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Estimates of the Population of Puerto Rico and the Outlying Areas: 1970 to 1981

(Estimates in this report supersede those for 1970 to 1978 published in Current Population Reports, Series P-25, No. 872. Estimates for Puerto Rico and the outlying areas for earlier years appear in Current Population Reports, Series P-25, Nos. 603 and 336).

This report presents estimates of the population for July 1, 1970, to 1981 for Puerto Rico, the Virgin Islands of the United States, American Samoa, Guam, the Northern Mariana Islands, and the remainder of the Trust Territory of the Pacific Islands.¹ Census counts for 1970 and 1980 are also shown for each of the areas. These areas had an estimated population of 3.6 million in 1981. Small areas under American jurisdiction in the Pacific Ocean, such as Midway, Wake, and Canton Islands, and Johnston Atoll, are excluded; there were 1,082 persons on these islands in 1980.

The report also presents the components of population change for these areas for the 1970-81 period: births, deaths, and net migration (the number of persons migrating into a particular area minus the number migrating from the area). In some of the areas shown, net migration is not estimated directly but is derived as the difference between the total amount of change and natural increase.

METHODOLOGY

Because the availability of data relating to population change varies from territory to territory and the concentration of special population groups in some of the areas makes it difficult to rely on standard methods, different procedures are used for each area.

Puerto Rico. The estimates for Puerto Rico were based on the 1970 and 1980 censuses and on reported statistics for each of the components of population change. Because of the incomplete reporting of births, this component has been corrected for underregistration by the Commonwealth government. The migration component was derived from monthly passenger statistics on arrivals to and departures

¹ As of October 1, 1979, the Canal Zone ceased to be under the "jurisdiction, control, or sovereignty" of the United States. Therefore, population estimates are no longer shown for this area. For estimates through 1976, see Current Population Reports, Series P-25, No. 731.

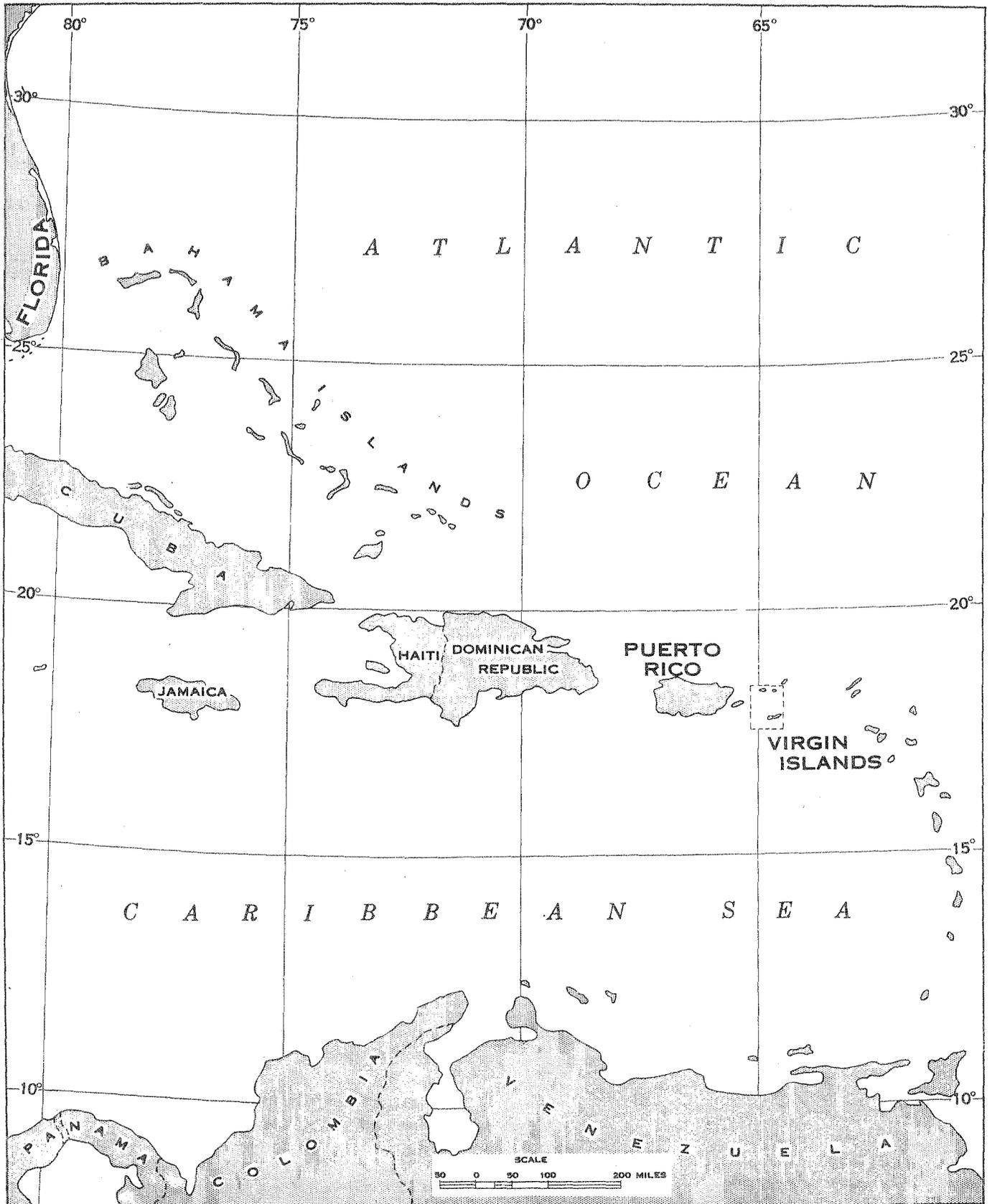
from Puerto Rico compiled by the Commonwealth government. The migration estimate for Puerto Rico is the sum of centered 12-month moving averages of the reported monthly data. This compensates for bias introduced by short-term fluctuations in passenger data which reflect the seasonal movement of transients (tourists and other visitors) rather than the movement of migrants to a new residence. The movement of transients tends to cancel out over longer periods.

