncertainties reflecting the sampling design, coverage, and possible nonresponse bias. Uncertainties in the size of P, particularly if this size is small, are especially problematic because they appear in denominators in expressions such as (17). When indicators are reported for multiple units (e.g., states), proper attention should be paid to multiplicity.[18]

[18] Multiplicity refers to performing large numbers of comparisons in a single analysis. Statistical tests based on such comparisons can be biased if they are done without proper adjustments. For example, someone might calculate year-to-year changes in GCD indicators for all 50 states and report all of the changes that were statistically significant using tests that address only one state at a time. Doing so produces upwardly biased estimates of statistical significance.

The Task Force is concerned about coverage of the CPS, which does not collect data about active duty military personnel or individuals living in group quarters such as prisons. As a result, the CPS lacks data about some important populations living in the United States. The ACS does not have similar coverage limitations, but it is not clear that the ACS will continue to be conducted.

There are cognitive and self-reporting issues that add to inherent uncertainties. For example, some respondents may confuse high school graduation as used in this report with high school completion by other means. This problem is exacerbated by some presumptive interpretations of responses, for example, that "Some College" implies completion of high school. It seems plausible that respondents would be reluctant to report themselves as dropouts, especially if they are concerned about the confidentiality of their responses.

The Task Force further recommends that NCES work with the Bureau of Labor Statistics (BLS), Census, states, congressional staff, and education researchers to address these issues.

6. Implementation

While it is beyond the scope of the Task Force to address implementation and cost issues in detail, we believe it important at least to call attention to key items. These comments are framed by our anticipation (see §3) that state-level electronic student tracking systems will be universal in the not-distant future, so that it is neither fair nor realistic to attribute fixed costs of constructing and operating such systems to calculation of GCD indicators.

We also believe that, with the exception of documentation of exclusions, the data elements necessary to calculate the GCD indicators in §4 are already, or will be, available in any reasonable student tracking system. These elements are described in detail in Appendix D, but consist essentially, for every student, of the date and grade of entrance and the date and status of exit. It is likely that these data exist already, although not necessarily in a uniform or accessible form.

The one exception, alluded to above, is the need for data elements identifying *documentation of exclusions*. We believe that most student tracking systems will have one record for each school (in a state) that a student enrolls in, which contains an exit code. Addition of an associated documentation code is simple conceptually, but could entail redesign of the database schema and in any case is not cost-free.[19]

Neither is the cost negligible to prepare scripts or other report-generating tools to calculate GCD indicators. These will involve complex database queries, especially to handle exclusions.

There will also be costs to states, on a continuing basis, to prepare and maintain the lists of institutions offering state-designated diploma-granting programs, that are required for documentation of transfers.

It seems clear to the Task Force, however, that the largest cost associated with our recommendations is the labor cost of documenting exclusions and entering this information into databases. Depending on the sophistication of the database, some of this process can occur automatically. For example, creation of a record for a student at another school in the same state could automatically enter the exit and documentation codes for the previous school. Similarly, if a transcript request is treated as acceptable documentation of a transfer, then production of the transcript could — but this would require a more complex database — trigger entry of the exit and documentation codes.

More likely, however, is that the process would be substantially manual. As noted in §4.1, it is in a school's interest to expend the resources.

[19] Here as elsewhere, the Task Force is not in a position to estimate costs definitively. Even seemingly simple changes, such as adding data fields, may be costly.

Documentation of interstate and international transfers, and possibly of intrastate transfers to private schools, pose additional burdens.[20] As described in §7, technologies exist that would enable NCES to construct a system that would verify most interstate transfers without compromising confidentiality. International out-transfers may be sufficiently rare[21] not to pose a major problem. Public-to-private transfers may be dealt with adequately on the basis of transcript requests.

The Task Force neither can nor should make recommendations regarding who bears the costs associated with GCD indicators. We do note, however, that both generally and for education data in particular (NAEP is a notable example), the federal government has often provided some resources to the states to support data collection.

[20] The increasing diversity of institutions offering high school credentials (§2) adds to the problem.

[21] Although there is anecdotal evidence to the contrary for some schools.

7. Additional Recommendations

In the course of its deliberations, the Task Force discussed a number of more general issues, which has led to several additional recommendations.

