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Who's Lagging Now?

Gender Differences in Secondary Course Enrollments

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Summary

A generation ago, concern about gender equity in schools prompted both federal and state legislation. In the 1980s, that concern gave way to other educational equity issues, but recent research showing a strong relationship between school curriculum and labor market outcomes for women and men suggests that it is time to reexamine gender equity in education. Over the last 30 years, enrollment gaps between girls and boys at the national level have either narrowed, disappeared, or been reversed, but female students continue to lag their male counterparts in key subject areas. More important from a policy perspective, perhaps, is that women also lag their male counterparts in subject areas that prepare workers for certain high-paying professions.

This issue of *California Counts* traces these outcomes to enrollment disparities in the state's middle schools and high schools. Although the analysis covers several core subject areas, it focuses on mathematics and science, which are specifically addressed in equity legislation and where Governor Davis has targeted new scholarship programs. These enrollment gaps for boys and girls are also considered in light of school settings (urban, suburban, or rural) and the racial and ethnic status of students.

The results of the analysis indicate that high school boys lag girls in English, foreign language, and social science but that girls are 10 percent less likely than boys to take physics and 43 percent less likely to take college-preparatory computer science classes. These last two areas of study prepare students for some of the highest-paying jobs in today's labor market. Girls also lag boys in Advanced Placement (AP) course enrollment in calculus, chemistry, physics, and computer science.

In some subject areas, the enrollment data include racial or ethnic status as well as gender. These data indicate that girls in all racial and ethnic groups enroll at higher rates in advanced

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math and first-year chemistry courses than their male counterparts. They also show that graduating females in all racial and ethnic groups complete college-prep classes at higher rates than their male peers. These disparities do not bode well for boys in some ethnic groups. For example, the female-male enrollment gaps are negligible for whites and Asians in advanced math courses, but African American females are enrolled at a much higher rate than African American males in these courses. Even in first-year physics, where girls lag boys in overall enrollment, female enrollments for Filipinos, Hispanics, and African Americans exceed those for their male counterparts.

Where enrollment gaps have narrowed, it is unclear whether this development can be traced to legislation, college admission requirements, parental influence, labor market opportunities, female preferences, or some combination of these or other factors. In areas where gaps remain, it is similarly unclear from these data whether girls simply prefer foreign language to computer science, are tracked into that course by the education system, or are actively discouraged from pursuing courses in the male-dominated field of computer science. What is clear is that the precursors to these patterns are in place by grade 8—halfway through a typical college graduate's school career. If the skills gained in school serve as a signal to colleges and employers, female and male students in California are sending different signals in an increasingly technology-dependent world.

Context

Enrollment differences between girls and boys have been substantial historically. In a nationally representative sample of twelfth-graders in 1960, only 9 percent of females compared to 33 percent of males took four years of high school mathematics (Wise, 1985). By 1972, this figure had risen to 22 percent for girls compared to 39 percent for boys (Chipman, 1996), thereby narrowing but by no means eliminating the enrollment disparity.

In the 1970s, two key pieces of federal legislation were enacted to address gender inequality in education. The first was Title IX of the Education Amendments Act of 1972. Its preamble contains the statement, "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any educational programs or activity receiving federal financial assistance." The second piece of legislation was the Women's Educational Equity Act (WEEA) of 1975, which specifically targeted mathematics and science and provided resources and technical assistance to implement gender-equity programs in educational institutions. California is one of several states that have subsequently enacted legislation to parallel these federal laws.

Since the 1970s, gender gaps in enrollment have narrowed nationally in some subject areas but remain significant in others (Bae et al., 2000; AAUW, 1998). These disparities often continue into the college years. Although women enroll at higher rates than men in the University of California, California State University, and California Community College systems, large disparities still exist nationally within specific fields of study, especially engineering and computer science. In 1996, only 16 percent of the engineering degrees and 27.5 percent of the computer science degrees were awarded to women (Bae et al., 2000).

These disparities also persist in certain sectors of the labor market. Recent data from the Bureau of Labor Statistics show that females constitute 26 percent of the employees in engineering services and an average of 35 percent of the employees in several high-tech occupations nationally (BLS, 2000). In 1993, college graduates entering the male-dominated fields of engineering and computer science professions earned higher median starting salaries than graduates entering other fields (Bae et al., 2000). Previous research has shown a relationship between high school curricula and future earnings (Altonji, 1995; Levine and Zimmerman, 1995) and that some portion of the wage gap between men and women also appears to

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be linked to school curricula. For example, Marini and Fan (1997) conclude that almost 3 percent of that gap could be explained by the amount and type of education received, especially education related to or dependent upon mathematics.

