



***U.S. CENSUS MONITORING BOARD***

*Presidential Members*

***Effects of Census Undercount on School Planning***

***February 2001***

*Report Series  
Report No. 05*



U.S. Census Monitoring  
Board

4700 Silver Hill Road  
Suite 1250-3  
Suitland, MD 20746

**PRESIDENTIAL MEMBERS**

Phone: (301) 457-9900  
Fax: (301) 457-9901

Gilbert F. Casellas  
Co-Chair

Cruz M. Bustamante

Everett M. Ehrlich

Lorraine A. Green

Mark Johnson  
Executive Director

February 13, 2001

The Presidential Members of the U.S. Census Monitoring Board present the research findings of Dr. Barry Edmonston, "Effects of Census Undercoverage on Analyses of School Enrollments: A Case Study of Portland Public Schools."

The study finds that the 1990 census undercount affected the major factors which influence enrollment changes in the Portland School District – births, migration, and public school enrollment. Dr. Edmonston states that the uncertainty in the uncorrected data affected decisions such as the need for school construction and school placement. He also indicates that school districts with larger census undercounts were more profoundly impacted.

Sincerely,

A handwritten signature in cursive script that reads "Gilbert F. Casellas".

Gilbert F. Casellas, Co-Chair

## Effects of Census Undercoverage on Analyses of School Enrollments: A Case Study of Portland Public Schools

Barry Edmonston  
Director, Population Research Center  
Portland State University  
Portland, Oregon 97207  
[edmonstonb@pdx.edu](mailto:edmonstonb@pdx.edu)

### Executive Summary

Virtually all school districts in the nation routinely analyze school enrollment data for several purposes. One is to predict near-term needs for staff, especially teachers, and other school resources. Most schools, for example, base the recruitment of teachers on a forecast for next year's enrollments, and how those enrollments may vary by grade and location. A second purpose of school enrollment analysis is for planning needs over the next five or six years, such as for expansion (or contraction) of the school's physical plant, investment in school buses, and the myriad resources required for maintaining a school system. Finally, analyses of enrollment trends are essential for planning the long-term capital investment of a school district. In a school system that is growing, land acquisition is usually made at least ten years in advance of the anticipated construction of new schools. Careful school enrollment analyses and forecasts are essential for a school district's planning.

I recently carried out a comprehensive study of the factors affecting enrollment changes in the Portland Public Schools, a large metropolitan school system in Portland, Oregon. The three factors examined were births, migration, and enrollment rates in public and other types of schools. Using findings from this analysis, I also completed forecasts of future enrollments in Portland Public Schools from the present to 2010. These studies relied heavily on reported data from the 1990 census.

In this report, I replicate the original analysis of factors affecting enrollment changes but also consider the effects of census undercoverage. I use estimates for undercoverage in the 1990 census, taken from the U.S. Census Bureau's 1990 Post-Enumeration Survey, tabulated by age, sex, race, and selected variables on housing and location, and repeat the earlier analysis. My current analysis leads to four central findings about the effects of census undercoverage on the analysis of school enrollment for the Portland Public Schools.

After taking census undercoverage into account:

- Birth rates are *lower*. Analysis based on the new birth rates suggests that there will be fewer births due to population growth. This implies that future enrollments will be *lower* than originally calculated.
- Migration rates are *lower*. Analysis based on the new migration rates suggests that there will be fewer net in-migrants than originally calculated. This implies that that there may

be somewhat lower levels of net out-migration of preschool and school-age children and that enrollments may be *greater* than originally estimated.