7.1 Meta-Recommendations

The Task Force believes that the importance and complexity of human, political, and statistical issues associated with GCD indicators demand that NCES play a leadership role in making recommendations to states regarding calculation of indicators and associated data requirements, and assisting states in implementing the recommendations. Without such leadership, the result might be chaos, confusion and — worst — failure to meet the fundamental goal of the NCLB Act that all children be educated well.

Therefore, our strong recommendation is that NCES provide leadership in creation of a federal-state cooperative program to develop the data needed for GCD and to establish guidelines for their use. It seems sensible to the Task Force that, if possible, such a program can be instituted more rapidly and cost-effectively by expanding extant programs that by creating an entirely new program, but we feel that this decision belongs ultimately to NCES. The Task Force recognizes that such a program will require resources both for the states and for NCES. We also emphasize once again that the benefits of such NCES leadership extend far beyond the calculation of graduation, completion, and dropout indicators,[22] and we urge that NCES articulate these broader justifications.

In particular, the Task Force recommends that NCES explore the desirability and feasibility of full-time state or regional data collection coordinators. These coordinators would be similar in nature to the current state-level NAEP coordinators. The coordinators would be state employees whose salaries, benefits, and minimal support would be funded by the federal government. Their very presence and efforts would alter dramatically the current sometimes distant relationship between NCES and the states. Assuming that each position costs $150,000 annually, the total required resources would be on the order of $8 million per year, which the Task Force does not consider to be inconsistent with the anticipated benefits.

To summarize, NCES leadership is important, not just for NCLB, but also for general improvement of education data. The Task Force urges the Commissioner to consider the most effective ways to achieve this goal.

7.2 Appropriateness, Relevance, and Usefulness

As stated already in §2, the Task Force is profoundly concerned that too much focus on "producing the numbers" represented by our recommended graduation, completion, and dropout indicators may lead to a disconnect between indicators and the primary goals of the educational system — a challenging, exciting experience for students that prepares them for further study and lives as productive citizens.

[22] And even further, beyond compliance with NCLB reporting requirements.

We recommend that NCES undertake or support a program of research to assess the extent to which our recommended graduation, completion, and dropout indicators, or any others, do capture the "right" outcomes. To illustrate (see also §4.6), although there are preconceptions, it is not clear that graduates from high schools with high graduation rates are more successful than those from high schools with lower graduation rates. For example, further studies of the degree to which each of the different indicators is associated with various measures of later life success (for example, earnings, employment, or additional education) would help to ascertain which measures are most appropriate for which purposes.

7.3 Other Recommendations

The Task Force believes that several items require short-term attention, in particular because necessary resources would presumably be included in fiscal year (FY) 2006 or FY 2007 budget requests. The Task Force anticipates that, given the already substantial burdens on its staff, NCES may wish to engage external contractors to assist in implementing these and other recommendations below.

Student tracking systems. The Task Force recommends that NCES develop a set of minimal standards, covering both systems and data, for state-level student tracking systems, in order to ensure that data necessary for calculation of important measures of student and school performance, including GCD indicators, will be available in the near future. Especially, should NCES decide to adopt the indicators recommended in this report, it should develop standards that ensure that state-level tracking systems will collect and be able to provide the requisite data in the proper form.

NCES should also work with states, and within its existing statistical standards (National Center for Education Statistics, 2004), to develop data quality standards for state-level tracking systems, which should include data reviews by NCES. In this context, especially if there were state or regional NCES coordinators (§7.1), important but potentially contentious issues, such as NCES reviews of the data from which GCD indicators are calculated, can be resolved in a collegial manner. The Task Force does feel that, at least initially, items such as documentation of exclusions should be at least subject to NCES audits.

The current and probable continuing lack of a federal overlay that would allow verification of interstate transfers should not be regarded as an insurmountable obstacle. Techniques known generically as secure multiparty computation (Goldwasser, 1997) would allow states to query each others' databases to determine whether records are present without compromising any content of those records. NCES should investigate whether such techniques are feasible in this context.

Validation studies. The Task Force recommends that NCES conduct validation studies of data from which current GCD indicators are calculated, such as CCD and other state administrative data. The urgency of this item reflects the perception of the Task Force that many currently reported indicators are based on extremely problematic data.