Net movement between the civilian population and the Armed Forces is based on the reported number of inductions, enlistments, and separations in Puerto Rico through 1975. These data were not available for the years after 1975. Net movement for those years was assumed to be zero.

Estimates made for the intercensal period, April 1, 1970, to April 1, 1980, were adjusted for the 1980 error of closure, the difference between the 1980 census count and the provisional April 1, 1980, estimate. (See the Limitations Section for an analysis of the error of closure.) The error of closure was distributed throughout the 10-year period in proportion to time elapsed since 1970 and population size, as measured by the provisional population estimates. A detailed description of this procedure, also used to compute intercensal estimates for States and counties, is available from the Population Division, Bureau of the Census, Washington, D.C. 20233.

Virgin Islands. The estimates for the Virgin Islands were based on the 1970 and 1980 censuses and reported births and deaths. Component Method II was used to estimate net migration. In this method, net migration is estimated on the basis of school enrollment or school census data using the difference between the actual population of elementary school age and the population of school age expected on the basis of the most recent census and births since the census. A more detailed discussion of the method can be found in Current Population Reports, Series P-25, No. 640. No intercensal adjustment was necessary for the Virgin Islands.

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American Samoa. The estimates for American Samoa were based on the 1980 and 1970 censuses; a special census of the territory taken in September 1974 which showed a population of 29,190; and a 10-percent sample survey taken in February 1977 which yielded a population estimate of 30,600. The special census and the 10-percent sample survey were both conducted under the auspices of the Samoan government. Births and deaths are reported by the Government of American Samoa. Since there is no reporting system for migration, net migration must be estimated indirectly.

For the periods between the reference dates, reported natural increase was subtracted from the net population change for each period to get residual net migration. This residual net migration was then prorated over the relevant period. The estimates for July 1, 1970, to 1979 were obtained by adding the components of population change to the 1970 population base. For April 1, 1980, through July 1, 1981, the average annual amount of net migration was estimated based on the level of residual net migration for the 1977-80 period. The estimates for July 1, 1980, and 1981 were then derived by adding the components of population change to the 1980 population base.

The procedure used to estimate net migration actually yields an estimate of net migration and the sum of any other errors in the data, that is, the error of closure. Thus, the result shown as net migration in table 2 includes the error of closure. This procedure results in the error of closure for each period being evenly distributed over the period.

Guam. The estimates of the population of Guam were developed by adding the components of change to the relevant population base. For the July 1, 1970, to 1979 estimates, the population base was the 1970 census count excluding those persons born in the United States or born abroad of American parents.