- Public school enrollment rates are *lower* than originally calculated. This implies that future changes in the school-age population will have a diminished effect on school enrollment changes. This means that although Portland's public school enrollments will decrease in the future, enrollments will be *greater* than originally anticipated.
- The combined influence of birth, migration and public school enrollment rates affect school enrollment forecasts. Because forecasts are created 10 to 15 years in advance, public school enrollments in 2010 are likely to be about 200 to 300 fewer students than originally expected when taking census undercoverage into account.
- **Moreover, the overall effect of modifications to these three factors leads to uncertainty over a ten-year period of as many as 1,250 students. Such a level of uncertainty affects important planning decisions, for example, about the need for one or more additional schools and uncertainty about the appropriate location for schools.**

In sum, census undercoverage has important effects on outcomes and implications of school enrollment analysis of the Portland Public Schools. How might these findings compare to other school districts? One caution is that census undercoverage is lower in Portland than in other major metropolitan areas. Undercoverage is lower in Portland for two reasons: (1) there are fewer subpopulations such as immigrants and minorities that have been historically undercounted, and (2) the city's housing includes a higher proportion of owner-occupied units that are usually better counted in the census. If anything, the findings observed for Portland may underestimate the effects of census undercoverage for other cities. The effects would be doubled or tripled for other larger-sized cities.

Although my replication of the original study leads to similar overall conclusions about future enrollment trends for Portland Public Schools, this is not necessarily the conclusion that would be reached for other school systems. Failure to take census undercoverage into account could lead to mistaken conclusions in other cases. Given the inherent uncertainties in analyzing and forecasting school enrollments, it is therefore necessary to identify and account for, if possible, additional sources of uncertainty due to undercounted census data. Taking census undercoverage into account, as illustrated in this study, can improve school enrollment analysis and lead to better planning decisions.

## **Analysis of School Enrollment: Portland Public Schools**

### **Background**

The Portland Public Schools system currently enrolls about 52,000 students. The school district is three times the size of the next largest school district in Oregon. Portland Public Schools is distinctive among metropolitan school districts in the nation because it enrolls almost 90 percent of local school-age children and youth – a larger percentage than in most metropolitan areas.

Enrollments in Portland Public Schools have decreased in recent years, however, and declined by more than 2,000 students over the past four years. It has been unclear to school and local officials and to the public why enrollments increased in the early 1990s and then decreased recently. Are declining enrollments due to fewer births, to selective in and out migration, to more students attending private schools or home study curriculum, or to a combination of factors? Regardless of the driving factors, careful analysis depends upon accurate population data, especially for the school-age population.

At the request of the Portland Public Schools, I recently conducted a detailed demographic study of the factors affecting public school enrollments from 1990 to the present. The study used data from the 1990 census, as well as information from the U.S. Census Bureau's American Community Survey, which began testing in Portland and three other sites in 1996. The study also relied on annual enrollment data for Portland Public Schools and local private schools, birth and death information from the Oregon Health Division, and immigration data from the U.S. Immigration and Naturalization Service.

The decennial census is the only source of data for small areas across the nation. The study relied heavily on the 1990 census for age and sex data on the population residing in the Portland Public Schools' area. Similar age and sex information from the 1996 American Community Survey were used to make estimates of the selective in and out-migration for the 1990 to 1996 period.

This study replicates the original analysis, examining the effect of three factors on school enrollment: births, migration, and public and other type of school enrollment rates. In this report, I consider the impact of these three factors, taking into account the effects of census undercoverage.

### **Births Analysis**

Analysis of the effects of births on school enrollments depends upon calculating a set of birth rates for the resident population. Birth data are very accurate in the United States. Virtually all births in metropolitan Portland occur in hospitals and all are recorded with the residential address of the parents (or mother if no father is reported). Because of the high coverage rate for reported births and the associated accurate addresses, it is possible to construct a highly accurate database on births that occur to the population residing in the Portland Public Schools' area.

Data on the resident population by age and sex is benchmarked to the decennial census, with intercensal estimates based on administrative records – such as tax returns, drivers’ licenses, automobile registration, or voters’ registration – that provide indicators of population changes.