The Task Force believes that planning for other items, including efforts to ensure that adequate resources are available, should begin at once, although implementation may not be immediate.

Longitudinal studies. The Task Force recommends that NCES investigate the feasibility, desirability, utility, and cost of expanding its current longitudinal data collection programs to provide more detailed, timely, and reliable information regarding graduation, completion, and dropout indicators.

Statistical issues. The Task Force recommends that NCES undertake planning and research necessary for principled treatment of graduation, completion, and dropout indicators as statistical estimates. These indicators are estimates now, and will remain so even when state- and federal-level tracking systems are in place. Issues include calculation and reporting of uncertainties, reporting questions such as multiplicity, and calibration of multiple indicators.

Cross-agency consistency. The Task Force was struck by one inconsistency among federal agencies regarding GCD indicators: the Census Bureau defines a high school graduate as a completer not only by graduation from a diploma-granting program but also by equivalent means such as the GED. Especially with attention focused by NCLB on (in our terminology "true") graduation indicators, this inconsistency seems destined to engender confusion among policymakers and the general public regarding the actual rate of high school graduation in the United States. In particular, graduation indicators such as those in §4.1 do not include those deemed graduates by the Census Bureau, resulting in lower estimates than those produced by the Census. Although it is not within the power of NCES singlehandedly to effect a change, we do urge initiation of discussions between NCES and Census directed toward using common definitions and terminology for calculating and reporting high school graduation and completion statistics.

Acknowledgments

The Task Force thanks the leadership and staff of NCES for the amount and quality of information provided to us, as well as their willingness to permit the Task Force to follow its own paths and reach its own conclusions. We also thank Education Statistics Services Institute (ESSI) personnel, especially Susan Lapham, who have served as our organizers and intermediaries with NCES.

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Appendixes

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B Charge to the Task Force

- Consider what dropout and completion statistics are needed for what purposes;
- Review existing NCES methodology for calculating dropout rates;
- Examine the criticisms that have been raised;
- Consider alternative means of measuring dropouts and completers in terms of both school system needs and broader community-level needs; and
- Recommend ways to improve data collections and measures.

C Assumptions and Definitions

For purposes of exposition and simplicity, the body of this report incorporates several assumptions and definitions, which we list here.

1. High schools are assumed to be four-year schools. The adjustments to various formulas for three-year high schools are straightforward.
2. "Year" means academic year, with year *Y* ending 6/30/*Y* . Students entering in year *Y* actually begin their studies in the fall of calendar year *Y* - 1.
3. "Graduation" means award of a state-recognized diploma.

D Yearly Status Summaries

The Yearly Status Summary is a table constructed annually at whatever level of aggregation is of interest — school, district, state, or United States. An example appears in Table 1. An extended description appears in Karr (2004).

D.1 Formulation

A Yearly Status Summary has an academic year *Y* — the "Yearly Status Summary year" — associated with it, and so would be produced annually. The Yearly Status Summary classifies all students who entered as ninth graders in year *Y*, or for some designated number of previous years, by their status as of the end of the Yearly Status Summary year. Each entry is a count of the number of students who entered in the year corresponding to a column and whose status at the end of the Yearly Status Summary year corresponds to a given row. For simplicity, the **No Longer Enrolled** categories in Table 1 are cumulative rather than year-specific. Reentrants are not "flagged" explicitly as such, although in principle they could be. Often, they will be identifiable by means of their status, which will be "slower than normal progress."

The number of columns in Table 1 can be varied, depending on need, but presumably should not be less than four. Similarly, the number of rows associated with **Graduated** is variable.

For simplicity, the version of the Yearly Status Summary presented here ignores in-transfers and other means of completion, such as equivalency exams or the GED. Implicit in Table 1 is that **Out-Transfers** are verified, although this is really a data quality issue.

The interpretations of the entries in Table 1 are as follows:

- **NP** are cells corresponding to students making normal progress;
- R(*n*) are students who have been retained *n* times (R = retained). The Yearly Status Summary indicates only how many times they were retained, not which grades they were retained in.
- EG(*n*) are students who graduate *n* years early (EG = early graduates) relative to normal progress. For example, the EG(2) cell corresponding to Year of Entry = *Y* – 1 and Graduated Year = *Y* is students who graduated two years early — in two years rather than four.
- LG(*n*) are students who graduate *n* years late (LG = late graduates) relative to normal progress. For example, the LG(2) cell corresponding to Year of Entry = *Y* – 5 and Graduated Year = *Y* is students who graduated in six years rather than four — two years late.
- Entries with XX are logical impossibilities.

