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The Problematic Pipeline

Demographic Trends and Latino Participation in Graduate Science, Technology, Engineering, and Mathematics Programs

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Abstract: This article addresses Latino population growth in the United States and their participation in higher education, particularly in science, technology, engineering, and mathematics programs. The demographic and educational trends outlined here suggest that although the Latino population will continue to grow very rapidly, the participation in higher education by Latino students and faculty will not keep pace. The projected increase of school-age Latinos will increase the pool of students at the K-12 end of the educational pipeline; however, without effective interventions, the higher education end of this pipeline will remain narrow, and only a small number of Latinos with graduate degrees will be produced.

Resumen: Este manuscrito señala el crecimiento de la población Latina en los Estados Unidos y como éste se transforma en incrementos en la participación en educación superior y, particularmente, en programas de ciencia, tecnología, ingeniería, y matemáticas. El rumbo demográfico y educacional señalado aquí sugiere que mientras la población Latina continúe creciendo rápidamente, la participación de estudiantes y profesores Latinos en educación superior no mantendrá el mismo paso. El incremento proyectado de Latinos en edad escolar aumentará el grupo de estudiantes al final del conducto K-12; sin embargo, sin intervenciones efectivas el final del conducto de educación superior se mantendrá angosto y solo se producirá un número pequeño de Latinos graduados.

Keywords: *Latino; STEM; graduate degrees; demographic trends; postsecondary education; degree attainment; higher education participation*

The educational “pipeline” for Latinos is rife with massive leaks. The ultimate result is that graduate degree recipients from the nation’s colleges and universities do not reflect the racial and ethnic diversity of the population. Figure 1 illustrates the growing gap between the total Latino population, the Latino college-age population (i.e., those 18 to 24 inclusive), and the proportion of Latino individuals obtaining educational credentials and degrees. The Latino college-age population has

increased sharply in comparison to the overall increase in the number of Latinos in the United States, thereby illustrating the youthfulness of the Latino population. However, the number of Latino students who have completed high school does not reflect the overall population. The number of Latino students with bachelor's degrees drops again, thereby documenting the high attrition rate of Latino students. The percentage of Latinos with doctorates is also very low and illustrates how few Latino students make it through to the end of the pipeline.

The misleading nature of the term *pipeline* can be seen in the rapidly decreasing proportion of these three groups found at each successively higher educational level. For example, in 2000 Latino individuals accounted for 12.5% of the total population and 17.5% of the college-age population; however, only 10.8% of the high school graduates were Latino, 9.9% of the associate degree recipients were Latino, and only 6.6% of all bachelor's degrees and 3.8% of all doctorates were Latino individuals.

Latino Demographic Trends and Characteristics

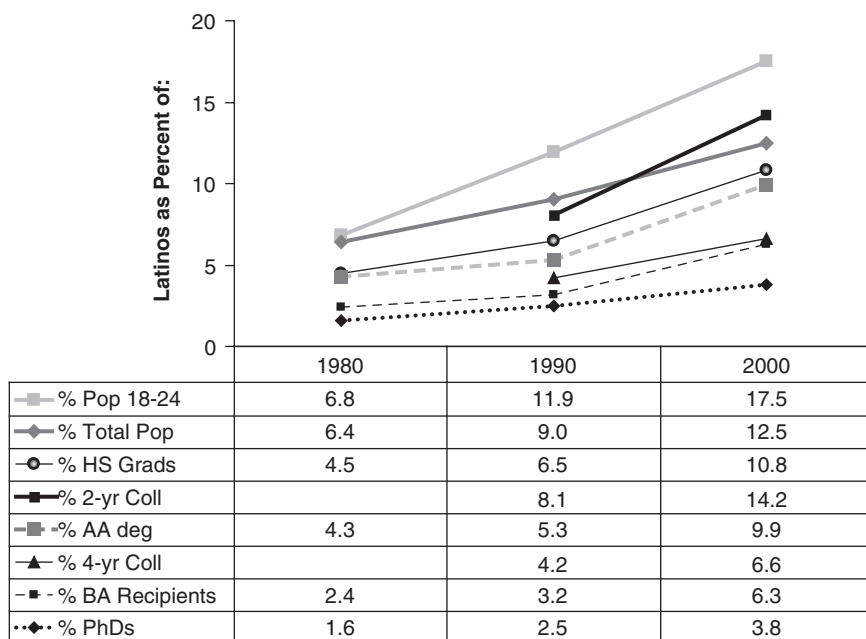
Demographic trends will reshape American higher education in the next generation. Without question, one of the most significant changes occurring in the composition of the future U.S. population is a marked increase in the proportion of Latino individuals. This in itself might not be of interest or concern for educators if it were not for the fact that many Latino students come from backgrounds with many factors that are generally thought to limit their overall educational success rates. These factors include low-income households, low levels of parental education, enrollment in underperforming schools, and more (see Chapa & De La Rosa, 2004).