This issue of *California Counts* addresses four basic questions. First, what sorts of enrollment gaps between females and males still exist in California's schools? Second, at what point in the educational process do these gaps emerge or become measurable? Third, do these disparities vary according to a school's urban, suburban, or rural location? Finally, do these gaps vary by student race or ethnicity? Although the report presents data for several subject areas, it focuses on two that are specifically motivated by equity legislation—mathematics and science, including computer science.[1]

[1] The computer science classes included here resemble academic mathematics courses rather than those for vocational education or word processing. Researchers who examine the question of gender equity in mathematics and science often include computer science in their studies (Gribbon, 1986; Straker, 1986; Ward, 1986; Hanna, 1996; Harding, 1996; and Littleton, 1996).

Measuring the Gender Gap

California Basic Educational Data System. Administrative data from the 1998–1999 CBEDS datasets provide a profile of California's schools, teachers, and students. The Professional Assignment Information Form (PAIF) collects classroom-level enrollment counts and information about the certified staff, whereas the School Information Form (SIF) collects school-level enrollment counts and other information about the school. These datasets are merged to provide a comprehensive dataset from which to derive the information in this analysis. Table 1 contains SIF data for the numbers of schools, enrollment, and gender composition of the schools in this analysis, which includes middle schools, junior high schools, high schools with regular academic programs, and alternative schools, many of which are charter and magnet schools.[a] An identifying variable in the CBEDS dataset that follows general U.S. Census definitions was employed to indicate the urbanicity of the school's location.

PAIF Data. Table 2 and Figures 1 through 7 use unweighted, state-level aggregated classroom enrollment data to calculate the gender gaps for the various subject areas. Counts of males and females in individual subjects are collected on this form for every class in the state. However, these counts do not indicate the ethnic or racial composition of the enrollment. Urbanicity data are unweighted and aggregated by the three location categories. The indicator variable for the school's urbanicity is from the merged CBEDS dataset.

SIF Data. Tables 1 and 3 use state-level aggregated school enrollment counts to detail the numbers of schools and students in each grade span by race or ethnicity and urbanicity. Figure 8 uses unweighted, state-level aggregate data by gender and ethnic or racial group for only a few types of curricula in grades 9–12.[b] These counts include enrollment in advanced math, first-year chemistry, and first-year physics, and graduates completing the "a–f" requirements. These counts allow us to calculate female-male gaps for students of different ethnic and racial groups.

When female enrollment is simply divided by male enrollment, enrollment gaps in both datasets may appear to be wider than they actually are because of differentials in female and male overall enrollment. We therefore compare the rates at which males and females are enrolled.[c]

In all charts in this report, 200 represents female enrollment rates that are twice the size of male enrollment rates, whereas 50 represents female enrollment rates that are half the size of male enrollment rates, and 100 represents equal female-male enrollment rates. When one gender's enrollment is less than 100 percent of the other's, the gap is often referred to as a "lag" throughout the report.

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[a] Juvenile hall, California Youth Authority, continuation, special education, and community day schools are not included. K–8 and K–12 schools are also excluded. Middle schools and high schools were identified using a combination of the school's included grades and the CBEDS ownership code. This count yields a slightly different number from the one on the California Department of Education web site.

[b] Beginning in the fall of 2000, some of these data are also collected for grades 7 and 8 to reflect an increasing number of "a–f" classes offered in lower grades.

[c] To address concerns that simple ratios may not control for differential enrollment rates across males and females and ethnic and racial groups, female enrollment as a percentage of male enrollment for various subjects is calculated. For the PAIF data used in Figures 1 through 7, this calculation is ((#females enrolled in subject / #females enrolled in all courses) / (#males enrolled in subject / #males enrolled in all courses) *100). For the SIF data in Figure 8, this calculation is ((# females in subject / #females in school) / (#males in subject / #males in school) *100) for each racial and ethnic group. The denominators for the "a–f" graduates are from the 1997–1998 enrollment data because any graduates counted in the fall of 1998 are from that academic year.

Table 1. Number of Schools, Students, and Unweighted Percentage of Female Students in the Sample by Ethnic or Racial Group, 1998–1999

Middle Schools (n=1,043)	Total No.	% of Total	% Female
Native American	7, 265	0.8	49.8
Asian	78,555	8.2	48.3
Pacific Islander	6,299	0.7	50.1
Filipino	23,657	2.5	48.4
Hispanic	388,498	40.5	48.9
African American	86,351	9.0	49.6
White, non-Hispanic	369,752	38.5	48.6
Total	**960,377**	**100.2**	**48.8**
High Schools (n=882)	**Total No.**	**% of Total**	**% Female**
Native American	13,090	0.9	50.3
Asian	146,642	9.9	49.1
Pacific Islander	9,016	0.6	50.5
Filipino	42,536	2.9	48.6
Hispanic	538,001	36.5	49.4
African American	115,549	7.8	50.4
White, non-Hispanic	609,597	41.3	49.0
Total	**1,474,431**	**100.1**	**49.3**

Source: 1998–1999 CBEDS. Note: The text often refers to Asian, non-Filipinos as Asians, and white, non-Hispanics as whites. Percentages do not sum to 100 because of rounding.