Both column and row sums in the Yearly Status Summary are meaningful:

- The column sum for some year is the number of students entering as ninth graders in that year, which does not change over time, even when the Yearly Status Summary year does change.
- The row sums are the total numbers, by status, of all students entering in years represented in the Yearly Status Summary. For example, the row sum for **Graduated Year** *Y* is the total number of graduates in that year, regardless of when they entered.[23]

Because the Yearly Status Summaries contain counts rather than rates, low-level Yearly Status Summaries, for example at the school district level, can always be aggregated to form Yearly Status Summaries at higher levels, for example, at the state level.[24]

Note that Yearly Status Summaries do not classify as dropouts students who drop out but return to school (possibly multiple times), and who may even graduate; such students appear as either **Still Enrolled** or **Graduated**.

[23] As long as the year of entry is a column in the Yearly Status Summary.

[24] Note that this entails only aggregation of Yearly Status Summaries for the same year. In general, aggregation of Yearly Status Summaries over multiple years does not make sense.

Status	Year of Entry to Ninth Grade						Total
	Y	*Y* – 1	*Y* – 2	*Y* – 3	*Y* – 4	*Y* – 5	
				Still Enrolled: Completed Grade			
8	R(1)	R(2)	R(3)	R(4)	R(5)	R(6)	
9	**NP**	R(1)	R(2)	R(3)	R(4)	R(5)	
10		**NP**	R(1)	R(2)	R(3)	R(4)	
11			**NP**	R(1)	R(2)	R(3)	
				Graduated: Year			
Y	EG(3)	EG(2)	EG(1)	**NP**	LG(1)	LG(2)	
Y – 1	XX	EG(3)	EG(2)	EG(1)	**NP**	LG(1)	
Y – 2	XX	XX	EG(3)	EG(2)	EG(1)	NP	
Y – 3	XX	XX	XX	EG(3)	EG(2)	EG(1)	
				No Longer Enrolled			
Verified Out-Transfer							
Dropout							
Other							
Total							

Table 1: Prototype Yearly Status Summary for academic year *Y*. The Yearly Status Summary summarizes the status at the end of a given academic year *Y* of all students who entered for the *first time as ninth graders* that year or up to *n* years earlier. In this example, $n = 5$. See the text for a detailed explanation.

It is preferable that "interior" elements of the Yearly Status Summary — those other than the row of column totals — be regarded as the "raw data" elements of the Yearly Status Summary, in which case totals available from other sources may be used to check data quality on Yearly Status Summaries. Even in the presence of student tracking systems, it may be necessary to calculate the **Dropout** row of the Yearly Status Summary by subtraction. The Task Force feels that doing so is sound conceptually only if NCES provides an emphatic recommendation that all out-transfers and other causes of **No Longer Enrolled** must be verified, including specification of acceptable means and evidence of verification.

D.2 Extensions

The simplifications in Table 1 are rather easy to remove, although possibly at a "price" in terms of understandability or data collection burden.

Cumulative graduation counts. This is straightforward: by adding across rows, the Yearly Status Summary yields cumulative (graduated by) rather than year-specific (graduated in) counts.

In-transfers. Conceptually, inclusion of inward transfers is straightforward: the Yearly Status Summary becomes a three-dimensional table in which the third dimension is "entering grade." Alternatively, the **Year of Entry** can become a **Year and Grade of Entry**, as shown in the Yearly Status Summary in Table 2. Whether either of these alternatives is too complicated as a means of presentation for some purposes or audiences is not clear, but construction of either from a student tracking system is straightforward.

Other means of completion. Rows can be added to the Yearly Status Summary to represent means of completion other than graduation, and these can be broken down by year in the same way that graduation is, but doing this may impose unreasonable data burdens unless state-level tracking systems contain such data.

Year-specific No Longer Enrolled counts. Given appropriate data, including these requires only adding more rows to the Yearly Status Summary.