Population counts from the 2000 U.S. Census indicate that the Latino population grew by more than 57% between 1990 and 2000, compared to a 13% increase for the total population. Moreover, the Latino population has continued to grow rapidly since the 2000 Census, growing 9.8% between 2000 and 2002. The rate of growth of the population as a whole was only 2.5%. The Census Bureau estimates there were 38.8 million Latino individuals in the United States on July 1, 2002, and that Latino growth accounted for half of the total population growth between 2000 and 2002. Since 1980, about half of Latino population growth was because of international migration, and the other half was because of increases in birth rates (Bernstein & Bergman, 2003). By all projections, the Latino population will continue to grow at a much faster rate than the U.S. population for many more decades to come.

Latino Population Youthful Age Distribution

Latinos now compose the largest minority group in the United States. They have been the largest school-aged minority group since the 1990s. Typically, populations that grow rapidly are quite young. As indicated in Figure 2, Latinos are a very young population.

Figure 1
Hispanic Demographic and Education Trends



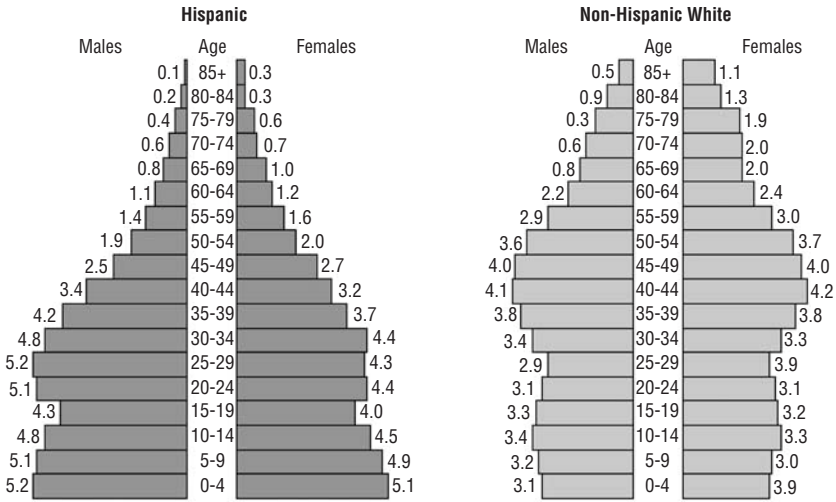
Source: Data from U.S. Bureau of the Census and National Center for Education Statistics tables.

The proportion of Latinos in younger age groups is much larger than that of the non-Hispanic White population. More than one third of all Latinos are younger than 18, compared to about one fourth for non-Latinos. Latinos have much younger age distributions (with a median age of 26 years) compared to non-Latinos (median age of almost 36 years). The fact that many Latino adults are also relatively young and have more child-bearing years ahead of them ensures that Latinos will become an even greater part of the school-age population in the future. The Latino population will continue to grow at very high rates and will continue to compose larger and larger portions of the preschool, and school-age, and college-age populations.

Latinos' Geographic Distribution

As shown in Figure 3, Latinos are moving to all regions of the nation and becoming major population groups in several states and many cities. The 2000 Census thus confirmed a new and striking aspect of Latino population growth, that being a

Figure 2
Hispanics Are a Young Population



Source: Figure 4 in Ramirez and de la Cruz (2002).

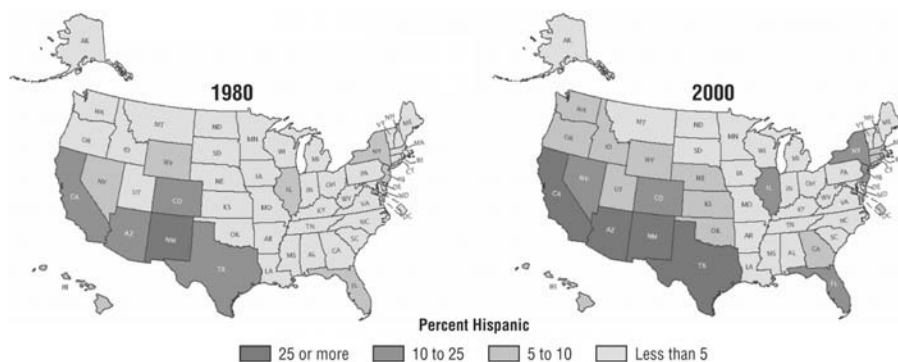
noticeable number of Latinos in areas that previously had relatively few Latino individuals. For example, the Latino population of North Carolina grew by almost 400% between 1990 and 2000. Similarly, the growth rate in Georgia was 300%. Despite the trend toward geographic dispersion, a large part of the Latino population is concentrated in just a few states. One state, California, has about a third of the nation's Latino individuals. Together, California and Texas are home to half of the nation's Latino population.

The two maps in Figure 3 show the increased geographic spread of the Latino population from 1980 to 2000. States that already had high concentrations of Latinos in 1980 now have even higher concentrations; states that border high concentrations of Latinos are also attracting more Latinos. The 2000 Census indicates that Latinos have moved to all regions of the nation, including states that have traditionally had very small Latino populations. Immigration is a major component of Latino population growth and is particularly pronounced in those states with very high rates of growth.