Table 2 details the enrollment percentages in selected subject areas in California's middle schools and high schools. The columns labeled "a–f Enrollment" refer to courses that fulfill University of California and California State University minimum entrance requirements. AP courses are college-level classes offered at high schools. We use "student-courses" as a unit of measurement because the same student may be enrolled in more than one class in the same general subject area (for example, English composition and English literature). Consequently, the enrollment count may exceed the total number of students reported by some schools, especially those in which students take many electives.

In the state's middle schools, approximately 19 percent of the overall course enrollment is in English, 16 percent in math, 13 percent in science, and 15 percent in social science. Only 1.3 percent of course enrollment is in foreign language classes and 1.5 percent in computer science classes. The other 35 percent of overall enrollment is in physical education (15 percent) and a variety of electives. Even courses with small enrollments are offered at a relatively large percentage of schools. For example, computer science courses account for only 1.5 percent of enrollment at middle schools, yet almost 70 percent of these schools offer at least one section. Despite their small enrollments, these

Table 2. Subject Course Enrollment Percentages, 1998–1999

	Overall Enrollment			"a–f" Enrollment			AP Enrollment		
Middle Schools (n=1,043)	Overall Enrollment	Schools Offering at Least One Section	Sections	"a–f" Enrollment	Schools Offering at Least One Section	Sections	AP Enrollment	Schools Offering at Least One Section	Sections
English	18.8	97.6	19.5	0.3	10.5	0.3	n/a	n/a	n/a
Foreign language	1.3	62.2	1.3	0.2	11.4	0.2	n/a	n/a	n/a
Math	15.8	98.1	15.6	0.5	24.4	0.5	n/a	n/a	n/a
Science	13.1	97.9	12.3	0.1	3.4	0.1	n/a	n/a	n/a
Social science	15.0	97.7	14.5	0.1	2.9	0.1	n/a	n/a	n/a
Computer science	1.5	69.8	1.7	0.0	0.2	0.0	n/a	n/a	n/a
High Schools (n=882)									
English	17.8	95.5	18.7	14.1	91.8	14.4	0.49	64.2	0.53
Foreign language	7.9	93.2	7.6	7.6	90.9	7.3	0.40	55.3	0.47
Life science [a]	4.1	90.5	3.8	3.4	87.6	3.1	0.17	39.0	0.20
Math [b]	15.2	95.7	14.6	10.8	92.4	10.1	0.33	56.1	0.37
Physical science [c]	4.3	93.5	4.1	3.3	91.2	3.1	0.18	48.8	0.21
Social science	14.1	95.4	13.2	11.7	92.5	10.7	0.73	67.9	0.76
Computer science	0.9	61.3	1.0	0.1	16.1	0.1	0.05	11.0	0.05

Source: 1998–1999 PAIF.
Note: Included are schools for which there are classroom enrollment data. Middle schools have a combined student-course enrollment of 6,064,661. High schools have a combined student-course enrollment of 8,322,766. Classes qualifying as "a–f" are a subset of all classes in the broad subject area and AP classes are a subset of "a-f" classes. [a] All AP life science enrollment is in biology. [b] Over 80 percent of AP math enrollment is in calculus.
[c] Approximately half of AP physical science enrollment is in chemistry and half in physics.

classes provide early indications of enrollment gaps between females and males that become more evident in later years.

At the high school level, approximately 18 percent of the overall enrollment is in English, 15 percent in math, 12 percent in science,[2] 14 percent in social science, 8 percent in foreign language, and the rest in a variety of other subjects. Less than 1 percent of total high school course enrollment is in computer science classes, and only one-tenth of 1 percent of total student-courses is in "a–f" computer science courses. As in middle schools, many high schools offer courses that account for a small portion of the overall enrollment. For example, AP calculus accounts for less than 1 percent of total enrollment, but over 56 percent of schools offer at least one section of it.

Middle school "a–f" courses are less common than high school AP courses—about 24 percent of middle schools offer an "a–f" math class, whereas almost 59 percent of high schools offer an AP math class. For the purposes of this analysis, however, they are roughly analogous insofar as both kinds of courses tend to serve the most advanced students at their respective levels. Thus, middle school "a–f" courses allow us to identify gender gaps in these advanced courses even before the high school years.

[2] High school science is divided into three areas—life science, physical science, and "other" science. The first two categories account for about two-thirds of the science classes.