	Year and Grade of Entry																
	Year *Y*				Year *Y* – 1				Year *Y* – 2				Year *Y* – 3				
Status	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**Total**
							Still Enrolled: Completed Grade										
8	R(1)	XX	XX	XX	R(2)	XX	XX	XX	XX	XX	XX	XX	R(4)	XX	XX	XX	
9	**NP**	R(1)	XX	XX	R(1)	R(2)	R(3)	XX	R(2)	XX	XX	XX	R(3)	R(4)	XX	XX	
10		**NP**	R(1)	XX	**NP**	R(1)	R(2)	XX	R(1)	R(2)	R(3)	XX	R(2)	R(3)	R(4)	XX	
11			**NP**	R(1)		**NP**	R(1)	R(2)	**NP**	R(1)	R(2)	R(3)	R(1)	R(2)	R(3)	R(4)	
							Graduated: Year										
Y				**NP**			**NP**	LG(1)		**NP**	LG(1)	LG(2)	**NP**	LG(1)	LG(2)	LG(3)	
Y – 1							**NP**				**NP**	LG(1)		**NP**	LG(1)	LG(2)	
Y – 2												**NP**			**NP**	LG(1)	
Y – 3																**NP**	
							No Longer Enrolled										
Out-Transfer																	
Dropout																	
Other																	
Total																	

Table 2: Prototype Yearly Status Summary incorporating both year and grade of entry. In this case the Yearly Status Summary only reaches $n = 3$ years into the past. Early graduates are not shown.

E Relationship of Recommended Graduation Indicators to Yearly Status Summaries

Here we show which elements of the Yearly Status Summary are required to calculate the recommended graduation indicators in §4.1. This discussion also illuminates the relationships among the indicators. Implicit throughout is that the Yearly Status Summary corresponds to the unit *U*. Also, for simplicity, we consider single-year rather than cumulative versions of the indicators, which we denote with asterisks.

E.1 Preferred Indicators

Table 3 shows elements of the Yearly Status Summary needed to calculate the exclusion-adjusted cohort graduation rate EACGI* associated with (3), under the assumption that students no longer enrolled for **Other** causes should not be removed from the denominator of computations

$$\mathrm{EACGI}^*(S, Y_c, Y_g) = \frac{\mathrm{Num}_4 + \mathrm{Num}_3 + \mathrm{Num}_2 + \mathrm{Num}_1}{\begin{array}{l}(\mathrm{Denom}_4 - \mathrm{Denom}_4^T) + (\mathrm{Denom}_3 - \mathrm{Denom}_3^T) \\ +(\mathrm{Denom}_2 - \mathrm{Denom}_2^T) + (\mathrm{Denom}_1 - \mathrm{Denom}_1^T)\end{array}}. \tag{20}$$

Should all or some of students no longer enrolled for **Other** causes be deemed as a matter of policy to be excluded from the denominator of transfer-adjusted cohort graduation rates, this can be accomplished by straightforward modification of (20).

	Year and Grade of Entry																
	Year $Y = Y_g$				Year $Y-1$				Year $Y-2$				Year $Y-3 = Y_c$				
Status	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**Total**
								Still Enrolled: Completed Grade									
8																	
9																	
10																	
11																	
								Graduated: Year									
Y				Num_1				Num_2				Num_3				Num_4	
$Y-1$																	
$Y-2$																	
$Y-3$																	
								No Longer Enrolled									
Out-Transfer				Denom_1^T				Denom_2^T				Denom_3^T				Denom_4^T	
Dropout																	
Other																	
Total				Denom_1				Denom_2				Denom_3				Denom_4	

Table 3: Elements of the Yearly Status Summary required to calculate the exclusion-adjusted cohort graduation rate EACGI in (3), using (20).

E.2 Alternative Graduation Indicators

The cohort graduation indicator of §4.2 requires some but not all "interior" elements of the Yearly Status Summary. Specifically, Table 4 shows elements of the Yearly Status Summary required to calculate the cohort graduation rate CGI* corresponding to (4):

$$\text{CGI}^*(S, Y_c, Y_g) = \frac{\text{Num}_4 + \text{Num}_3 + \text{Num}_2 + \text{Num}_1}{\text{Denom}_4 + \text{Denom}_3 + \text{Denom}_2 + \text{Denom}_1}. \tag{21}$$

	Year and Grade of Entry																
	Year $Y = Y_g$				Year $Y-1$				Year $Y-2$				Year $Y-3 = Y_c$				
Status	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**Total**
								Still Enrolled: Completed Grade									
8																	
9																	
10																	
11																	
								Graduated: Year									
Y																	
$Y-1$				Num_1				Num_2				Num_3				Num_4	
$Y-2$																	
$Y-3$																	
								No Longer Enrolled									
All Reasons																	
Total				Denom_1				Denom_2				Denom_3				Denom_4	

Table 4: Elements of the Yearly Status Summary required to calculate the cohort graduation rate CGI in (4), using (21).