Undocumented High School Graduates

Although rapid population growth and immigration are factors that contribute to the gaps between the size of the Latino population and the proportion of Latino

Figure 3
Hispanics Are Moving to All Regions of the United States



Source: Figure 3-15 in Hobbs and Stoops (2002).

individuals with higher education degrees, neither of these factors explains away diminishing numbers of Latino students in the educational pipeline (Chapa, 1989, 1990). The Latino education gap is pervasive and cannot be attributed alone to large increases in immigration or in undocumented individuals entering the United States. For example, the Urban Institute estimates that 65,000 undocumented students of all races, ethnicities, and national origins graduate from high school every year. However, the report *Knocking at the College Door* estimates that about 2.6 million students graduated from high school last year, including 380,000 Latinos (WICHE, 2003).

These figures support the contention that although undocumented students face many obstacles in attempting to participate in higher education, legal status in and of itself is not a reason why Latino high school graduates have difficulties accessing higher education. The data indicate that only a relatively small proportion of all Latino high school graduates are, in fact, undocumented.

Latinos and Higher Education Science and Engineering Programs

The discussion so far has centered on the fact that Latinos are seriously underrepresented in higher education programs and that the degree of underrepresentation increases as the level of education increases. The same generalization holds true for Latino graduates in higher education science and engineering programs.

Before examining data for Latino graduates from science and engineering programs, it is useful to examine a few figures about Latinos and higher education in general. Table 1 shows the number and percentage of doctoral degrees granted to

Table 1
Number and Percentage of U.S. Citizen PhD Recipients,
by Race/Ethnicity, United States 2000

Race/Ethnicity	<i>n</i>	%
Asian	1,407	5.2
Black	1,656	6.1
Hispanic	1,157	4.2
Native American	169	0.6
White	22,911	83.9
Total	27,300	100.0

Source: Hoffer et al. (2001).

Table 2
Total Fall Enrollment by Level, Latinos, United States 2000

	<i>n</i>	%
All institutions	1,461,800	9.5
2-year institutions	843,900	14.2
4-year institutions	617,900	6.6
Graduate	95,400	5.2

Source: U.S. Department of Education (2003).

U.S. citizens by race in 2000. Of the 27,300 doctoral degrees awarded in all disciplines that year, a mere 4.2% went to Latino students. Table 2 shows the total Latino student enrollment in all levels of higher education across the nation in the fall of 2000. Latinos were almost 10% of an enrollment of more than 1.5 million students. Comparing the 1,157 Latino PhDs to the approximate 1.5 million Latino students enrolled in higher education programs provides a striking example of why the word *pipeline* in higher education does not seem appropriate. Shortly, this article will present data on the few hundred Latino doctorates awarded each year in science and mathematics. The comparison between the overall Latino student population and the very small numbers of these PhDs will truly make the pipeline seem much more like a pipette.

Community Colleges and Associate of Arts Degrees

Table 2 shows that Latinos have a relatively high rate of enrollment in community colleges. In 2000, Latinos composed 14.2% of all community college students and earned close to 10% of all associate of arts degrees granted. Table 2 also shows

Table 3
Science and Engineering (S&E) and Non-S&E Associate's Degrees
for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All recipients	546,574	544,094	540,644	546,031	549,191	543,876	552,046
S&E	74,832	70,590	67,820	68,328	71,006	78,224	82,102
Non-S&E	471,742	473,504	472,824	477,703	478,185	465,652	469,944
Hispanic							
All fields	35,557	38,499	39,115	42,784	45,452	50,488	54,333
S&E	5,293	5,593	5,581	5,818	6,001	7,869	8,109
Non-S&E	30,264	32,906	33,534	36,966	39,451	42,619	46,224
Hispanic as a percentage of all degrees							
All fields (%)	6.5	7.1	7.2	7.8	8.3	9.3	9.8
S&E (%)	7.1	7.9	8.2	8.5	8.5	10.1	9.9
Non-S&E (%)	6.4	6.9	7.1	7.7	8.3	9.2	9.8
Increase in degrees from 1994 to 2000					Total		Hispanic
All fields (%)					-0.5		42.0
S&E (%)					4.5		48.7
Non-S&E (%)					-1.3		40.8
Increase in population from 1994 to 2000 (%) ^a					6.6		32.5

Source: Table C-2, National Science Foundation (2005).

a. Census population estimates and counts from www.census.gov.

that Latino enrollment in 2-year colleges is substantially higher than in 4-year colleges. This is not the case for other demographic groups. Striplin (1999) maintains that most first-generation college students begin their higher education at community colleges and that "for many of these students, a community college serves as a route towards the baccalaureate degree" (p. 1). Solórzano, Rivas, and Velez (2005) write that about 25% of the Latino PhDs in the United States were first enrolled in community colleges.

