## Asian and Pacific
# CENSUS FORUM

# How Many Samoans?
# An Evaluation of the 1980
# Census Count of Samoans
# in the United States

by Geoffrey R. Hayes and Michael J. Levin

*One of the most persistent fantasies that haunts the human mind is the fantasy of certainty.*

*Thus in a sense the estimate of the population is actually the creation of the process set in motion for measuring it.*

Mitroff, Mason, and Barabba 1983

In 1983, the United States Congress commissioned the Department of Labor to conduct a study to determine why Samoans in the United States were experiencing high rates of poverty and unemployment. One of the first tasks of the inquiry was to ascertain the size of the population that any remedial programs that might be developed would have to reach. Although the 1980 census counted 41,948 Samoans in the United States (U.S. Census Bureau 1983:125), this figure was much lower than many members of the Samoan community had expected, and attention was drawn to previous estimates made by social scientists and others (table 1). Some of these sources (e.g., Steele 1981) suggested that the Samoan population of the United States could be as high as 100,000—almost two and a half times the number counted by the Census Bureau.

**Table 1. Estimates of the Samoan Population of the United States, 1929–83**

| | United States | Hawaii | California | Source |
|---|---|---|---|---|
| 1929 | | 125 | | Pierce 1956:20 |
| 1950 | | 463 | | U.S. Census Bureau 1953:18 |
| 1956 | | 1,000–2,000 | | Hirsh 1956:1 |
| 1964–67 | | 2,420 | | Schmitt 1977 |
| 1966 | | 7,500 | | Alailima and Alailima 1966:1 |
| 1970 | | 5,000–18,000 | | McCormick 1972:9 |
| | | | 15,000–20,000 | Ablon 1971:329 |
| | 20,000 | | | Park 1979:27 |
| | | 5,500–11,000 | | Schmitt 1972 |
| 1971 | | 6,544 | | Hawaii SISC 1972 |
| 1972 | | 12,000 | | Selle 1972:48 |
| | 48,000 | | 23,000[a] | Chen 1973:41 |
| | | | 15,000–30,000 | Lewthwaite et al. 1973:133 |
| 1975 | | 7,030 | | Hawaii OEO 1976 |
| | 70,000 | 21,000 | 51,000 | Rolff 1978:58 |
| 1976 | 68,000 | | 37,000 | Emery 1976:10 |
| | | 16,000 | | McGarvey and Baker 1979:463 |
| 1977 | | | 20,000[b] | Shu and Satele 1977:7 |
| | | 5,648 | | Hawaii Dept. of Health 1979 |
| 1978 | | 6,000 | | Markoff and Bond 1980:189 |
| | | | 90,000 | Macpherson et al. 1978:247–49 |
| 1979 | | 11,520 | | Hawaii Dept. of Planning 1980 |
| 1980 | 40,000–60,000 | 10,000–12,000 | 36,000–41,000 | Shore 1980 |
| | 100,000 | | | Steele 1981 |
| 1981 | | 9,357 | | Hawaii Dept. of Health n.d. |
| 1982 | | 8,000–18,000 | | Alailima 1982:105 |
| | | 12,556 | | Hawaii Dept. of Health n.d. |
| 1983 | 73,000 | 30,000 | | Takeuchi 1983 |
| | | | 60,000[c] | Andersen 1983 |

a. For Southern California only.    b. Los Angeles area only.    c. Los Angeles-Anaheim area only.

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## HOW MANY SAMOANS? *(continued)*

An examination of the sources of these figures suggested
that many of the estimates are probably guesses, while in other
cases it is not clear how the numbers were obtained. Two ex-
ceptions are the 1964—67 and 1971 estimates for Hawaii,
which were based on surveys conducted by the State of Hawaii
Health Surveillance Program (Schmitt 1977) and the Hawaii
State Immigrant Services Center (Hawaii ISC 1972). None of
the other figures appear to have been derived from an actual
count of the Samoan population, but at least one study (Park
1979) was based on sound demographic procedures, and an-
other (Lewthwaite, Manzer, and Holland 1973) made good use
of secondary statistics available at the time. In general terms,
the more systematic the methodology employed, and the
larger the supply of secondary statistics (as in Hawaii), the
closer the estimates were to what might be expected on the
basis of the 1980 census results. Where historical statistics
were largely lacking (as in California) the range of estimates
was wide and deviated substantially from what would be ex-
pected if the census were correct.