Table 5 shows how the in-transfer adjusted graduation indicator IAGI* corresponding to (6) is the ratio of one row sum of the Yearly Status Summary to the sum of four column sums:

$$\mathrm{IAGI}^*(S,Y) = \frac{\mathrm{Num}}{\mathrm{Denom}_4 + \mathrm{Denom}_3 + \mathrm{Denom}_2 + \mathrm{Denom}_1}. \tag{22}$$

	Year and Grade of Entry																
	Year *Y*				Year *Y* – 1				Year *Y* – 2				Year *Y* – 3				
Status	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**9**	**10**	**11**	**12**	**Total**
							Still Enrolled: Completed Grade										
8																	
9																	
10																	
11																	
							Graduated: Year										
Y																	Num
Y – 1																	
Y – 2																	
Y – 3																	
							No Longer Enrolled										
All Reasons																	
Total				Denom_1			Denom_2				Denom_3				Denom_4		

Table 5: Summary elements of the Yearly Status Summary necessary to calculate the in-transfer adjusted graduation indicator IAGI, using (22).

Finally, Table 6 shows that the unadjusted graduation rate UGI* corresponding to (7) is the ratio of one row sum in the Yearly Status Summary to one column sum:

$$\mathrm{UGI}(S,Y) = \frac{\mathrm{Num}}{\mathrm{Denom}}. \tag{23}$$

The "row sum divided by column sum" nature of UGI* explains why, as discussed in §4.2, it can assume values greater than one. All other rates are, in effect, ratios of column entries to corresponding column sums.

Status	Year of Entry to Ninth Grade						Total
	Y	*Y* – 1	*Y* – 2	*Y* – 3	*Y* – 4	*Y* – 5	
			Still Enrolled: Completed Grade				
8							
9							
10							
11							
			Graduated: Year				
Y							Num
Y – 1							
Y – 2							
Y – 3							
			No Longer Enrolled				
All Reasons							
Total				Denom			

Table 6: Relationship of UGI given by (7) to the Yearly Status Summary: UGI(*Y*) = Num/Denom.

F Catalog of Graduation, Completion, and Dropout Indicators

F.1 General Discussion

The Task Force commissioned the preparation of a catalog of graduation, completion, and dropout indicators by Dr. Christopher B. Swanson of the Urban Institute. That catalog is summarized below, in this appendix.

The purpose, in keeping with the charge to the Task Force, was to understand what indicators have been used, by whom and for what purposes, as well as associated data requirements. The catalog contains

- Indicators used by federal agencies;
- Generic indicators; and
- Indicators that states plan to use to satisfy NCLB reporting requirements.

In the remainder of this appendix, we present a summary of the catalog, which places the indicators there into four general classes — status indicators (§F.2), departure classification indicators (§F.3), cohort indicators (§F.4), and other indicators (§F.5). We also discuss how the graduation, completion, and dropout indicators recommended by the Task Force in §4 and 5 relate to these existing indicators.

The catalog contains approximately 70 indicators. For each indicator, the following information is presented:

Identification: Classification of method, Reporting agency, Data source/type;

Definition: General definition, Mathematical definition, Definition of elements;

Data Description: Unit of analysis, Observations, Time span;

Reporting: Target population, Structural units/levels, Population subgroups;

Purpose: Main uses; and

Citation: including URLs.

F.2 Status Indicators

Indicators in this class are of the form of the population-based indicators in §5:

$$I(P,c) = \frac{\#(P_c)}{\#(P)},$$

where P is a population and P_C is the subset of those elements of P with characteristic c.