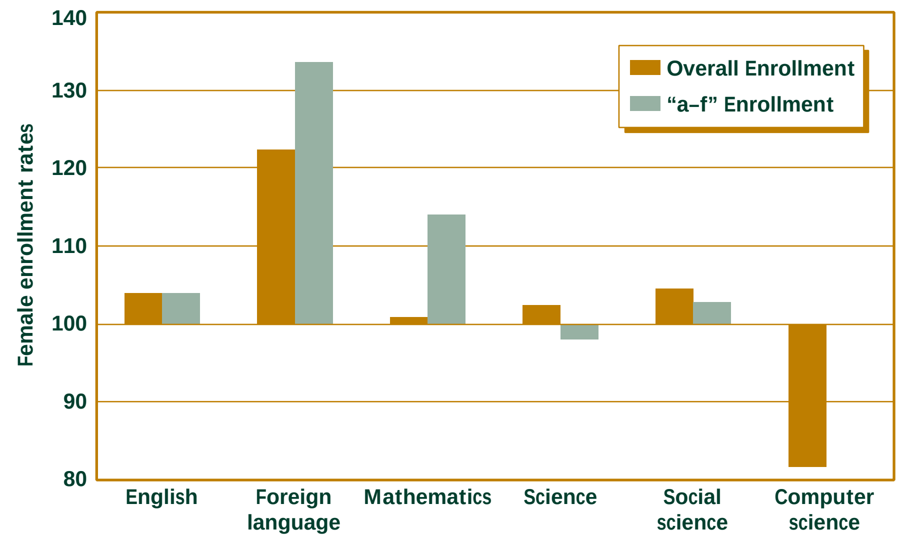
Statewide Enrollment Disparities

Middle Schools. Figure 1 presents middle school female enrollment as a percentage of male enrollment in basic subject areas and selected "a–f" classes in these same subjects. As the figure indicates, the disparities are quite small in the basic subject areas, where female enrollment is equal to or slightly exceeds male enrollment. The two exceptions to this pattern are in the areas of foreign language and computer science. In middle schools that offer such courses, females are substantially more likely than males to take foreign language classes and substantially less likely to take computer science classes. In schools that offer "a–f" classes, females are much more likely than males to be in foreign language and math courses and slightly less likely than males to be in science courses.

High Schools. At the high school level, female enrollment exceeds male enrollment in every core subject area except "a–f" computer science, where females lag males substantially (Figure 2).

The picture is somewhat different for AP classes, in which girls are much less likely than boys to take AP physics and computer science courses and more likely than boys to take AP English, foreign language, and social science (Figure 3). These patterns resemble

Figure 1. Middle School Female Enrollment as a Percentage of Male Enrollment in Selected Subject Areas, Fall 1998



Note: Because only two middle schools offer "a–f" computer science, it is omitted from this figure.

Figure 2. High School Female Enrollment as a Percentage of Male Enrollment in Selected "a–f" Subject Areas, Fall 1998

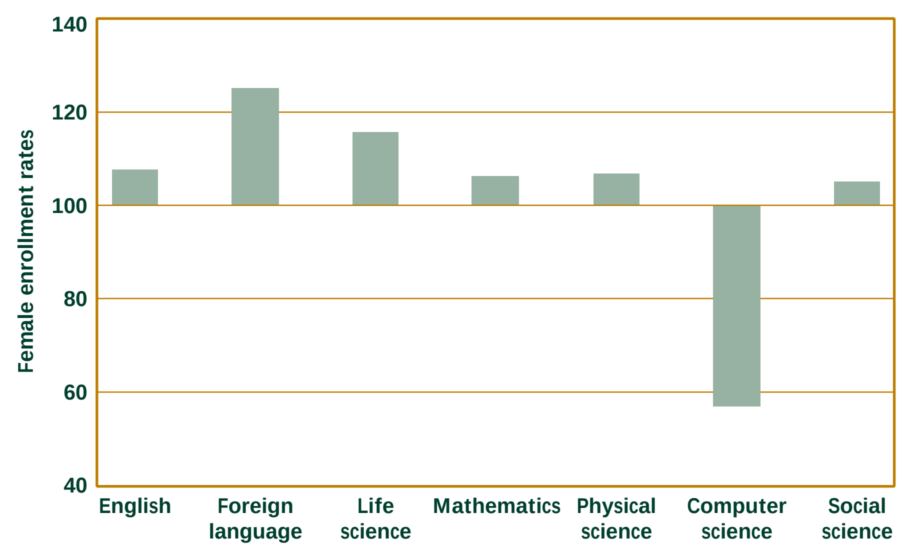
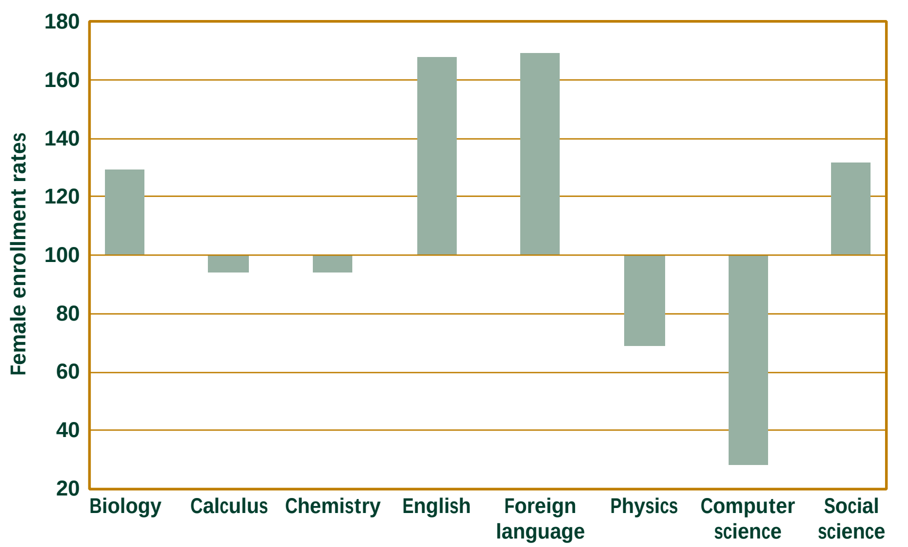