This paper reports the results of applying demographic
methods, in combination with assumptions about vital rates
and migration, to estimate the total Samoan population of the
United States in 1980. Because of the wide range of error in
many of the statistics and the assumptions used, the methods
employed do not permit an exact measure of the census cover-
age of Samoans. They do, however, provide a basis for com-
paring the relative accuracy of the census count and informal
estimates. The results of our analysis show that a census under-
count of the magnitude implied by some of the figures cited
in table 1 is demographically implausible.

### Evaluation Methods

An evaluation of the accuracy of the census count of a small
minority group raises all the technical problems associated
with the measure of census coverage in general. The Samoan
case is complicated by the fact that the 1980 census was the
first U.S. census since 1930 in which Samoans were reported
as a distinctive ethnic group (both the 1920 and 1930 censuses
counted Samoans). Furthermore, Hawaii is the only state to
report Samoan vital statistics separately, so it is impossible to
determine the total number of Samoan births and deaths in the
country as a whole. These two conditions rule out the use of
an intercensal comparison using a conventional demographic
balancing equation. Moreover, migration statistics on Samoans
entering or leaving the United States are almost nonexistent.
Although immigrants from the independent state of Western
Samoa are included in U.S. Immigration and Naturalization
Service statistics, American Samoans are "nationals" and there-
fore may enter the United States without restriction. The
supply of migration statistics from the Samoa end of the migra-
tion stream is limited to a few years and is quite inadequate to
the task of checking the census count.

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The other methods used by demographers to evaluate the coverage of a census can be placed in five categories: (1) post-enumeration surveys, (2) reenumeration, (3) consistency checks within a single census, (4) matching against individual records, and (5) checks against independent aggregates (Shryock and Siegel 1975:105). All of these methods raise practical and statistical problems in the case of the Samoan population in the United States.

The U.S. Census Bureau has, of course, carried out post-enumeration sample surveys to test the accuracy of the count of some racial groups and urban areas (Passel, Cowan, and Walter 1983), but the Samoan population is too small to be represented in them. The reenumeration of the entire Samoan population is obviously ruled out for practical reasons. There appear to be no gross inconsistencies in the age and sex distribution of the 1980 census data on Samoans (Hayes and Levin 1983), but further tests are necessary. The final two methods raise the question of whether other sources of data are less error-free than the census itself. Matching studies might have been possible shortly after the census in parts of Honolulu, where independent survey data are available, but this would not help evaluate the coverage of Samoans in the country as a whole. Comparison with independent aggregates such as church records may be a plausible procedure in areas of high Samoan concentration, but the high rates of circular mobility between Samoa, Hawaii, and the United States mainland would make this method highly unreliable unless extremely severe statistical controls were maintained. It would not be practical to employ this method on a national basis.

Given the difficulties associated with conventional demographic procedures, an unorthodox method was called for. In this paper we have applied a variant of the intercensal comparative method in combination with demographic analysis and statistical estimation to make a range of estimates of the Samoan population in 1980. As will become clear, the method requires that assumptions be made where empirical data are weak or nonexistent.

### The General Procedure

Although Samoans were not reported in United States censuses from 1940 to 1970, they have been counted in American Samoa, Western Samoa, and New Zealand (the other centers of Samoan population) since the early 1900s. Few Samoans live outside these four locations, but small numbers are likely in Tonga, Fiji, and Australia. If a base population in the United States can be established for some period before major immigration to the United States began, census data from the other three locations, in combination with vital statistics (or demographic estimates) and migration statistics, would provide a means of estimating the "expected" Samoan population in the United States in 1980. In order to reveal the degree to which the expected population is sensitive to different assumptions about demographic rates and the size of the base population, we have made four separate estimates of the expected population.

### Establishing the Base Population

The first difficulty is determining the size of the base population. The 1920 census of the United States counted six