The July 1, 1980, and 1981 estimates were derived using a base composed of the 1980 census count less the estimated American population on Guam on April 1, 1980.² Both the 1970 and 1980 population bases are restricted because of the large and relatively transient Federally-affiliated population for which migration is substantial and difficult to estimate. Rather than estimate migration for this population group, administrative records are used to determine the number of Federally-affiliated persons on each estimate date. The following were added to the relevant population base:

1. *Natural increase.* The excess of births over deaths to the population is based on reported birth and death statistics. Excluded are the births and deaths occurring in the U.S. Naval Hospital, which should be accounted for in step 4.
2. *Change in alien contract workers.* This category is composed primarily of contract workers brought in from the Philippines by the Department of Defense. The estimates are based on information provided by the Guam Department of Commerce. Prior to April 1, 1980, these data were furnished by the U.S. Department of Defense.

²The April 1, 1980, American population on Guam was estimated based on data furnished by the Guam Department of Commerce and the U.S. Department of Defense.

3. *Net alien immigration.* These are persons accepted for permanent residence in the United States. The estimate is based on Immigration and Naturalization Service figures on immigrants who reported on their visa application that they intended to live on Guam. It is assumed that 20 percent of the immigrants each year either leave Guam or inaccurately reported their intention of living on Guam.

4. *Federally affiliated population.* The number of Armed Forces stationed on Guam was obtained from the U.S. Department of Defense. Prior to 1977, the Department of Defense also provided information on the numbers of Federal civilian employees and dependents of both Federal civilian employees and the military. Since 1977, the Guam Department of Commerce has provided these data.

No data are available on the movement of the nonfederally affiliated population who are not covered above, but this component of net migration is probably not large.

As a last step in the derivation of the estimates for the period between April 1, 1970, and April 1, 1980, the error of closure was distributed over the estimates for July 1, 1970, to 1979 according to the same procedures as were used for Puerto Rico.

Northern Mariana Islands. Population estimates for July 1, 1970, to 1979 are consistent with both the apportionment census taken by the Trust Territory of the Pacific Islands on September 18, 1973, and the April 1, 1980, census, but not with the April 1, 1970, census.³ The estimate for April 1, 1970, upon which the July 1, 1970, to 1979 estimates are based, was derived from the annual "census" of residents taken by the High Commissioner.⁴ Net migration for April 1970 to September 1973, was calculated by subtracting reported natural increase from the net population change for the period. The migration was then prorated evenly for each year back over the period. The components of change were added to the 1970 base population in order to derive the July 1, 1970, to 1973 estimates.