Figure 3. High School Female Enrollment as a Percentage of Male Enrollment in Selected AP Subject Areas, Fall 1998



those for the nation as a whole. For every 100 boys who took AP exams nationally in 1997, 167 girls took the English exam, 177 took foreign language, 83 took calculus, and 20 took the computer science exam (Bae, et al., 2000). In the following year, 168 California girls took AP English classes, 169 took foreign language, 94 took calculus, and 28 took computer science for every 100 boys taking those same classes. Although the California data do not indicate how many girls and boys actually took AP tests that year, they suggest that the California ratios did not diverge radically from those of the nation as a whole.

Table 3. Number of Schools, Students, and Unweighted Percentage of Female Students in the Sample by Urbanicity,1998–1999

	Total Enrollment	% Female
Middle Schools		
Urban (n=323)	382,752	48.9
Suburban (n=485)	429,632	48.8
Rural (n=207)	128,023	48.6
Total (n=1,015)	**940,407**	**48.8**
High Schools		
Urban (n=234)	523,781	49.4
Suburban (n=372)	704,356	49.2
Rural (n=258)	230,366	49.2
Total (n=864)	**1,458,503**	**49.3**

Source: 1998–1999 CBEDS Data.

Enrollment Disparities in Urban, Suburban, and Rural Settings

The California data also permit us to review enrollment disparities between females and males according to school setting (urban, suburban, or rural). In certain subject areas, the size and direction of these enrollment disparities vary according to a school area's urbanicity. Given the close proportions of males and females in all three urbanicity categories (see Table 3), it is unlikely that the gender gap variations we see across subjects and locations result because one gender or the other is underrepresented in a particular urbanicity category.[3]

Middle School Urbanicity. Enrollment gaps between girls and boys in middle schools are very small in all settings and subject areas except foreign language and computer science (Figure 4).[4] In urban middle schools, female enrollment rates for foreign language are 26 percent higher than those for boys but only 13 percent higher in rural locations. It is interesting to note that girls lag boys in computer science enrollment more in suburban schools than in urban or rural ones.

Gender disparities for "a–f" classes across these settings resemble the patterns for classes overall in foreign language and mathematics, but are more pronounced (Figure 5). For English, science, and social science a different pattern emerges—in rural schools, females are considerably less likely than males to take English and social science, and in suburban schools slightly less likely to take science and social science. The finding that girls lag boys in English and social science is surprising

Figure 4. Middle School Female Enrollment as a Percentage of Male Enrollment in Selected Subject Areas by Urbanicity, Fall 1998