Table 3 presents data on the number of associate degrees conferred to Latinos and all other individuals from 1994 through 2001. Although the number of associate of arts degrees in all fields conferred during this period increased slightly, the number of Latinos receiving associate of arts degrees increased substantially. The same pattern holds for science and engineering associate degrees. In other words, there was a small increase in all recipients, compared to a substantial increase in the number of Latino recipients. To compare the change in the number of Latino degree recipients to the increase in the Latino student population, the bottom panel of Table 3 shows the increase both in science and engineering and nonscience and engineering degrees from 1994 to 2000 and the increase in the Latino student population during the same

Table 4
Science and Engineering (S&E) and Non-S&E Bachelor's Degrees
for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All fields	1,183,141	1,174,436	1,179,815	1,186,589	1,199,579	1,253,121	1,257,648
S&E	395,380	378,148	384,674	388,482	390,618	398,622	400,206
Non-S&E	787,761	796,288	795,141	798,107	808,961	854,499	857,442
Hispanic							
All fields	62,683	66,691	71,015	74,938	78,125	88,324	89,972
S&E	20,529	21,359	22,886	24,445	25,712	27,984	28,321
Non-S&E	42,154	45,332	48,129	50,493	52,413	60,340	61,651
Hispanic as a percentage of all degrees							
All fields (%)	5.3	5.7	6.0	6.3	6.5	7.0	7.2
S&E (%)	5.2	5.6	5.9	6.3	6.6	7.0	7.1
Non-S&E (%)	5.4	5.7	6.1	6.3	6.5	7.1	7.2
Increase in degrees from 1994 to 2000					Total	Hispanic	
All fields (%)					5.9	40.9	
S&E (%)					0.8	36.3	
Non-S&E (%)					8.5	43.1	
Increase in population from 1994 to 2000 (%) ^a					6.6	32.5	

Source: Table C-6, National Science Foundation (2005).

a. Census population estimates and counts from www.census.gov.

period. The percentage increase in Latino students receiving an associate degree in science and engineering is substantially higher than the overall Latino student population increase.

Bachelor's and Master's Degrees

Tables 4 and 5 provide data on the number of bachelor's and master's degree recipients, comparing Latino and non-Latino groups of students. As mentioned, the proportion of Latino degree recipients decreases at each successively higher degree level. For example, in 2001 Latino students earned 7.2% of all bachelor's degrees (Table 4) and 4.7% of all master's (Table 5). However, the pattern of growth for each of these degree levels is similar to the pattern seen for Latino associate of arts recipients: There is a large increase in the percentage of Latino science and engineering and nonscience and engineering recipients. These increases were also larger than the increase in the overall Latino student population.

Table 6 shows the 20 institutions that granted the most bachelor's degrees to Latinos in science and engineering. It is particularly striking that these 20 institutions alone granted close to 30% of all such degrees.

Table 5
Science and Engineering (S&E) and Non-S&E Master's degrees for All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All fields	389,008	399,428	408,932	420,954	431,871	456,260	466,645
S&E	86,080	94,309	95,313	93,485	93,918	95,683	98,986
Non-S&E	302,928	305,119	313,619	327,469	337,953	360,577	367,659
Hispanic							
All fields	13,177	13,905	15,394	16,360	17,416	20,803	22,163
S&E	2,514	2,945	3,090	3,220	3,462	3,746	4,077
Non-S&E	10,663	10,960	12,304	13,140	13,954	17,057	18,086
Hispanic as a percentage of all degrees							
All fields (%)	3.4	3.5	3.8	3.9	4.0	4.6	4.7
S&E (%)	2.9	3.1	3.2	3.4	3.7	3.9	4.1
Non-S&E (%)	3.5	3.6	3.9	4.0	4.1	4.7	4.9
Increase in degrees from 1994 to 2000					Total		Hispanic
All fields (%)					17.3		57.9
S&E (%)					11.2		49.0
Non-S&E (%)					19.0		60.0
Increase in population from 1994 to 2000 (%) ^a					6.6		32.5

Source: Table E-3, National Science Foundation (2005).

a. Census population estimates and counts from www.census.gov.

Doctoral Degrees

Between 1994 and 2001, the number of doctoral degrees in science and engineering awarded to Latino students increased at about the same rate as the total Latino student population (Table 7). The 31.6% increase in Latino PhDs during this period is particularly impressive when compared to the slight decrease in the total number of science and engineering PhDs. However, as mentioned earlier, the number of doctorates in science and engineering awarded to Latino students in 2001 still numbered only in the hundreds.

Table 8 presents the data for Latino PhDs awarded in engineering and selected sciences for several years beginning with 1980-1981. The hundreds of degrees (381) awarded to Latino doctoral students in 2001 represent a substantial increase over the small numbers two decades earlier.

Table 9 shows the proportion of both Latino and all non-Latino male and female doctoral students in science and engineering. The proportion of women among Latinos and Latinas is higher than the proportion of women among all science and engineering PhD recipients. This likely reflects the underenrollment of Latino males in higher education.

Table 6
Science and Engineering (S&E) Bachelor's Degrees Awarded
to Hispanics by Leading Institutions: 1997 to 2001

Institution	<i>n</i>
University of Puerto Rico Mayaguez Campus	4,674
University of Puerto Rico Rio Piedras Campus	2,813
Florida International University	2,610
University of California, Los Angeles	2,232
University of Texas at Austin	1,786
University of California, Berkeley	1,405
University of Texas–Pan American	1,314
San Diego State University	1,286
Universidad Politecnica de Puerto Rico	1,212
University of Texas at San Antonio	1,188
University of Florida	1,146
The Pontifical Catholic University of Puerto Rico	1,135
University of Texas at El Paso	1,102
University of California, Davis	1,078
California State University, Los Angeles	1,076
University of California, Santa Barbara	1,075
Texas A&M University (main campus)	1,067
California State University, Northridge	1,049
Inter American University of Puerto Rico, San German campus	1,040
University of Arizona	1,023
Total for top 20 institutions listed above	31,311

Source: Table 20, National Science Foundation (2005).

