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Evaluating Components of International Migration:
Migration Between Puerto Rico and the United States

By Matthew Christenson

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Synopsis

On March 1, 2001, the U.S. Census Bureau issued the recommendation of the Executive Steering Committee for A.C.E. Policy (ESCAP) that the Census 2000 Redistricting Data not be adjusted based on the Accuracy and Coverage Evaluation (A.C.E.). By mid-October 2001, the Census Bureau had to recommend whether Census 2000 data should be adjusted for future uses, such as the census long form data products, post-censal population estimates, and demographic survey controls. In order to inform that decision, the ESCAP requested that further research be conducted.

Between March and September 2001, the Demographic Analysis-Population Estimates (DAPE) research project addressed the discrepancy between the demographic analysis data and the A.C.E. adjusted estimates of the population. Specifically, the research examined the historical levels of the components of population change to address the possibility that the 1990 Demographic Analysis understated the national population and assessed whether demographic analysis had not captured the full population growth between 1990 and 2000. Assumptions regarding the components of international migration (specifically, emigration, temporary migration, legal migration, and unauthorized migration) contain the largest uncertainty in the demographic analysis estimates. Therefore, evaluating the components of international migration was a critical activity in the DAPE project.

This report focuses on the evaluation of the U.S. Census Bureau's estimate of net migration between Puerto Rico and the United States in the 1980s and 1990s. Specifically, the review process evaluated and critiqued the previous estimates of net migration from Puerto Rico to the U.S. in the 1980s and created an estimate for the 1990s. To produce the estimate of net migration from Puerto Rico, the Census Bureau used an adjusted residual survival method.

Our evaluation resulted in an estimate of net migration between Puerto Rico and the U.S. of 126,465 in 1980s and 111,336 in 1990s. For both periods, migrants from Puerto Rico were more often male than female, were overwhelmingly Hispanic, and would have identified their race as being either "white" or "other". In addition, the pattern of the net migration varied by age, with flows being generally positive (toward the U.S.) for those below age 40 and negative (away from the U.S.) above age 40. Future research will focus on finding and processing administrative data that is available in the post-censal period and that will allow the estimation of both in- and out-flows of migrants between the U.S. and Puerto Rico.

Methods

The previous 1980-90 estimate: These estimates were done in a two-stage process. First, passenger traffic data for Puerto Rico were used to obtain an estimate of net international migration for Puerto Rico for the period 1980-1990. Subsequently, this estimate was adjusted using information on legal permanent international migration of foreign nationals into Puerto Rico during 1980-1990. The resultant figure, 288,163, was assumed to represent net migration from Puerto Rico to the United States for this period.

The current approach: During the process of reviewing the methods used to produce estimates and projections in the 1990s, it was determined that the passenger traffic data were too unreliable to be used for this purpose. In its place, an adjusted residual survival method was adopted and is used to the present day. Hence, this method was used by Team 10 to produce the estimates of net migration from Puerto Rico to the United States for both the 1980-1990 and 1990-2000 periods.

The adjusted residual survival method can be summarized in the following steps:

1) Calculation of annual average net international migration for period (i.e., 1980-1990 or 1990-2000) by age and sex for Puerto Rico.
    a) The population by sex and 5-year age groups from the census of Puerto Rico in the base year (i.e., 1980 or 1990) is entered into the International Programs Center's Rural Urban Projection program (RUP). RUP is a population projection program that projects each age and sex cohort over time based on the components of growth (fertility, mortality, and migration).
    b) The base population is survived to the end year (i.e., 1990 or 2000) using vital registration data for each year (both births by sex and deaths by age and sex) and an assumption of zero net migration.
    c) The survived population by single years of age and sex is exported from the RUP program. It is then subtracted from the enumerated population in the end year (i.e., 1990 or 2000) by single years of age and sex to arrive at a 10-year estimate of net international migration for Puerto Rico by single years of age and sex.
    d) These totals are divided by 10 to arrive at an estimate of net annual international migration from Puerto Rico by age in the end year. Then, the total in each age group is moved back 5 years in order to approximate the age at which the migrants moved.

2) Adjustment of (1) with estimate of annual average legal migration into Puerto Rico.
    a) The number of migrants with intended residence in Puerto Rico by single years of age and sex is extracted from the INS micro-data files for each year of the period under investigation (i.e., 1980-1990 or 1990-1998)
        Note: 2000 INS micro-data file was not available at the time of this work, so it was not considered in the analysis.
    b) The panels of data (migrants by age and sex) for the time period under analysis are added together and then divided by the number of panels in order to arrive at

an estimate of the average annual number of legal migrants moving to Puerto Rico in that period.

    c)   The results from (b) are added to the results from 1(d) to arrive at the estimate of the annual average net migration from Puerto Rico to the United States

3)   Calculate 10-year totals of net migrants from Puerto Rico to the United States.

    a)   "Cohortize" the assumed number of net migrants for each year from Puerto Rico to the United States in the period under investigation. Specifically, take the estimate of the average annual number of net migrants, assume these migrants moved in one of the years under investigation (i.e., 1980-1990 or 1990-2000), and convert the age of these migrants to the age in the end year (i.e., 1990 or 2000).

    b)   Sum the totals by age and sex from (a) This gives the "cohortized" estimate of net international migration for Puerto Rico for the 10 year period by age in the target year and sex.