The original study revealed that the number of births in the Portland Public Schools’ area peaked at 6,840 births in 1981, declined to 6,408 in 1990, and decreased to 5,693 in 1998. Based on analysis of the number of younger adults, I calculated how many children were born to the average young adult. Taking into account trends in the number of younger adults and the average number of children born to adults, I concluded that decreases in the average fertility for younger adults was the main reason for declines in the annual number of births.

When census undercoverage is taken into account, it makes clear that fertility rates were *lower* in 1990 than originally calculated. The original calculation was that the average number of children born to adults was 1.70. Adjusting for the undercoverage in the census adult population numbers results in an estimate that the number of children born to adults was 1.68, or 1.2 percent lower than the original calculation.

Basing enrollments on the original, uncorrected fertility rates results in enrollment forecasts that assume more births occurring in the population. Taking census undercoverage into account suggests that there is actually a larger population in the Portland Public School area, but that there are fewer births per younger adult. A forecast based on the corrected fertility rates reveals that there are likely to be about 75 fewer births each year in the Portland Public School area. Although the number of fewer births each year is not large, the cumulated births over a decade amounts to 700 to 800 fewer births, a size that matters for decisions about new schools. Overall, based on the birth analysis, future school enrollments are likely to decrease somewhat more than originally suggested.

### **Migration Analysis**

Besides births, migration is the other key demographic process that can affect the population of school-age children and youth. Migration can directly affect school enrollments by adding or subtracting school-age children to the resident population. Migration can also indirectly affect school enrollments through the addition or subtraction of pre-school children or adults who may later have children.

The population in the Portland Public Schools’ area is noteworthy for the large number of younger adults, especially aged 18 to 34 years, who move into and out of the area. The location of colleges and training institutes, jobs, and the variety of available rental housing are attractive to younger adults who move into the area. Some continue to live in the central city area, buying a home and raising their families. However, many move outside the central city area as they become older. The original analysis found that the city’s population has been increasing due to net in-migration of younger adults. However, adults over age 35 and their children tended to be leaving the area of the Portland Public Schools. The result of these in and out-migration flows is that there is selection of pre-school and younger school-age children accompanying their parents in net out-migration, thereby reducing the number of children in the public schools.

When census undercoverage is taken into account, the revised estimates suggest that they may be *stronger* net in-migration of adults and slightly *less* net out-migration of pre-school and younger school-age children from the Portland Public Schools' area. This implies that, if current migration patterns continue, future enrollment in Portland Public Schools may increase more than was originally estimated. The effects of migration shifts on overall enrollments, however, are modest and indicate that annual enrollments would increase by about 25 students, cumulating to approximately 200 to 300 more students over a decade.

### **School Enrollment Rates Analysis**

Parents can enroll their children in public or private schools, or may choose to home-school their children themselves. Given a specific proportion of school-age children, changes in the relative percentage of children in one schooling option will necessarily affect the percentages of children in the other options.

Public schools have traditionally enrolled the vast majority of American school-age children and youth. There are a substantial number of children, however, enrolled in private schools and a small, but growing, number of children who are home-schooled. The original study calculated that for public school enrollments in 1990, 86 percent of school-age children and youth, aged 6 to 17 years, were enrolled in the public schools in Portland. Based on available data, less than 1 percent were home-schooled and 9 percent were in private schools, and the remaining 4 percent were not enrolled in school programs. Using estimates for changes in the school-age population and observed public school enrollment data for the period from 1990 to the present, the original study concluded that there was no evidence that public school enrollments were affected by shifts to private schools or home schooling. Although there was some conflicting evidence – in part based on the limited data available for specific residential address for private school enrollments – it did not appear that there were any significant declines in the proportion of school-age children or youth who attended public schools. This is a critical finding because one key local concern was that recent enrollment declines might have resulted from increased private school attendance, reflecting parental concerns about the quality of the public schools. Instead, the original study indicated a high level of public school support and the continued desire among most parents for their children to attend public schools.