Table 10 shows the immigration status of science and engineering PhD recipients, both Latino and non-Latino. The large number of temporary visa holders is of particular interest. About a quarter of all PhDs and almost a third of science and engineering doctoral degrees granted in 2001 went to temporary visa holders. Among Latinos, about a third of all PhDs and more than 40% of science and engineering PhDs granted in 2001 went to holders of temporary visas. These figures are important for two reasons. First, any analysis of Latinos in the U.S. educational pipeline should likely focus on how well those who were educated in the U.S. K-12 or K-16 systems do in graduate education. Temporary visa holders would be excluded from this analysis. Second, for many reasons, the number of temporary visa holders (i.e., international students in U.S. graduate programs, including science and engineering programs) has decreased recently (Thurgood, 2004). If this trend continues, there may be more opportunities for U.S. citizens and permanent residents to participate in advanced degree programs in science and engineering.

Table 7
Science and Engineering (S&E) Doctoral (PhD) Degrees
All and Hispanic Degree Recipients, 1994 to 2001

	1994	1995	1996	1997	1998	2000	2001
All S&E fields	18,187	18,997	18,650	18,398	18,257	17,565	17,106
Hispanic	548	573	626	659	754	721	728
Hispanic as a percentage of all degrees (%)	3.0	3.0	3.4	3.6	4.1	4.1	4.3
	Total						Hispanic
Increase in S&E degrees from 1994 to 2000 (%)	3.4						31.6
Increase in population from 1994 to 2000 (%) ^a	6.6						32.5

Source: Table F-6, National Science Foundation (2005).

Note: Data include U.S. citizens and permanent residents.

a. Census population estimates and counts from www.census.gov.

Table 8
Latino PhDs Selected Years

	1980-1981		1985-1986		1990-1991		1995-1996		2000-2001	
	Total	%	Total	%	Total	%	Total	%	Total	%
Engineering	26	1.0	69	2.1	133	2.6	185	2.9	213	3.9
Life sciences	74	1.4	123	2.1	183	2.6	255	3.1	31	3.7
Physical sciences	41	1.3	76	2.1	127	2.9	128	2.8	137	3.3

Source: National Science Foundation Tables 300, 302, and 303 (2005).

Population Projections for Latino and Higher Education Science and Engineering Programs

Population projections have a well-developed methodology, and it is generally accepted that more accurate projections can be made for areas with larger populations than for those with smaller ones. Large populations give a larger base for calculating trends and a smaller probability of deviation from a central tendency or trend. Many agencies, including the United Nations and the U.S. Bureau of the Census, publish population projections at the national level that are given a great

Table 9
Science and Engineering (S&E) Doctoral Degrees for All and Hispanic Recipients by Gender, 1994 to 2001

	1994	1995	1996	1997	1998	1999	2000	2001
All S&E fields	18,187	18,997	18,650	18,398	18,257	17,565	17,106	16,262
Female	6,494	6,913	6,967	6,990	7,170	7,071	7,123	6,867
Female (%)	35.7	36.4	37.4	38.0	39.3	40.3	41.6	42.2
Male	11,692	12,082	11,683	11,392	11,069	10,494	9,981	9,395
Hispanic	548	573	626	659	754	721	728	669
Female	230	232	273	266	326	362	348	332
Female (%)	42.0	40.5	43.6	40.4	4.2	50.2	47.8	49.6
Male	318	341	353	393	428	359	379	337

Source: Table F-11, National Science Foundation (2005).

Table 10
Immigration Status of All and Science and Engineering (S&E) Doctoral (PhD) Degrees for All and Hispanics Recipients

	All Fields		All S&E	
	<i>n</i>	%	<i>n</i>	%
All races/ethnicities	40,744	100.0	25,509	100.0
U.S. citizen	26,907	66.0	14,999	58.8
Permanent resident	1,822	4.5	1,263	5.0
Temporary resident	9,780	24.0	7,925	31.1
Hispanic	1,888	100.0	1,181	100.0
U.S. citizen	1,119	59.3	581	49.2
Permanent resident	143	7.6	88	7.5
Temporary resident	613	32.5	503	42.6

Source: SRS Table F-5, National Science Foundation (2005).

deal of credence among users of demographic data. The preparers of population projections often defend themselves against the charge of making inaccurate forecasts by claiming that their analyses are not population predictions per se (i.e., statements about what they think will occur) but instead are projections of demographic trends. If we know the age, sex, and race or ethnic distribution of a population—and if we have accurate and specific birth, death, and migration rates—then the process of projecting the future course of a population becomes, essentially, an exercise in arithmetic. Because demographic rates vary greatly by sex, age, and ethnic groupings, the projections that are based on specific rates for each group are more precise than are projections for combined or aggregated groups.