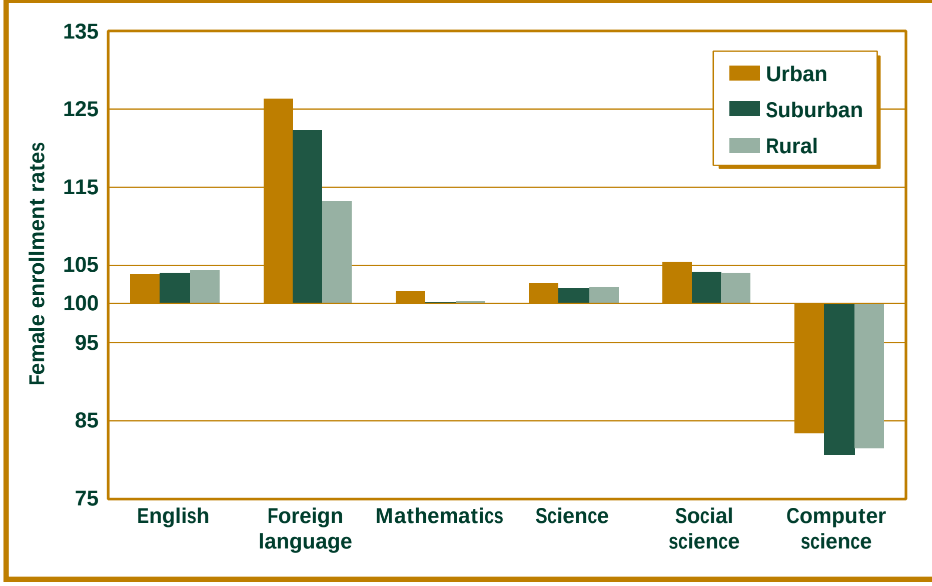
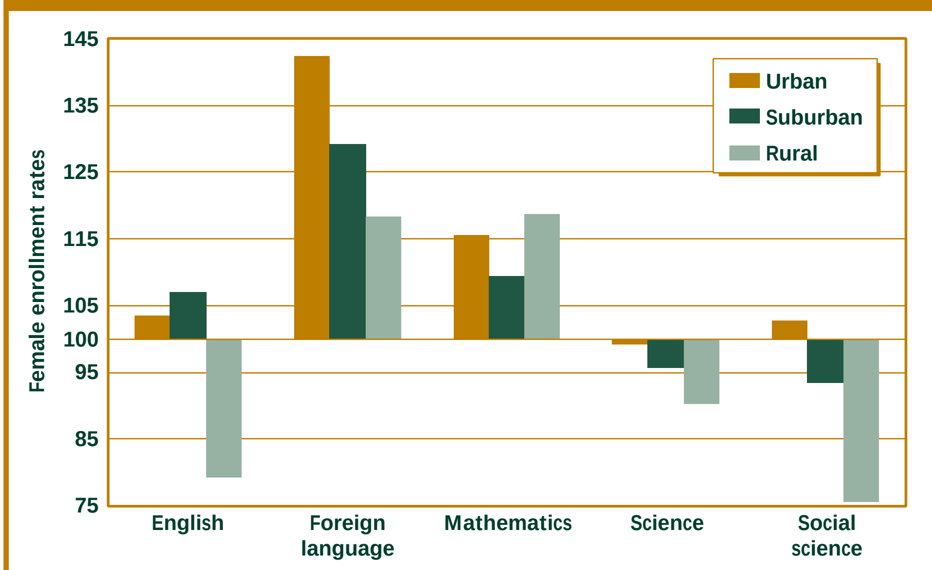


Figure 5. Middle School Female Enrollment as a Percentage of Male Enrollment in Selected "a–f" Subject Areas by Urbanicity, Fall 1998



[3] Rural schools do offer fewer sections of "a–f" and AP courses than urban or suburban schools (not shown), and the gender composition of those few schools may not reflect the gender composition of the overall urbanicity category. Thus, it is possible for just a few schools to skew gender ratios in those subjects and locations.

[4] In urban, suburban, and rural locations, 195, 347, and 94 schools offer foreign language, respectively. For computer science, the numbers of schools are 228, 348, and 133.

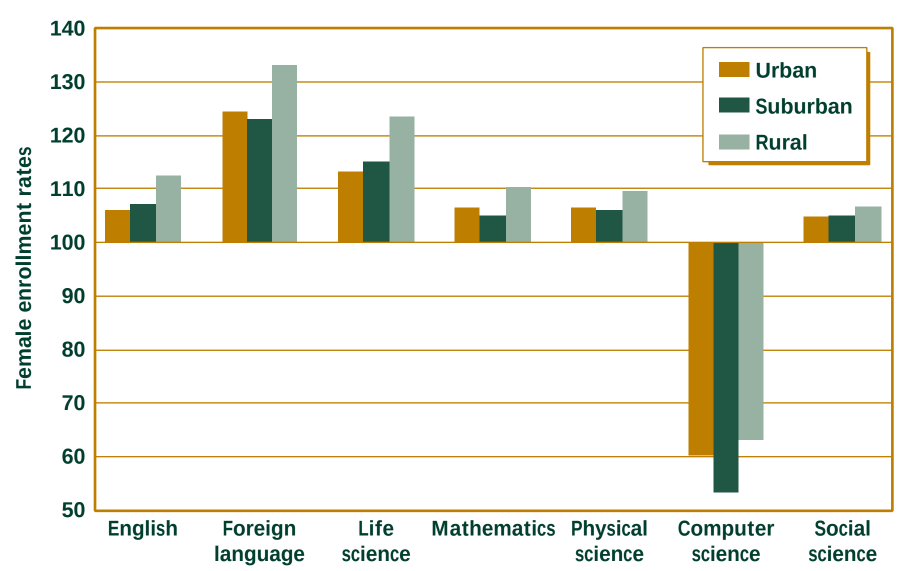
In all high school settings, females are enrolled at higher rates than males in most "a–f" subject areas.

in light of evidence that males lag females substantially in advanced levels of these two subject areas in rural high schools (see Figure 7).

High School Urbanicity. In all school settings, females are enrolled at higher rates than males in most "a–f" subject areas (Figure 6). The widest gaps in these subject areas are in rural locations—this is rather surprising, because Figure 4 showed that in middle schools, rural areas had relatively narrow gaps between females and males. The exception is computer science, where female enrollment rates lag male enrollment rates in all locations. Females lag males by about 37 percent in rural schools, by 40 percent in urban locations, and by almost 50 percent in suburban schools. These results suggest that in middle school, core academic courses are taken by most students, but in high school, rural males are not preparing for college at the same rate as females.