MAJOR SAMOAN COMMUNITIES
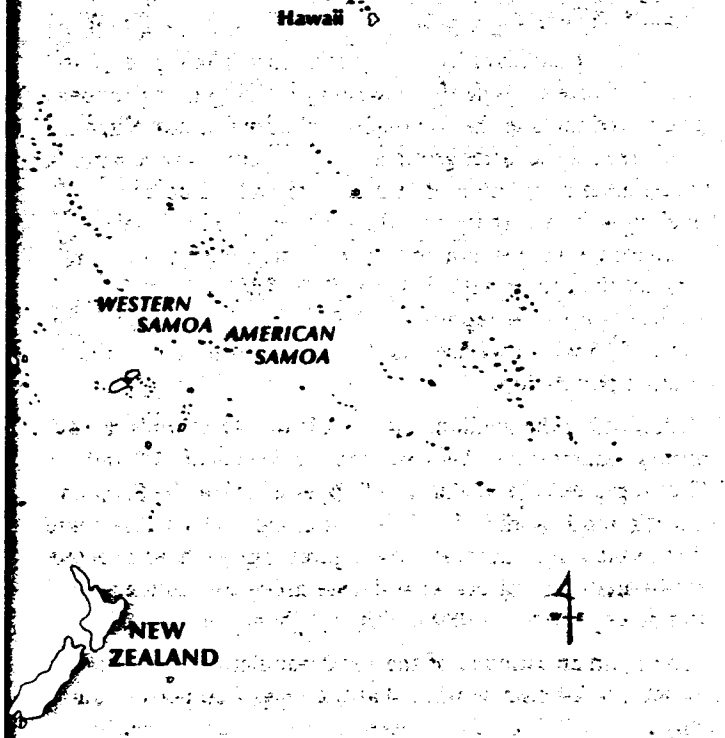
Samoans, all of whom were in California and all but one foreign-born (U.S. Census Bureau 1933:59). The 1930 census also reported six Samoans, two of whom were in Utah and four in California. All were listed as native-born. The category Samoan did not appear again in a U.S. census until 1980.

Although we know from the 1920 census that at least six Samoans had reached the United States mainland by that year, the migration history of Samoans prior to World War II is poorly documented. Movement to Hawaii and California started during World War I (Lewthwaite et al. 1973:134), but adventurous sailors were probably visiting Pacific ports as early as the 1840s and those who stayed most likely became absorbed into local populations. The nucleus of the Samoan population of Hawaii was formed in the 1920s from three groups: five or six families numbering 33 persons in 1925 who settled in Laie village on the island of Oahu; an unknown number of entertainers who stayed in Hawaii after touring the United States; and between 50 and 60 Samoan prisoners who were sent to serve their time in Hawaii jails and decided to remain in Hawaii on their release (Alailima 1982:105; Born 1968:456). It is not known how many of these persons eventually returned to Samoa or continued on to California or other places. If the strongest assumption of no subsequent return or onward migration is made, there could have been between 100 and 200 Samoans in Hawaii by the mid 1920s. There is reason to be-

lieve, however, that many of the Samoans in Hawaii at this time intermarried with Hawaiians (Alailima 1982:108) and may have lost their Samoan identity. Samoan immigration to Laie slowed down in the 1930s and, according to Stanton (1978:273), "totally ceased" during World War II.

Between November 1947 and March 1950, letters of identity were issued to 474 Samoans intending to travel to the United States (Lewthwaite et al. 1973:134), but it is not known how many actually made the journey. The 1950 census reported 463 persons in Hawaii who had been born in American Samoa (U.S. Census Bureau 1953:18) but did not indicate the number of Samoans by race or ethnicity. The figure of 463 would therefore exclude the Hawaii-born children of previous migrants and include the Samoa-born children of non-Samoans. If we disregard the latter group as insignificant, assume a minimum Samoan population of 100 in 1925 and a 2 percent annual growth rate, there would have been an additional 63 Hawaii-born Samoans, not counting children born to new migrants, by the census date, 1 April 1950. Adding these Hawaii-born Samoans to the reported 463 Samoa-born, we obtain the figure of 526 which we have used as the lower bound of the estimated population.

Establishing the medium and upper bounds requires rather arbitrary assumptions. We have used the figures of 300 and 500 to represent the medium and upper limits of the Samoan population in Hawaii in 1925. No historical evidence has come to light that would support these figures, but we have selected them in order to indicate what demographic consequences could be expected by 1980 if either of them was correct.

To obtain an estimate of the 1950 population, we assumed that net immigration continued at the rate of 10 persons annually from 1925 to 1930, slowed to 5 per year during the Depression and World War II, and increased again to 40 per year from 1946 to 1950. These estimates were obtained simply by assuming that 60 percent of the 463 American Samoa-born enumerated in Hawaii in 1950 had immigrated between 1925 and 1950. The actual period of migration was determined subjectively on the basis of comments by Stanton (1978:273) and others. Although these sources indicated that immigration stopped completely during World War II, we have allowed for a small inflow, which seems more realistic.