4)   Distribution of net migration from Puerto Rico to the United States by race and Hispanic Origin.

    a)   Use data from 1990 census on US residents in 1990 who lived in Puerto Rico 5 years earlier by age, sex, race (5 categories), and Hispanic Origin (yes/no) as pattern for flow of migrants from the United States to Puerto Rico.

    b)   Use data from 1990 census on Puerto Rico residents in 1990 who lived in United States 5 years earlier by age and sex as pattern for flow of migrants from Puerto Rico to the United States.

    c)   Apply race/Hispanic Origin proportions from (a) to (b) to obtain age, sex, race, and Hispanic Origin pattern of flow of migrants from Puerto Rico to the United States.

    d)   Subtract (a) from (c) to get an age, sex, race, and Hispanic Origin pattern of *net* migration from Puerto Rico to the United States.

    e)   Apply pattern from (d) to 10-year totals from 3(b) (above) to arrive at the 10-year estimate of net migrants from Puerto Rico the United States by age, sex, race, and Hispanic Origin.

<u>Limits</u>

Aside from the obvious questions that could be raised about the adequacy of the chosen methods to give an accurate estimate of migration between Puerto Rico and the United States, there are two limitations of the estimates that deserve mention.

1)   The estimation of the number of legal migrants into Puerto Rico ignored the date of entry of these migrants and, instead, was based on the date of registration. The drawback of this is that the actual year of entry into Puerto Rico was not captured. However, the actual difference in the estimated number of net legal migrants into Puerto Rico using the two different methods is minimal (approximately 3,000 extra for 1990-2000). In addition, we know that there are migrants who moved into Puerto Rico in the late 1990s who will subsequently become legal migrants but who are not captured in the data because the time series does not extend far enough into the future. Consequently, the estimation of migrants for these years is artificially suppressed. Therefore, it was concluded that "migrants by date of registration" was an adequate proxy for migrants by date of entry for the purposes of this exercise.

2)   The assumptions used to distribute migrants by race and Hispanic Origin may be inadequate. Particularly, the estimates include an "other race" category that was not used in the broader DAPE project. Ultimately, these migrants were simply distributed proportionally across the rest of the age, sex, race, and Hispanic Origin groups. However, this "other" category contained a large proportion of the overall migrants, so this method may have been inadequate.

<u>Results</u>

The work of Team 10 resulted in this document, two SAS program files, and two excel spreadsheets containing the estimates of migration by age, sex, race, and Hispanic Origin. The locations of each of these files are listed below. In addition, Tables A and B give a summary of the two sets of estimates:

Table A: Net migrants from Puerto Rico to the U.S. by Age and Sex: 1980s and 1990s.

Age	1980s Males	1980s Females	1990s Males	1990s Females
<1	63	55	46	40
1-4	1,405	1,203	1,124	998
5-9	3,229	2,862	3,431	3,250
10-14	2,894	2,597	4,716	4,512
15-19	10,670	7,629	10,130	8,221
20-24	26,954	19,395	21,821	16,841
25-29	28,200	21,809	25,931	20,208
30-34	12,254	11,069	16,493	13,322
35-39	1,455	2,903	5,284	5,095
40-44	-1,248	941	-245	1,339
45-49	-2,444	36	-3,330	-1,111
50-54	-2,632	-391	-5,412	-3,519
55-59	-3,070	-1,170	-5,798	-4,166
60-64	-4,211	-2,428	-6,478	-4,587
65-69	-4,331	-2,541	-6,134	-4,195
70-74	-2,685	-699	-3,668	-1,983
75-79	-1,735	-205	-1,322	-259
80+	-686	-682	201	540
	64,082	62,383	56,790	54,546
		126,465		111,336

Table B: Net migrants from Puerto Rico to the U.S. by Race and Hispanic Origin: 1980s and 1990s.

Race	1980s Hispanic	1980s Non-Hispanic	1980s Total	1990s Hispanic	1990s Non-Hispanic	1990s Total
White	50,487	3,358	53,845	42,961	2,392	45,353
Black	5,539	696	6,235	4,866	645	5,511
AIAN	182	31	213	145	38	183
API	462	306	768	385	271	656
Other	65,196	208	65,404	59,471	162	59,633
Total	121,866	4,599	126,465	107,828	3,508	111,336

To summarize these tables, three points stand out:

- The estimates of net migration during both the 1980s (126,465) and 1990s (111,336) are substantially below the figure used in the previous demographic analysis for the 1980s (288,163).

- The age-sex patterns of the new estimates for both time periods are similar, with movement to the U.S. at its height for both sexes at young adult ages (especially 15-39) and with return migration to Puerto Rico for both sexes at older ages (especially 50+).

- The race and Hispanic Origin patterns for both time periods are also similar, with the great majority of migrants being Hispanic and with migrants primarily identifying themselves as "white" or "other."

Demographic Analysis–Population Estimates (DAPE) Research Project Reports Related to Evaluating Components of International Migration (in order of Working Paper Series Number)

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