Enrollment rates for girls exceed those for boys in AP biology, English, foreign language, and social science in all school settings (Figure 7). However, females lag males slightly in calculus and by a substantial amount in AP physics and computer science. Results are mixed for chemistry, with female enrollment rates exceeding male rates in urban schools, lagging in suburban locations, and tracking male rates in rural areas. The gaps in AP computer science classes are particularly striking. For every 100 boys enrolled in such classes, there are 31, 27, and 16 girls in urban, suburban, and rural schools, respectively.

Figure 6. High School Female Enrollment as a Percentage of Male Enrollment in Selected "a–f" Subject Areas by Urbanicity, Fall 1998



Gender Disparities Across Racial and Ethnic Groups

High schools collect enrollment data by both gender and racial or ethnic status for students taking advanced mathematics, first-year chemistry, first-year physics, and the "a–f" requirements (see the text box "Measuring the Gender Gap"). Approximately 11 percent of high school students are enrolled in an advanced math class, 10 percent in a first-year chemistry class, and 5 percent in a first-year physics class. Compared to overall enrollment in high school, whites and non-Filipino Asians are over-represented in these three courses, Hispanics and African Americans are underrepresented, and the other groups enroll in theses courses at approximately the same rates as their overall enrollment. Whites constitute just over 41 percent of high school enrollment, whereas their enrollment in these subjects is 47 to 52 percent. For Asians, these numbers are just under 10 percent of total enrollment and 16 to 24 percent of subject enrollment. Hispanics represent 36.5 percent of enrollment and 17 to 25 percent of enrollment in these subjects. African Americans account for just under 8 percent of total enrollment, whereas their enrollment in these advanced subjects ranges from 4 to 7 percent.

Figure 8 shows statewide female enrollment as a percentage of male enrollment in these subject areas for selected racial and ethnic groups. Boys lag girls across the board except in first-year physics, and even here, Filipino, Hispanic, and African American females have higher participation rates than their male counterparts. For non-Filipino Asians, female and male enrollments are generally close to equal. The largest disparities are among African Americans,

Figure 7. High School Female Enrollment as a Percentage of Male Enrollment in Selected AP Subject Areas by Urbanicity, Fall 1998

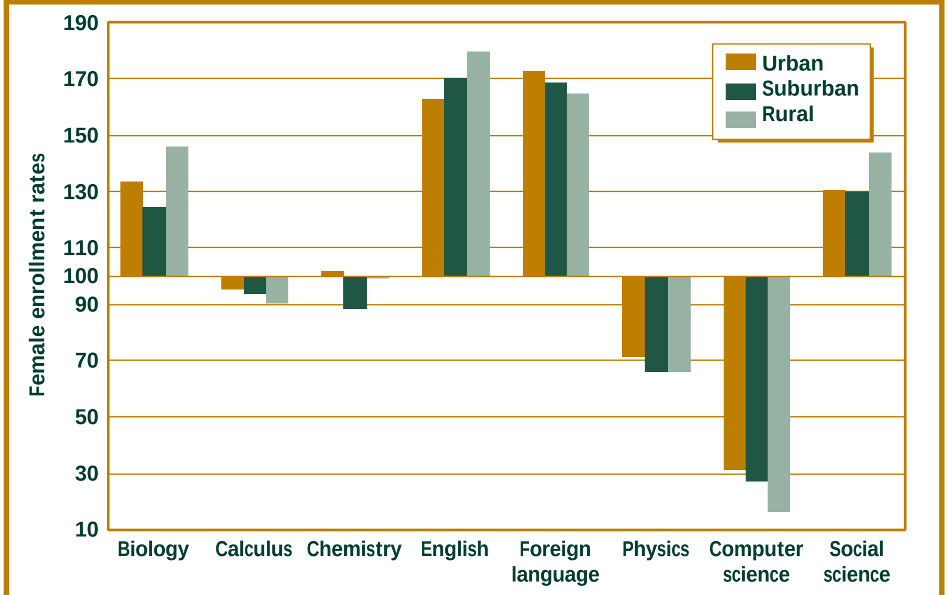
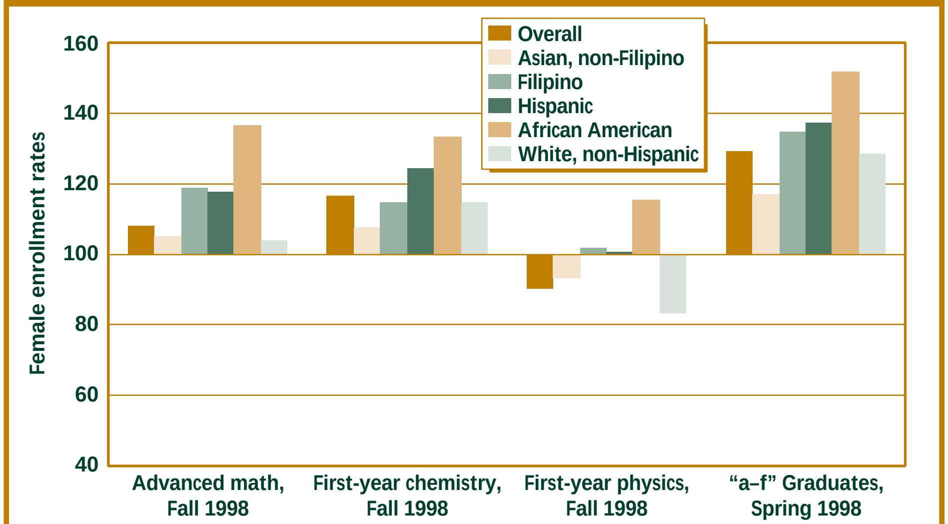