Indicators in Catalog: CPS Status Dropout Rate, CPS Status Completion Rate, CPS Status Alternative Completion Rate, CPS Status Graduation Rate, Digest of Education Statistics Graduate Ratio, American Community Survey Completion Rate.

F.3 Departure Classification Indicators

These rates are of the general form of the ratio of the number of students departing from a school during year Y for a reason of interest (example: graduation) to the number of students departing for any reason. Possibly, but not always, "not departing" is also included in the denominator. An example is the NCES leaver graduation rate: the ratio of graduates to all departing students.

The general mathematical form is

$$I(S,Y) = \frac{\text{Number of students departing for reason } i}{(\text{Number of students departing for reason } i) + (\sum \text{Some } j \neq i \text{ Number of students departing for reason } i)}. \quad (24)$$

Possibly one value of $j \neq i$ represents students who have not departed. Note that exclusions in (24) are implicit: the summation includes only *some* — not all — $j \neq i$.

Indicators in Catalog: CCD Completion Leaver Rate, CCD Graduation Leaver Rate, CCD Alternative Completion Leaver Rate, OSEP Graduate:Leaver Ratio, OSEP Dropout:Leaver Ratio.

State NCLB Indicators in Catalog: Alabama, Alaska, California, Connecticut, Delaware, District of Columbia, Georgia, Idaho, Iowa, Kentucky, Maine, Maryland, Minnesota, Missouri, Montana, Nebraska, Nevada, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Utah, Vermont, Virginia, West Virginia, Wisconsin, Wyoming.

The departure classification state indicators vary somewhat, for example, as to whether alternative forms of completion are included in the denominator. Predominantly, these indicators include dropping out as one reason for departure, which the indicators recommended by the Task Force include only implicitly.

F.4 Cohort Indicators

These indicators are similar in many respects to preferred graduation indicators of §4.1, as well as the alternative graduate indicators in §4.2.

The general form is

$$I(C,Y) = \frac{\text{Number of students in cohort } C \text{ departing for reason } i}{C_0 + \sum \text{years } y \; \Delta\, C\,(y)}, \tag{25}$$

where C is the cohort of interest, C_0 is its initial size, and $\Delta C(k)$ is the change in its size — for all or possibly only some reasons — in year y.

The cohorts in §4.1 and 4.2.1 are defined via entrance and graduation years. For example, for the cohort graduation indicator CGI defined in (4):

- The cohort is "Students entering 9th grade for the first time in Y_c or transferring into 10th grade in $Y_c + 1$ or transferring into 11th grade in $Y_c + 2$ or transferring into 12th grade in $Y_e + 3$;"
- The departure reason is "Graduation in Y_g"; and
- The only allowed changes to the cohort size are those associated with in-transfers.

Whether the exclusion-adjusted cohort graduation indicator EACGI of (3) — the Task Force's preferred rate — is precisely of the form (25) is to some extent a matter of interpretation. Literally, in-transfers and exclusions can be incorporated into the changes $\Delta C(y)$ in (25), but we feel that it is important, as we have done in (3), explicitly to view in-transfers as part of the definition of the cohort, and to define exclusions as the only means by which the cohort size may decrease. In addition, of course, (3) in fact defines a whole family of indicators parameterized by the cohort and graduation years.

State NCLB Indicators in Catalog: Arizona, Colorado, Florida, Hawaii, Illinois, Kansas, Massachusetts, Michigan, Mississippi, New York, South Carolina, Texas, Washington.

F.5 Other Indicators

These indicators generally are either of the form

$$I(S,Y) = \frac{\text{Number of students in } P \text{ departing for reason } i}{\text{Number of students in } P}, \tag{26}$$

where P is a population within school S, or are products of such terms.

The unadjusted dropout rate UDR of (10) falls into this category. The exclusion-adjusted dropout rate EADR of (11) does not.[25]

Indicators in Catalog: CPS Event Dropout Rate, CCD Event Dropout Rate, Annual Dropout Rates (Grades 7–12, Grades 9–12, and Grade-Specific), Derived Four-Year Dropout Rate, Synthetic Four-Year Dropout Rate (two versions), Non-Persistence Rate.

State NCLB Indicators: Arkansas, Indiana, Louisiana, New Hampshire, New Jersey, New Mexico, North Carolina.

[25] Except by forcing the population to account for exclusions, which is a conceptual error.