The arithmetic of projecting a population consists of multiplying a specific demographic rate by the number of people in the age-sex-ethnic group for which that particular rate applies. To illustrate, the number of births that would be projected to occur to Latina women between the ages of 30 and 34 would be the product of multiplying the number of women in that age group by the fertility rate for these women. The projected number of births for all Latinas would consist of the sum of all the age-specific birth rates multiplied by the number of Latinas in each age group. The projected number of all births would be the result of repeating this same process for each racial or ethnic group and summing the results. Projecting deaths would require a similar process. Immigration would also be considered in an analogous or complimentary manner. Thus, although the essential arithmetic of population projections is relatively simple, the detailed procedures for computing population projections and for determining the specific demographic rates are much more complex.

Migration is the only aspect of population change that can conceivably have a significant impact on the population cohort containing the college graduating class of 2010. Migration is often said to be the wild card in performing a population projection because migration rates and patterns can change very rapidly. Future international immigration into the United States could have an impact on the size and composition of this group. With this in mind, future trends in international immigration could have a noticeable impact on the actual composition of the college attendees graduating in 2010 in contrast to the domestic residents, from which most of the college classes of that period will be drawn. Internal migration (i.e., migration among states) could also change some of the regional differences in the size and composition of the population. Internal migration could be a factor modifying the specificity of the analysis for several reasons. For example, internal migration could change the composition of the population of states, regions, or other geographic areas. Also, many young Americans move from state to state to attend college. This slightly weakens the connection between a state's college-age population and the potential enrollees in its institutions of higher education. However, neither of these types of migration are apt to change the fact that most of the college attendees of the future will be today's preschool children or that many will attend college in the state where they now reside.

The use and production of population projections has become more common in recent times, and there are published projections that serve to give a picture of the size, sex, and racial/ethnic composition of the college-age population of the next generation. However, these projections do not tell us anything about the socioeconomic background of these future students, nor do they have any information about their geographic concentration or distribution within the United States.

Given all of this, it is possible to produce useable projections of the Latino student population. The Census Bureau has recently published population projections for the overall U.S. population and for Latinos specifically. The results of these projections are summarized in Tables 11 and 12.

Table 11
Projected Population of the United States, by Race
and Hispanic Origin: 2000 to 2050

Population or Percentage and Race or Hispanic origin	2000	2010	2020	2030	2040	2050
Population						
Total	282,125	308,936	335,805	363,584	391,946	419,854
White alone	228,548	244,995	260,629	275,731	289,690	302,626
Black alone	35,818	40,454	45,365	50,442	55,876	61,361
Asian alone	10,684	14,241	17,988	22,580	27,992	33,430
All other races ^a	7,075	9,246	11,822	14,831	18,388	22,437
Hispanic (of any race)	35,622	47,756	59,756	73,055	87,585	102,560
White alone, not Hispanic	195,729	201,112	205,936	209,176	210,331	210,283
Percentage of total population						
Total	100.0	100.0	100.0	100.0	100.0	100.0
White alone	81.0	79.3	77.6	75.8	73.9	72.1
Black alone	12.7	13.1	13.5	13.9	14.3	14.6
Asian alone	3.8	4.6	5.4	6.2	7.1	8.0
All other races	2.5	3.0	3.5	4.1	4.7	5.3
Hispanic (of any race)	12.6	15.5	17.8	20.1	22.3	24.4
White alone, not Hispanic	69.4	65.1	61.3	57.5	53.7	50.1

Source: U.S. Bureau of the Census (2004).

a. Includes American Indian and Alaska Native alone, Native Hawaiian and Other Pacific Islander alone, and Two or More Races.

Table 12
Projected Population of the United States, by Race
and Hispanic Origin: 2000 to 2050

	Number of College-Age Latinos	Percentage of all 18- to 24-Year-Olds	Projected Latino Degrees at Current Latino Rate (.060)	Projected Latino Degrees at Current White Rate (.133)
2000	3,679,000	~18	221,844	487,835
2020	5,981,000	~25	360,654	793,081
2030	7,330,000	~29	441,999	971,958
2040	8,895,000	~33	536,369	1,179,477

Source: U.S. Bureau of the Census (2004)

A previous section of this article reviewed recent trends in the number of undergraduate and graduate science and engineering degrees awarded to Latino students. It is clear that the increase in the number of degrees is not connected in any direct way to changes in the Latino population. So although we can project trends in the

Latino population with reasonable certainty, the data do not suggest any strong basis for projecting the number of graduate science and engineering degrees likely to be awarded to Latinos in future years. The arithmetic of projecting these degrees is as straightforward as the arithmetic of projecting a population. However, the issue that is not clear is what assumptions about future growth are reasonable or useful.

The extremely low numbers of doctoral degrees granted to Latino students compared to the relatively large size of the overall Latino population in higher education (1,157 PhDs, compared to about 1.5 million students) suggests that the future number of Latino doctoral degrees could show a significant increase. However, the number of PhDs depends very much on the future we create rather than any trend that might be discerned from the analysis of raw data.