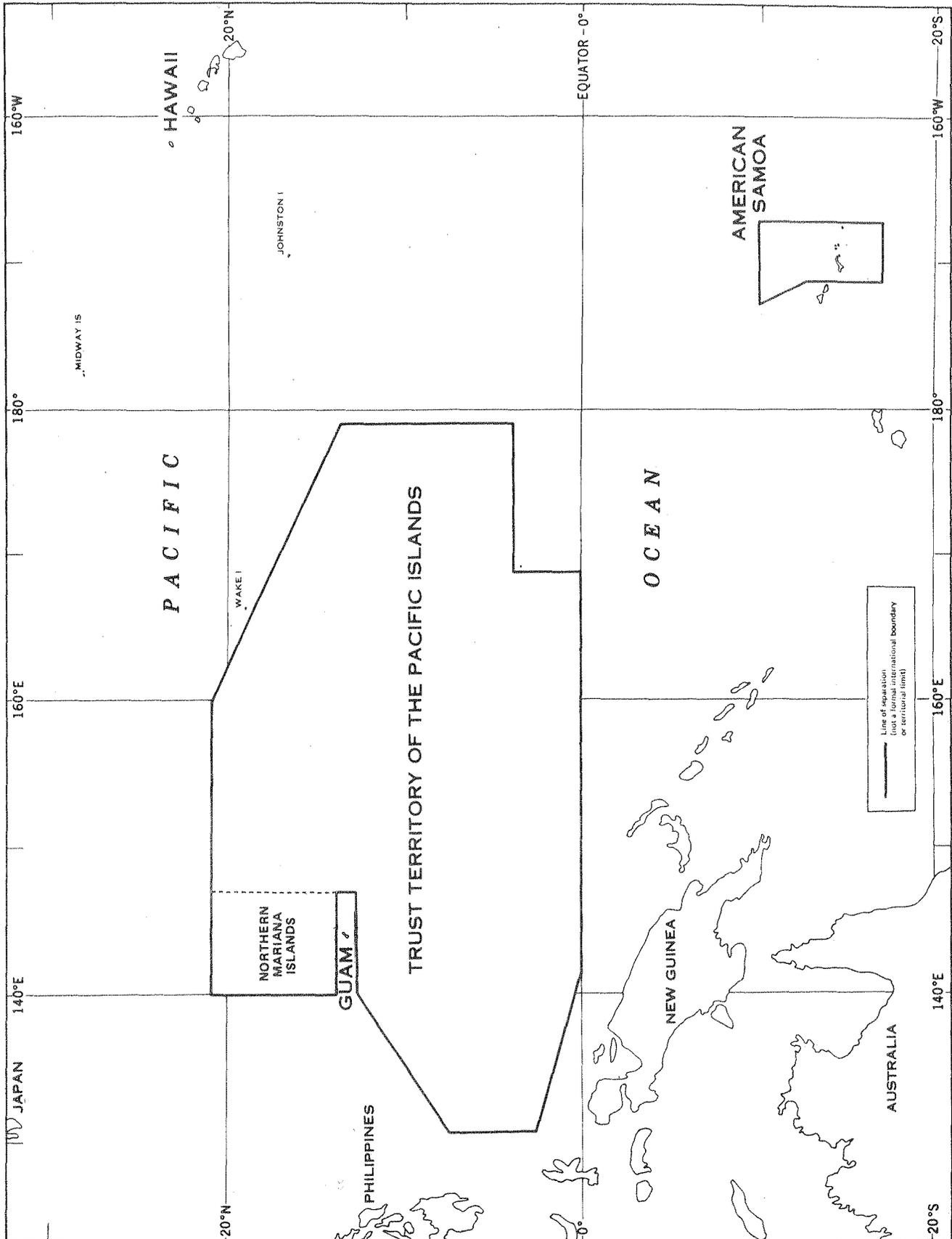
The implied average annual net migration for 1970-73 was then used in conjunction with reported births and deaths to estimate the population on July 1, 1974, to 1979 and April 1, 1980. The error of closure as of April 1, 1980, was then redistributed pro rata over the period since September 1973. This procedure is similar to that used for American Samoa in that it distributes the error of closure evenly over each period between censuses.

Net migration for April 1, 1980, to July 1, 1981, was estimated based on revised migration estimates (including the error of closure) for the period 1973 to 1980. The estimates for July 1, 1980, and 1981 were then derived by adding the components of population change to the 1980 census count. Since net migration is computed as a residual and vital statistics are likely to be underreported, the residual prob-

³The 1970 census of the Trust Territory of the Pacific Islands, which included the Northern Mariana Islands, undercounted the population.

⁴Adjustments were made to the 1970 High Commissioner's census to correct apparent population overstatements in Truk and Ponape Districts.

PACIFIC AREA



ably includes underreported births and deaths to a much greater extent than in American Samoa. For this reason, net migration is not shown for the Northern Marianas or the Trust Territory in table 2.

Trust Territory of the Pacific Islands, excluding Northern Mariana Islands. The methodology used in deriving these estimates was basically the same as that used for the Northern Mariana Islands. The only difference was that there was an additional reference date used in computing the net migration: The September 12, 1977, Skill and Occupation Survey conducted by the Office of Planning and Statistics of the Government of the Trust Territory of the Pacific Islands. It should also be noted that the census for the Trust Territory, excluding the Northern Mariana Islands was taken on September 15, 1980. As mentioned above, net migration is not shown in table 2 due to the suspected substantial underreporting of vital statistics.

LIMITATIONS OF THE ESTIMATES

The areas for which estimates are presented in this report are unique in terms of size, location, and composition. This creates difficulty in developing appropriate estimating procedures, much less standard procedures that are applicable for all the areas. The poor quality and absence of adequate data make it difficult to prepare accurate estimates. The estimation techniques used in this report were selected either on the basis of a test of methods against the 1970 census for three of the areas⁵ or the use of additional data sources not previously available.

