

An Update and Clarification Regarding Demographic Estimates and the Resulting Implications for Projected Secondary Education Costs

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The American Academy of Arts and Sciences recently published *Educating All Children: A Global Agenda*, the result of the first phase of its project on Universal Basic and Secondary Education (UBASE). Gene Sperling has brought to my attention the fact that the book offers apparently conflicting estimates of the number of children of secondary school age who are not enrolled in school. In Chapter 1, "Measuring Global Educational Progress", I wrote on page 72 that ". . . 226 million children of secondary school age . . . do not attend school." In Chapter 8, "The Cost of Providing Universal Secondary Education in Developing Countries," Melissa Binder gives what appears to be a much higher estimate. The chapter's second sentence reads, "Nearly 400 million children in developing countries between the ages of 12 and 17 do not attend secondary school." Table 1 says that this number is 325.2 million. In this memo I will ignore the "nearly 400 million" estimate, since that was an editing error and should have been changed to read "more than 300 million", and focus on the reasons for the discrepancy of 100 million students that appears between these two chapters.²

Most important, and before beginning a more detailed explanation, I note that the difference between Binder's estimate and my own derives from our differing definitions of which children are counted. Binder's figure of 325 million pertains specifically to secondary-age children *who do not attend secondary school*. (For simplicity, I refer to children as either primary-age or secondary-age, rather than the awkward primary-school-age or secondary-school-age.) My estimate, as made amply clear in the chapter, pertains to secondary-age children *who are not enrolled in school at all*. The difference is huge, as detailed below, and appears to account for most of the apparent discrepancy.

This memo consists of three parts. First, I review the main possible sources of the discrepancy in our estimates. Second, I apply Binder's cost-per-student estimates to the lower number of secondary-age students who are not in secondary school and point out some significant considerations in creating such revised aggregate cost estimates. And third, for reference, I include a version of the technical note that appears in Chapter 1, modified to focus on the issue of secondary-age enrollment.

1. Differences between the two sets of calculations

The discrepancy between what I calculate as the number of secondary-age children currently not enrolled in school (225.7 million) and the number calculated by Binder (325.2 million) results primarily from my counting as "enrolled in school" nearly 120 million secondary-age students who are enrolled in primary school. These students appear in calculations of the gross enrollment rate (the ratio of total primary enrollment, regardless of age, to the population of the age group that officially belongs in primary school) but not in the net enrollment rate (the number of pupils in the official primary-age group expressed as a percentage of the total population in that age group). When one subtracts primary net enrollment from primary gross enrollment, one finds 119.9 million students of secondary age are in fact enrolled in primary school. If we subtract this figure from Binder's 325 million, we can see that her methodology would conclude that 205 million children of secondary age do not attend school at all – similar to my estimate, but a bit lower.

Other differences between our calculations are as follows.

- a. I estimate the number of secondary-age children who are not enrolled in school in the world; Binder's figure estimates the number of unenrolled children in 144 developing countries. This difference leads to Binder's estimate being lower than mine. However, the number of secondary-age children in developed

¹ Larry Rosenberg and Meghan Tieu provided considerable assistance in the preparation of this memo.

² I note at the outset one small difference: My estimates are based on the midpoint between mid-2000 and mid-2005 population, whereas Binder's are based on mid-2000 data.

countries who attend primary school is relatively small compared to the apparent discrepancy that this note addresses.³

- b. I use the average of 2000 and 2005 population data from *World Population Prospects: The 2004 Revision*; Binder uses 2000 data from *World Population Prospects: The 2002 Revision*. With increasing world populations, particularly in countries where enrollment is low, this difference leads to Binder's estimate being slightly lower than mine.

The direction of the difference is not easily determined in the following two instances:

- c. Different estimates of NERs for countries without full data are used. My methodology is detailed below; Binder uses the average NER to GER ratio for the region when NER is not available. When GER is also not available, Binder uses the average NER for the region.
- d. I use country-specific UNESCO data for the starting and ending ages of secondary education to determine what is considered secondary age for each country; Binder uses 12-17 as secondary age for all countries.

2. Tentative revision of cost estimates for expanding secondary education

I offer here a rough re-estimation of the cost of achieving universal secondary education. Binder bases her estimates on a population of 325 million secondary-age children who would have to be provided with secondary education. I base the new estimates here on the 226 million cited above and in Chapter 1. My methodology here is straightforward; indeed, it is without question overly simplistic, as it based on the simple fact that $225.7/325.2 = 0.694$. I multiply Binder's final cost estimates by this factor. Of course, in considering the resulting figures that appear below, all of Binder's caveats that explain why her cost estimates must be considered approximate should be kept in mind. In addition, and by way of expansion on one of Binder's points, I note that unit costs vary across countries, regions, and country-income groups. The .694 ratio applies to the world as a whole; use of a weighted average figure (based on a country's share of secondary-age students enrolled in primary school) could lead to significantly different cost estimates. The next iteration of this re-estimation would need to examine the specific countries in which my enrollment figures are different from what Binder uses, and apply income-level-specific or country-specific unit costs to derive an overall cost of expanding secondary education. In addition, although Binder uses a unit cost method, it is possible that the substantial change of scale inherent in this re-estimation would lead to a different estimate of unit costs.

Binder states that ". . . depending on time horizon, cost structure, and repetition rates, the annual financial burden of providing enough school spaces to achieve universal secondary schooling in developing countries will fall between \$22 billion and \$45 billion annually." Multiplying these figures by .694 leads to an estimated range of \$15 billion to \$31 billion. However, as I explain below, this quick adjustment does not take an important factor into account.