Figure 8. High School Female Enrollment as a Percentage of Male Enrollment in Advanced Math, First-Year Chemistry, First-Year Physics, and "a–f" Graduates in Selected Ethnic or Racial Groups, 1998



Note: Native American and Pacific Islander enrollments account for such small percentages of enrollment that they are excluded from the figure.

For non-Filipino Asians, female and male enrollments are generally close to equal. The largest disparities are among African Americans, especially in advanced math, chemistry, and "a–f" courses, where boys lag girls substantially.

especially in advanced math, chemistry, and "a–f" courses, where boys lag girls substantially. One reason for the large gap relative to other groups is that African American males who are in high school tend to take these advanced courses at lower rates than other males.[5]

Conclusion

The most recent evidence from California shows that in most college-preparatory and AP subject areas, enrollment rates for girls exceed those for boys. The data also show relatively high female enrollment rates in some areas of math and science. However, girls still lag boys in physics and computer science as well as in AP calculus and chemistry. In the case of computer science, these enrollment gaps are evident as early as the middle school years.

The evidence also shows significant variation in female and male enrollment rates across ethnic and racial groups. In advanced math classes, for example, these rates are narrower for Asians and whites than for other groups. The largest gaps were for African American males and females. Although these measures are useful, more-detailed ethnic and racial data for more subject areas would allow a more precise measure of ethnic and racial variations across the gender dimension. The California School Information System (CSIS), which is currently being tested in a pilot program, gathers individual student data by gender, ethnic and racial group, and course enrollment. These data could be aggregated to the school level and analyzed without compromising individual student confidentiality. With more-detailed data on race and ethnicity, researchers and policymakers could better identify and focus on within-group gender gaps that may be otherwise overlooked. Full implementation of the CSIS on a statewide basis is crucial to better analyses of the characteristics examined here as well as other student characteristics in the state.

It is unclear whether enrollment gender gaps have narrowed as a result of legislation, college admission requirements, parental influence, labor market opportunities, female preferences, or some combination of these or other

[5] We analyzed female-male enrollment differences by ethnic and racial groups in grades 10 through 12 to see whether the high disparity in some groups can be traced to a smaller number of males in those grades. For the three grades combined, no combination of grade level and ethnic group had more than a 5 percent difference between males and females. There are slightly fewer males than females in all ethnic and racial groups except African Americans. When each grade is examined separately, there are approximately 10 percent fewer twelfth-grade African American males than females. These enrollment differentials are incorporated into the gap measurement.

factors. Similarly, it is unclear from these data whether girls simply prefer foreign language to computer science, are tracked into that course by the education system, or are actively discouraged from pursuing courses in the male-dominated field of computer science. What is clear is that males continue to dominate the fields of engineering and technology, despite the fact that women use computers at rates close to men (Bae, et al., 2000). The precursors to this pattern are in place by grade 8—halfway through a typical college graduate's school career. This finding goes beyond recent NCES reports (Alt and Choy, 2000; Bae et al., 2000) and supports a body of gender and curriculum research focusing on earlier schooling (Leder and Fennema, 1990). If the skills gained in formal schooling serve as a signal of preparedness to colleges and employers, female and male students in California are still sending different signals in an increasingly technology-dependent world.[6] ◆

It is unclear from these data whether girls simply prefer foreign language to computer science, are tracked into that course by the education system, or are actively discouraged from pursuing courses in the male-dominated field of computer science.

[6] Several people provided invaluable feedback during the process of researching and producing this report. Julian Betts, Karen Humphrey, Hans Johnson, Deborah Reed, Kim Rueben, and Joanne Spetz offered thorough and thoughtful reviews of previous drafts. Amanda Datnow, Heather Rose, and Susan Smith suggested research sources, and Terry Dean and Dan Lawrence located them. Peter Richardson and Patricia Bedrosian provided editorial assistance. The author retains responsibility for any errors of fact or interpretation.

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