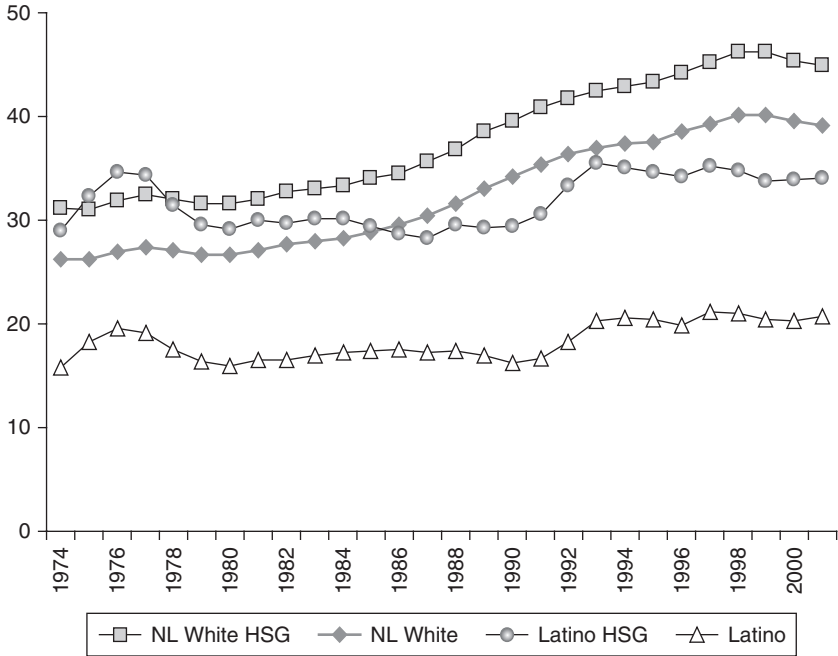
Population Projections Based on Latino Enrollments in Higher Education

As the report *Knocking at the College Door* states (WICHE, 2003), the largest percentage change in the high school population will be among Latino students; this group will grow from nearly 17% in 2001-2002 to a projected 21% in 2007-2008, with a projected enrollment of nearly 9.2 million students by 2007. The Census Bureau estimates that Latinos age 5 to 17 will number 9.6 million by 2010 and 11.9 million in 2020, and in 2050 there will be more than 20 million school-age Latinos in this age group. In comparison, the White school-age population in 2050 will number 48 million, whereas the Black student population in the 5 to 17 age group will number 12 million.

Figure 4 illustrates the data used as the basis for such projections. As can be seen, non-Latino Whites have much higher college-enrollment rates than do Latinos. The line marked with squares in Figure 4 is the proportion of White high school graduates who went on to enroll in college, and the line marked with diamonds is the proportion of the total White population ages 18 to 24 who enrolled in college. Approximately 35% of Latino high school graduates go to college, whereas 45% of Whites do. For the overall 18-to-24 population, approximately 40% of Whites and 20% of Latinos enrolled in college. These data reflect that the drop-out rate for Latinos is quite large. For the period 1994 to 2002, the lines tracing the percentage of the Latino college-age population and the percentage of high school graduates enrolling in higher education remain relatively flat. The percentages or rates are relatively stable.

Using data from Census Bureau projections presented in summary form in Table 12, we can calculate that the number of college-age Latinos will increase from 3 million to more than 8 million by 2040. Table 13 indicates that the Latino percentage of the college-age population will increase from 18% to 33%. Using these projections and rates of educational attainment from the 2004 Current Population Survey, Table 14 indicates that the number of Latinos enrolled in college will increase from fewer than 1 million to almost 2 million by 2040, based on projected population growth at current Latino enrollment rates. However, if Latinos had the same participation rates as do Whites, then enrollments would increase from 1.4 million to more than 3 million.

Figure 4
Higher Education Enrollment Rates, Hispanics
and Non-Hispanic Whites, Ages 18 to 24



Source: U.S. Department of Education (2003), Table 188.
 Note: Data are 3-year moving averages.

It is possible to calculate the proportion of the current population of given ages who have earned associate, bachelor's, master's and doctoral degrees and combine these rates with the population projections to estimate future numbers of degrees. Using current rates of degree attainment for the U.S. population as a whole and for Latinos, Table 15 presents the number of higher education degrees (associates through doctoral or professional degrees) that Latinos will earn based on projected population at the current rate of degree attainment. Based solely on increases in population, the number of Latinos with degrees will more than double by 2040. If Latino students could begin to attain degrees at the same rate as White non-Latinos, the number of Latino degree holders would increase more than five-fold by the same date. These data imply that if Latino degree attainment does not increase, the educational level of the entire population will decrease as Latinos become a larger part of the population. Given their high drop-out rates and the pervasive educational gap,

Table 13
Projections of College-Age Latinos, United States 2000 to 2040

Year	College-Age Latinos	Percentage of all 18- to 24-Year-Olds
2000	3,679,000	~18
2020	5,981,000	~25
2030	7,330,000	~29
2040	8,895,000	~33

Source: Authors' calculations based on data from U.S. Bureau of the Census (2004).

Table 14
College-Age Latino Enrollment, United States 2000 to 2040

Year	Projected Latino Enrollment at Current Latino Rate (.21)	Projected Latino Enrollment at Current Non-Latino White Rate (.393)
2000	772,590	1,445,847
2020	1,256,010	2,350,533
2030	1,539,300	2,880,690
2040	1,867,950	3,495,735

Source: Authors' calculations based on data from U.S. Bureau of the Census (2004).