Taking census undercoverage into account, my revised analysis suggests that there were an additional 1,400 children aged 7 to 17 years living in the Portland Public Schools' area in 1990. Because the public school enrollment data are fairly accurate, adjusting for 1990 census undercoverage suggests that these 1,400 students, or 2.4 percent of the school-age population, who were likely to be attending schools other than the public schools in 1990. Therefore, once census undercoverage is considered, public school enrollment rates decline from 86 to 84 percent in 1990. Because a lower percentage of school-age children and youth are enrolled in public schools, future population changes have a diminished effect on public school enrollments, suggesting that future enrollments will be about 25 students more each year than originally anticipated. Over a ten year period, analysis taking census undercoverage into account reveals that adjusted public school enrollment rates will lead to about 200 to 300 more students than originally expected.

## Summary of the Effects of Census Undercoverage

The effects of census undercoverage on births, migration, and school enrollment rates for school enrollment analysis are summarized in the table below. There are two types of overall effects of census undercoverage on Portland Public Schools enrollment analysis. The first is that ten-year enrollment forecasts decrease by about 200 to 300 students when undercoverage is taken into account. The second is that there are larger uncertainties in the forecast, increasing uncertainty by as much as 1,250 students compared to forecasts based on accurate data corrected for census undercount.

Summary of Effects of Census Undercoverage on School Enrollment Analysis				
Factor	Without Accounting for Census Undercoverage	After Accounting for Census Undercoverage	Difference Due to Census Undercoverage	Implications
Births	Births rates are calculated by taking births by age of mother and dividing them by the number of women by age.	There are more women in the childbearing years, and births rates are actually lower.	Births rates taking census undercoverage into account are 1.2 percent lower.	Because actual birth rates are lower, analysis based on them suggests that there will be fewer births due to population growth.
Migration	Migration rates are based on the number of migrants, 1990-96, divided by population estimates based on 1990 census data.	There are more men and women in each age group, and migration rates are actually lower.	Migration rates taking census undercoverage into account are 0.8 percent greater.	Because migration rates are greater, analysis based on them suggests that there will be more net in-migrants than originally calculated.
Public School Enrollment Rates	Public school enrollment rates are calculated by dividing 1990 public school enrollment figures by the 1990 census data on the school-age population.	There are more school-age children and youth, and public school enrollment rates are actually lower.	Public school enrollment rates are 2 percentage points lower, on average for kindergarten to grade 12.	Because public school enrollment rates are lower than originally calculated, future changes in the school-age population will have a diminished effect on school enrollment changes and future enrollments will be greater.



## **Using School Enrollment Analysis to Forecast Future Enrollments**

Forecasting school enrollments, like forecasting anything else, is difficult because it is impossible to know all the conditions that will affect enrollments in the future. However, we all rely on forecasts to some extent. We listen to weather forecasts to decide what to wear and school systems study enrollment forecasts to plan for the future. When it comes down to it, we may have to rely on a forecast in order to make decisions today for future planning. The school enrollment analysis described above forms the basis for the types of assumptions used to make enrollment forecasts for the next decade.

The forecasts were made with several cautions. I noted that enrollment forecasts are derived from the assumptions made and that it is not possible to judge, at the current moment, which of the assumptions or combinations of assumptions may be closer to future events. Nevertheless, assumptions about fertility rates, in and out-migration rates, and the proportion of school-age children and youth who will enroll in public schools are needed in order to anticipate future enrollments.

In the best of all worlds, we would have perfectly accurate and complete data. There is a familiar demographic saying, however, that “any demographer who believes that population data are 100 percent accurate is 100 percent wrong.” This case study of the effects of census undercoverage on Portland Public Schools’ enrollment provides evidence that there are many ways in which undercoverage further increases the uncertainties of school enrollment analyses. Given the uncertainties inherent in the analysis and forecasting of school enrollments, it is necessary to identify and account for, if possible, the additional uncertainty attributable to census undercoverage. Taking census undercoverage into account leads to more accurate estimates and helps school districts make more informed planning decisions.