Furthermore, we assumed that the natural growth rate of

Samoans in Hawaii was as reported for American Samoa by Park (1979:15–20), namely, 1.8 percent per year from 1925 to 1930, and 2.4 percent per year from 1930 to 1950. These calculations result in a medium estimate of about 900 and an upper limit of about 1,200 Samoans in Hawaii in 1950 (table 2, column 1).

Apart from the 1920 and 1930 census figures already mentioned, little is known about the pre-World War II Samoan population on the U.S. mainland. According to Lewthwaite et al. (1973:134), a Samoan "community" was "seemingly" established in California during World War I, but they cite no numbers, location, or historical sources. Here again, it is necessary to make assumptions. We were unable to find any information that would suggest a larger migration flow to the mainland than to Hawaii prior to the 1950s, so Samoans in Hawaii were probably the majority at least until 1950. For the sake of argument, however, we have assumed two separate distributions for 1950: the first assumed that three-quarters of all Samoans in the United States were in Hawaii and the balance on the mainland; the second assumed an equal distribution between the mainland and Hawaii.

When these two distributions are combined with the low, medium, and high estimates of the Samoan population of Hawaii in 1950, the result is six separate estimates of the total Samoan population in the United States (table 2, column 5). Since the two middle pairs are relatively close to each other, they have been averaged to produce four estimates as shown in table 2, column 6. Note that in effect all six estimates are represented in the analysis, depending on which interpretation of the table is made. That is, the estimate of 1,114 can be interpreted to mean either that the Hawaii base population was 526 with an equal distribution between Hawaii and the mainland, or that the Hawaii population was 882 with 25 percent of the total on the mainland. Two similar interpretations are possible with the estimate of 1,698.

### Reconciliation of Census, Natural Growth, and Migration Data

To establish a starting point from which all subsequent changes could be measured, we used migration and natural increase data from the other three locations for which we have statistics on Samoans (American Samoa, Western Samoa, and New

**Table 2. Estimates of the Samoan Population of the United States in 1950 and 1951**

| Assumption | Base Population Hawaii, 1950 (1) | Ratio Hawaii/ Mainland (2) | Population 4/1/50 | | | 1950 Revised (6) | Natural Increase[a] (7) | Migration (8) | Population 9/25/51 (9) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Hawaii (3) | Mainland (4) | Total (5) | | | | |
| | | 75/25 | 526 | 175 | 701 | 701 | 37 | 462 | 1,200 |
| Low | 526 | 50/50 | 526 | 526 | 1,052 | } 1,114 | 58 | 462 | 1,634 |
| | | 75/25 | 882 | 294 | 1,176 | | | | |
| Medium | 882 | 50/50 | 882 | 882 | 1,764 | } 1,698 | 89 | 462 | 2,249 |
| | | 75/25 | 1,224 | 408 | 1,632 | | | | |
| High | 1,224 | 50/50 | 1,224 | 1,224 | 2,448 | 2,448 | 129 | 462 | 3,039 |

a. Natural increase based on annual rate of 3.5 percent (see text).

Rele, J. R. 1967. *Fertility Analysis Through Extension of Stable Population Concepts.* Berkeley: Institute of International Studies, University of California. Republished in 1977 by the Greenwood Press, Westport, Connecticut, as Population Monograph Series, no. 2.

Smith, Peter C. 1978. Indexes of Nuptiality: Asia and the Pacific. *Asian and Pacific Census Forum* 5(2):1.

Spiegel, Murray R. 1961. *Schaum's Outline of Theory and Problems of Statistics.* New York: Schaum Publishing Company.

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Zealand). For convenience we chose 25 September 1951, the date of the Western Samoa census, as the starting date.

In order to adjust the American Samoa population and the Samoan population of the United States from 1 April 1950 to 25 September 1951, two further operations were necessary. First, natural increase during the intercensal period was added to both populations at the rate of 3.5 percent per year. This is the rate of growth observed in American Samoa during the 1950–56 period (Park 1979:15–20), and in the absence of vital statistics for Samoans in the United States at this time we have applied the same rate to them as well (see table 2, column 7). Secondly, emigration from American Samoa to the United States during the same intercensal period was subtracted from the 1950 census figure for American Samoa and added to the estimated population of Samoans in the United States (table 2, column 8). The net migration figure of 462 was obtained from McArthur (1968:144–45), who estimated that approximately 3,000 persons emigrated from American Samoa between 1 April 1950 and 25 September 1956. Of these, about 1,000 went to Western Samoa and fewer than 2,000 emigrated from the Samoan Islands. This figure appears to be corroborated by the estimates of the Naval Administration, which indicated that 1,987 Samoans left American Samoa between 3 May 1950 and 30 June 1956 (Lewthwaite et al. 1973:136). If emigration was evenly distributed throughout the 1950–56 period, the net outflow from American Samoa to the United States during the intercensal period 1950–51 would have been 462.