Table 15
College-Age Latino Degree Attainment, United States 2000 to 2040

Year	Projected Latino Degrees at Current Latino Rate (.0603)	Projected Latino Degrees at Current Non-Latino White Rate (.1326)
2000	221,844	487,835
2020	360,654	793,081
2030	441,999	971,958
2040	536,369	1,179,477

Source: Authors' calculations based on data from U.S. Bureau of the Census (2004).

the nation's colleges and universities may actually see a decrease in overall enrollments of Latino students in years to come.

Conclusion

Latinos are underrepresented in all parts of the nation's higher education pipeline; this degree of underrepresentation increases at higher education levels. Such massive leaks in the educational pipeline, combined with the concentration of Latinos in the

younger age groups, could indicate a future in which Latinos are largely locked out of positions of influence and leadership.

For many Latinos, community colleges are the first step into higher education. The increasing Latino enrollments in 2-year colleges—along with the high proportion of Latino PhDs who began their higher education in community colleges—suggests that recruitment programs oriented toward community college students could have a large numeric impact.

Deil-Amen and Rosenbaum (2003) argue that transfer opportunities for community college students often suffer because of miscommunications and misunderstandings. This is particularly true for issues that are complicated and unfamiliar to first-generation college students, such as the various prerequisites for majors, degrees, and transfers. The authors find,

Community colleges require certain kinds of social know-how—skills and knowledge less available to disadvantaged students. They present seven obstacles: (1) bureaucratic hurdles, (2) confusing choices, (3) student-initiated guidance, (4) limited counselor availability, (5) poor advice from staff, (6) delayed detection of costly mistakes, and (7) poor handling of conflicting demands. (p. 120)

It seems likely that improved counseling and communications that clarify the requirements for transferring to 4-year colleges could help increase the number of Latino students who would eventually apply to graduate school.

It is clear that the rapid increase of the youthful Latino population makes it imperative that they receive an education that will provide them with the skills to make them productive citizens. Latinos continue to have low enrollments in higher education and even lower graduation rates. No nation can ignore such a large potential workforce. With the shift from a manufacturing to a technology-based economy, it is vital that every segment of society be educated to its full potential.

References

- Bernstein, R., & Bergman, M. (2003). *Young, diverse, urban: Hispanic population reaches all-time high of 38.8 million, new Census Bureau estimates show*. Retrieved November 10, 2005, from <http://www.census.gov/Press-Release/www/2003/cb03-100.html>
- Chapa, J. (1989). *The question of Mexican-American assimilation: Socio-economic parity or the underclass formation?* Austin: University of Texas at Austin, LBJ School of Public Affairs.
- Chapa, J. (1990). The myth of Hispanic progress. *Harvard Journal of Hispanic Policy*, 4, 3-18.
- Chapa, J., & De La Rosa, B. (2004, February). Latino population growth, socioeconomic and demographic characteristics, and implications for educational attainment. *Education and Urban Society*, 36(2), 130-149.
- Deil-Amen, R., & Rosenbaum, J. E. (2003, March). The social prerequisites of success: Can college structure reduce the need for social know-how? *Annals, AAPSS*, 586, 120-143.

- Hobbs, F., & Stoops, N. (2002). *Demographic trends in the 20th century* (Census 2000 Special Reports, Series CENSR-4). Washington, DC: U.S. Government Printing Office.
- Hoffer, T., Dugoni, B., Sanderson, A., Sederstrom, S., Ghadially, R., & Rocque, P. (2001). *Doctorate recipients from United States Universities: Summary report 2000*. National Opinion Research Center. Retrieved on June 1, 2005, from <http://www.norc.uchicago.edu/issues/docdata.htm>
- National Science Foundation. (2005). *Women, minorities, and persons with disabilities in science and engineering*. Retrieved August 24, 2005, from <http://www.nsf.gov/statistics/wmpd/start.htm>
- Ramirez, R. R., & de la Cruz, G. P. (2002). *The Hispanic population in the United States: March 2002* (Current Population Reports P20-545). Washington, DC: U.S. Bureau of the Census.
- Solórzano, D. G., Rivas, M. A., & Velez, V. N. (2005, June). *Community collage as a pathway to Chicana/o doctorate production* (Latino Policy Issues Brief No. 11). Los Angeles: University of California, Los Angeles, Chicano Studies Research Center.
- Striplin, J. J. (1999, June). *Facilitating transfer for first-generation community college students* (ERIC ED430627). Retrieved on June 27, 2005, from <http://www.ericdigests.org/2000-1/transfer.html>
- Thurgood, L. (2004, June). *Graduate enrollment in science and engineering fields reaches new peak; First-time enrollment of foreign students decline* (NSF 04-326). Arlington, VA: National Science Foundation, Division of Science Resources Statistics.
- U.S. Bureau of the Census. (2004). *U.S. interim projections by age, sex, race, and Hispanic origin*. Retrieved August 24, 2005, from <http://www.census.gov/ipc/www/usinterimproj/>
- U.S. Department of Education. (2003). *Digest of educational statistics, 2002*. Washington, DC: U.S. Government Printing Office.
- WICHE. (2003). *Knocking at the college door; Projections of high school graduates by state, income and race/ethnicity, 1988 to 2018*. Boulder, CO: WICHE Publications.

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