One other issue needs to be addressed before continuing: Binder estimated that an effort to achieve universal secondary education *instantaneously* would cost between \$33 billion to \$62 billion. But because it is clear that instantaneous expansion cannot be achieved, the important question is the extra cost involved in gradually reaching universal secondary education. The remainder of this section is based on the assumption of *gradual* movement toward universal secondary education.

If the goal of universal secondary education is achieved in the context of an overall improvement of education, then it is likely that the number of secondary-age students currently in primary school would decrease substantially over time. In the end, it is possible that all or nearly all secondary-age children would be attending secondary school. In this scenario, there would be no reason to quibble with Binder's cost estimates, since the secondary education of all of the secondary-age students currently attending primary school, which does not appear in my simple calculation above, would need to be taken into account. In addition, if we were to follow this tack, we would ideally take into account another point cited by Binder: the greater cost of upper, as opposed to lower, secondary education. Since

³ This number is small because the population of children in developed countries is much smaller than that in developing countries and because, as seen in the small difference between gross and net primary enrollment ratios in developed countries, there are relatively few secondary-age students in developed countries who attend primary school.

most of the secondary-age children who are in primary school would (at first) be in lower secondary school if they were not in primary school, the cost of absorbing them into secondary school would (at first) not be as great as might otherwise be assumed. Finally, if secondary-age students by and large no longer attended primary school, the cost of expanding primary education would be reduced.

3. Method for calculating the current number of unenrolled secondary-age children

I used the method described below to estimate the number of children of secondary age who are not currently enrolled in school. This description is the same as is given in *Educating All Children: A Global Agenda*, but is adjusted to focus on secondary-age children.

The number of secondary-age children for each country is calculated assuming a homogeneous population distribution. Using the average of 2000 and 2005 population data from *World Population Prospects: The 2004 Revision* (UN, 2004) for children in the 10–14, and 15–19 age groups, I divide the total for each age group by 5. The resulting number represents the population of a one-year age group. Using UNESCO data for the starting and ending ages of secondary education, I find the number of secondary-age children by summing the population figures for the one-year age groups that correspond to the years of secondary school. (For example, to determine the number of students in a secondary age range of 12 to 17, I multiply 2 times the figure for a one-year age group of the 10–14 population and add this to 3 times a figure for a one-year age group of the 15–17 population.)

The most recent available net enrollment rates (NER) and gross enrollment rates (GER) from UNESCO⁴ are used for secondary data. To estimate missing NER, I use a regression of NER on GER, per capita GDP, and under-5 mortality rates, because NER is highly correlated with these indicators (for secondary school, correlations are: 0.94, 0.63, –0.84,). Per capita GDP data and under-5 mortality rates are taken from *World Development Indicators 2005* (World Bank, 2005). For countries without per capita GDP and/or mortality data, regressions using only GER and the other available data are used. (Thus, if only GER and per capita GDP are available, a regression of NER on GER and per capita GDP is used. Similarly, if only GER and mortality rates are available, a regression of NER on GER and mortality is used. Finally, if neither per capita GDP nor mortality is available, a regression of NER on GER is used to estimate NER.) All estimated NERs are capped at 100 percent, and are capped to be lower than reported GER.

I estimate the number of secondary-age children enrolled in secondary school by multiplying the most recent available secondary NER by the population of secondary-age children. Perhaps because the various data sets are from different years or simply because of inaccurate data, the estimated enrolled secondary-age population for some countries is larger than UNESCO's reported total secondary school enrollment. To correct for this overestimation, for any country whose estimated secondary-age enrollment is more than 1 percent larger than the reported secondary school enrollment, I multiply the reported secondary school enrollment by the average ratio of estimated-to-reported secondary-age enrollment for all other countries to estimate enrolled secondary-age students.

The number of secondary-age students enrolled in school is calculated by adding the estimated number of students in secondary school to the number of secondary-age students in primary school. Making the assumption that students enrolled in primary school who are not primary age are of secondary age, I calculate the number of secondary-age children in primary education by subtracting the primary NER [number of students of primary age in primary school/population of primary-age children] from the primary GER [number of all students in primary school/population of primary-age children] and multiplying this difference by the population of primary-age children.

The number of unenrolled secondary-age students is calculated by subtracting the number of enrolled students from the total number of secondary-age children. In the secondary school calculations, this number is negative for some countries, which cannot be correct. There are various possible explanations for this result. First, the simplifying assumption of a homogeneous population distribution within age groups may not hold. Second, the assumption that

⁴ http://www.uis.unesco.org/ev.php?URL_ID=5187&URL_DO=DO_TOPIC&URL_SECTION=201

students in primary school who are not primary age are by default secondary age may be incorrect (as some may be younger than primary age or older than secondary age), and it would lead to an overestimation of the number of secondary-age students enrolled in primary school. Thus, large differences between primary gross and net rates may lead to inaccurate estimates of enrolled secondary-age students; from the available data, one cannot determine the age of students enrolled in primary school who are not of primary age. Finally, and in my judgment most important, inaccurate data may account for the observed discrepancy.

Because the true number of unenrolled children cannot be negative, any negative value is adjusted to zero. This adjustment, which applies to nine countries, results in a change of less than 1 percent in the estimate of the number of unenrolled secondary-age children (and approximately three-quarters of the total adjustment is due to the figures from Brazil). Nevertheless, the fact that the unadjusted estimate is negative for some countries (and thus stands out in the calculations) suggests that there may be less-visible data problems with other countries.

For any country with primary but not secondary enrollment data, a regression of secondary enrollment rates on primary enrollment rates and per capita GDP is used to estimate secondary enrollment rates.

To account for the 19 small countries without any available NER or GER data, the final world number for unenrolled children is increased proportionally by the percentage that children age 15–19 from these countries represent of the total world population of children age 15–19.