For **Puerto Rico**, the estimating technique now used remains essentially unchanged from that used for the 1960's and 1970's. The accuracy of the estimate depends very heavily upon canceling out in the migration statistics the large number of visitors who move between Puerto Rico and the mainland of the United States. Since gross arrival and departure data obviously contain a large number of tourists,

⁵For more information on the 1970 test, see Current Population Reports, Series P-25, No. 731.

net monthly figures are computed and smoothed using a 12-month moving average. This process provides rough approximations of net migration for Puerto Rico.

Table A shows the 1980 census count, the provisional population estimate for April 1, 1980, and the error of closure (the difference between the two). For Puerto Rico, the 1980 error of closure was only 1,390 persons. At this point, no firm conclusions about the accuracy of the estimate can be drawn because the size of the error of closure is determined by differences in census coverage between the two censuses as well as by the accuracy of the components of population change and the estimation methodology.

The postcensal population estimates for Puerto Rico published in Current Population Reports, Series P-25, Nos. 872 and 731 were based on a passenger statistics series provided by the Puerto Rico Planning Board; these statistics were subsequently found to contain errors. Departures had been seriously underreported and consequently net movement into Puerto Rico was overstated by almost 250,000 between 1970 and 1977 (the year in which the errors were corrected). The revised passenger statistics series is available from the Puerto Rico Planning Board.

In the case of the **Virgin Islands** where Component Method II is employed, the error of closure between the April 1, 1980 estimate and the census count was trivial, only 23 persons. In 1970, the difference using that method in tests was also less than 1 percent.

The estimating procedure used for **American Samoa** is a means of bridging a period when no possible independent migration estimates can be developed. The 1970 and 1980 censuses, along with the 1974 special census and the 1977 survey, provide reference points which, in combination with reported vital statistics, can be used to yield acceptable estimates of net migration for the intervening periods. The actual migration for each year in the period is unknown. In the absence of any other information concerning the annual migration pattern, it has been assumed that there was a smooth annual net outmigration during each of these periods. If there had been no 1980 census from which net migration could be computed, the estimated net migration

Table A. Comparison of 1980 Census and 1980 Population Estimates for Puerto Rico and the Outlying Areas

| Area | 1980 census | 1980 provisional population estimate | Error of closure ¹ | Percent error of closure ² |
|---|-------------|--------------------------------------|-------------------------------|---------------------------------------|
| Puerto Rico..... | 3,196,520 | 3,195,130 | 1,390 | - |
| Virgin Islands..... | 96,569 | 96,546 | 23 | - |
| American Samoa..... | 32,297 | 32,260 | 37 | 0.1 |
| Guam..... | 105,979 | 116,251 | -10,272 | -9.7 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands..... | 116,149 | 116,210 | -61 | -0.1 |
| Northern Mariana Islands..... | 16,780 | 18,574 | -1,794 | -10.7 |

- Represents zero.

¹The error of closure is the difference between the 1980 census count and the 1980 provisional population estimate.

²Base for percent is 1980 census count.

between 1974 and 1977 would have been assumed to continue. Table A shows the resulting estimate for April 1, 1980, and the implied error of closure of 36 persons or 0.1 percent.

For **Guam**, as indicated earlier, the estimates are based on a special estimating method, which yields point estimates of the various subcategories of the population. The test of this method for the 1960-70 period showed a high bias of about 10 percent. In 1980, the magnitude of the error of closure suggests this high bias still exists in the estimates. The 1980 error of closure was -10,272, or -9.7 percent, that is, the estimate exceeded the census count by almost 10 percent. Likely explanations for this high error of closure include the lack of accurate migration data as well as conflicting information on persons who were born in the 50 States and on the special populations employed in the current methodology.

The estimates for the **Northern Mariana Islands** contain a similar level of error and are biased in the same direction. The 1980 error of closure was -1,794 persons, or -10.7 percent. As was the case for Guam, the lack of any migration data combined with the lack of censuses or surveys during the intercensal period poses a serious problem in estimating the Northern Marianas population. With only two points of reference early in the decade (the 1970 count and the 1973 census) as the basis for estimating net migration, the population estimates are likely to be biased by any change in migration patterns.

The Trust Territory of the Pacific Islands, excluding the Northern Mariana Islands population estimates have essentially the same limitations as those for the Northern Mariana Islands. Fortunately, the existence of the 1977 Skill and Occupation Survey provided an additional, and apparently

accurate, reference point. The error of closure was only -61 persons or -0.1 percent.

Efforts will be made to correct the estimation errors to the degree that available methodologies and data will permit.

SOURCES OF DATA

Most of the statistics used to prepare the area estimates presented in this report were obtained from the local governments of the outlying areas. Data on births and deaths were obtained from the local governments for Puerto Rico and the outlying areas. Births were adjusted for under-registration for Puerto Rico only.

Armed Forces data are based on figures provided by the Department of Defense. The Puerto Rico Planning Board supplied figures on the balance of inductions, enlistments and discharges for 1970 through 1975 in order to compute the net loss of civilians to the Armed Forces.

School enrollment data for the Virgin Islands were supplied by the Virgin Islands Department of Education. For Puerto Rico, data on migration were supplied by the Puerto Rico Planning Board. The number of Federal civilian employees on Guam was obtained from the Air Force and Navy commanders on Guam through 1976. Since 1977, the Guam Department of Commerce has provided these data.

ROUNDING OF ESTIMATES

Each estimate in this report has been rounded independently to the nearest thousand (Puerto Rico) or hundred (other areas) from figures computed to the last digit. Hence, the sum of the parts may differ from the total shown. Percentages are based on unrounded numbers.

Table 1. Estimates of the Resident and Civilian Populations of Puerto Rico and the Outlying Areas of the United States: July 1, 1970, to July 1, 1981

(Puerto Rico rounded to nearest thousand and outlying areas to nearest hundred)

| Type of population and area | 1981 | 1980 | 1979 | 1978 | 1977 | 1976 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| RESIDENT POPULATION | | | | | | |
| Caribbean Areas | | | | | | |
| Puerto Rico..... | 3,251,000 | 3,207,000 | 3,165,000 | 3,115,000 | 3,078,000 | 3,024,000 |
| Virgin Islands..... | 99,400 | 97,700 | 96,200 | 95,900 | 93,200 | 96,200 |
| Pacific Areas | | | | | | |
| American Samoa..... | 33,000 | 32,400 | 32,000 | 31,400 | 30,800 | 30,300 |
| Guam..... | 109,900 | 107,000 | 103,900 | 102,000 | 101,200 | 102,500 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands ¹ | 118,300 | 115,600 | 113,300 | 111,200 | 109,200 | 107,000 |
| Northern Mariana Islands ¹ | 17,300 | 16,900 | 16,500 | 16,100 | 15,700 | 15,300 |
| CIVILIAN POPULATION | | | | | | |
| Caribbean Areas | | | | | | |
| Puerto Rico..... | 3,248,000 | 3,202,000 | 3,162,000 | 3,111,000 | 3,074,000 | 3,020,000 |
| Virgin Islands..... | 99,400 | 97,700 | 96,200 | 95,900 | 93,200 | 96,200 |
| Pacific Areas | | | | | | |
| American Samoa..... | 33,000 | 32,400 | 32,000 | 31,400 | 30,800 | 30,300 |
| Guam..... | 101,400 | 97,600 | 94,600 | 92,300 | 91,400 | 91,800 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands ¹ | 118,200 | 115,500 | 113,100 | 111,000 | 109,100 | 106,900 |
| Northern Mariana Islands ¹ | 17,300 | 16,900 | 16,500 | 16,100 | 15,700 | 15,300 |
| Type of population and area | 1975 | 1974 | 1973 | 1972 | 1971 | 1970 |
| RESIDENT POPULATION | | | | | | |
| Caribbean Areas | | | | | | |
| Puerto Rico..... | 2,933,000 | 2,885,000 | 2,862,000 | 2,846,000 | 2,766,000 | 2,716,000 |
| Virgin Islands..... | 94,500 | 89,900 | 84,100 | 76,300 | 70,900 | 63,500 |
| Pacific Areas | | | | | | |
| American Samoa..... | 29,600 | 29,100 | 28,600 | 28,200 | 27,700 | 27,300 |
| Guam..... | 102,100 | 101,300 | 105,600 | 96,800 | 92,300 | 86,500 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands ¹ | 104,800 | 102,500 | 100,000 | 96,300 | 92,800 | 89,400 |
| Northern Mariana Islands ¹ | 14,900 | 14,600 | 14,200 | 13,600 | 13,000 | 12,400 |
| CIVILIAN POPULATION | | | | | | |
| Caribbean Areas | | | | | | |
| Puerto Rico..... | 2,929,000 | 2,881,000 | 2,854,000 | 2,840,000 | 2,761,000 | 2,706,000 |
| Virgin Islands..... | 94,500 | 89,900 | 84,100 | 76,300 | 70,900 | 63,500 |
| Pacific Areas | | | | | | |
| American Samoa..... | 29,600 | 29,000 | 28,600 | 28,200 | 27,700 | 27,200 |
| Guam..... | 91,200 | 89,500 | 87,400 | 84,500 | 81,000 | 75,200 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands ¹ | 104,600 | 102,300 | 99,700 | 96,100 | 92,600 | 89,100 |
| Northern Mariana Islands ¹ | 14,900 | 14,600 | 14,200 | 13,600 | 13,000 | 12,400 |

¹Estimates consistent with the Apportionment Census of September 1973. See text for further explanation.



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Table 2. Estimates of the Components of Change in the Resident and Civilian Populations of Puerto Rico and the Outlying Areas of the United States: 1970 to 1981

(Resident population includes persons in the Armed Forces stationed in each area. Each estimate has been rounded to the nearest thousand for Puerto Rico and to the nearest hundred for the outlying areas)

| Type of population and area | July 1, 1981 | April 1, 1980 (census) | April 1, 1970 (census) | Net change, 1970-81 | | Components of change, 1970-81 | | |
|---|--------------|------------------------|------------------------|---------------------|---------|-------------------------------|---------|------------------|
| | | | | Number | Percent | Births | Deaths | Net migration |
| RESIDENT POPULATION | | | | | | | | |
| Caribbean Areas | | | | | | | | |
| Puerto Rico..... | 3,251,000 | 3,196,520 | 2,712,033 | 539,000 | 19.9 | 837,000 | 219,000 | -78,000 |
| Virgin Islands..... | 99,400 | 96,569 | 62,468 | 36,900 | 59.1 | 31,100 | 6,000 | 11,700 |
| Pacific Areas | | | | | | | | |
| American Samoa..... | 33,000 | 32,297 | 27,159 | 5,800 | 21.4 | 11,900 | 1,600 | -4,500 |
| Guam..... | 109,900 | 105,979 | 84,996 | 24,900 | 29.3 | 24,000 | 3,800 | 18,700 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands..... | 118,300 | ¹ 116,149 | ² 88,500 | 29,800 | 33.7 | 39,100 | 5,700 | (³) |
| Northern Mariana Islands..... | 17,300 | 16,780 | ² 12,200 | 5,100 | 42.1 | 6,000 | 1,000 | (³) |
| CIVILIAN POPULATION | | | | | | | | |
| Caribbean Areas | | | | | | | | |
| Puerto Rico..... | 3,248,000 | 3,192,000 | 2,701,000 | 546,000 | 20.2 | 837,000 | 219,000 | -78,000 |
| Virgin Islands..... | 99,400 | 96,600 | 62,500 | 36,900 | 59.1 | 31,100 | 6,000 | 11,700 |
| Pacific Areas | | | | | | | | |
| American Samoa..... | 33,000 | 32,300 | 27,100 | 5,900 | 21.6 | 11,900 | 1,600 | -4,500 |
| Guam..... | 101,400 | 96,700 | 71,300 | 30,100 | 42.2 | 24,000 | 3,800 | 18,700 |
| Trust Territory of the Pacific Islands, excluding Northern Mariana Islands..... | 118,200 | ¹ 116,100 | ² 88,300 | 29,900 | 33.9 | 39,100 | 5,700 | (³) |
| Northern Mariana Islands..... | 17,300 | 16,800 | ² 12,200 | 5,100 | 42.1 | 6,000 | 1,000 | (³) |

¹Census on September 15, 1980.

²Estimates consistent with the Apportionment Census of September 1973. The Federal census of 1970, which showed a population count of 9,640 for the Northern Mariana Islands and 81,300 for the Trust Territory of the Pacific Islands, excluding the Northern Mariana Islands (plus 3,960 on Kwajalein Island), appears to have been incomplete.

³Because part of the residual migration reflects underregistration of vital statistics, migration figures are not shown.