Column 9 of table 2 shows four estimates of the Samoan population in the United States adjusted to 25 September 1951. The range is from a low of 1,200 to a high of about 3,000.

### Estimating the Expected Population

Estimates of the "expected" population of Samoans in the United States for successive periods were obtained by means of the basic balancing equation:

$$P_t = P_0 + B - D + M$$

where $P_t$ is the population at the end of the period, $P_0$ is the population at the beginning of the period, $B$ is births, $D$ is deaths, and $M$ is net migration.

For $P_0$ (1951) we used the four estimates of table 2, column 9. In order to obtain estimates of the population in subsequent years, statistics on Samoan births, deaths, and net migration were required, ideally by single year. Since birth and death statistics for the total Samoan population in the United States were not available, it was necessary to use estimates. For the period 1951 to 1965, we applied the same birth and death rates as were reported for American Samoa (Park 1979: 15–20) during the same period. From 1965 onwards, fertility estimates derived from the application of the own-children method (Levin and Retherford 1983) to 1980 census data for Samoans in the United States were used. The crude birth rate (CBR) for the period 1965–67 was 37 per 1,000. While it was clear from the own-children analysis that the total fertility rate (TFR) of Samoans declined by about one third between 1966 and 1979 (from 5.9 to 4.0), the CBR remained at about 35 per 1,000 in 1979 because of the large proportion of women in the childbearing ages. Consequently this rate was applied throughout the 1968–80 period on the assumption that declining total fertility is yet to be reflected in the CBR.

From 1965 through 1980, we applied a constant crude death rate (CDR) of 5.0 per 1,000. This rate was simply an average of the reported CDR of 4.9 per 1,000 in American Samoa during the 1973–75 period (Park 1979:20), the Nordyke (1979) estimate of 4.8 per 1,000 for Samoans in Hawaii, and our estimate of 5.2 per 1,000 from 1980 census data (Hayes and Levin 1983).

Deriving migration estimates was a much more complicated process. A continuous series of annual migration statistics (arrivals and departures) for the 1951–80 period was unavailable, either from the Samoan or United States end of the migration stream. Consequently, net migration had to be estimated using indirect methods. If American Samoa were the only source of Samoan migrants to the United States this would be a relatively straightforward calculation. But many migrants originate from the independent state of Western Samoa, spending various periods of time in American Samoa before moving on to the United States. Even if few Western Samoans emigrated on to the United States, their continuous inflow to American Samoa would tend to conceal the outflow of Samoans from American Samoa as indicated by indirect methods.

To allow for the flow of Samoans in and out of American Samoa from Western Samoa, it is necessary to treat the total population of Samoans in the United States, American and Western Samoa, and New Zealand as a closed system. That is, other than internal movement between these locations, no other migration was permitted. If this closed system is assumed, then all Samoans who emigrated from Western Samoa but did not go to New Zealand must have either emigrated to American Samoa or the United States. By the same token, all Samoans who emigrated from American Samoa but did not go to Western Samoa or New Zealand must have entered the United States.

Because some Samoans probably do migrate to other parts of the Pacific and elsewhere in the world, the above assumptions are not absolutely realistic, but the error they produce will likely be small. In order to allow for some Samoan emigration elsewhere, and to simplify our calculations, we have ignored the inward movement of other Pacific Islanders to American Samoa during the 1951–80 period (probably in the order of 800 persons).

## Table 3. Estimated Samoan Migration to the United States: 1951–81

| Period | Net Migration from American Samoa (1) | Net Migration from Western Samoa (2) | Total (1) + (2) = (3) | Migration to New Zealand (4) | Migration to United States (3) − (4) = (5) | Average Annual Migration to U.S. (6) |
|---|---|---|---|---|---|---|
| 1951–56 | 1,537 | 2,905 | 4,442 | 2,404 | 2,038 | 408 |
| 1956–61 | 2,692 | 5,857 | 8,549 | 2,744 | 5,805 | 1,161 |
| 1961–66 | 559 | 6,621 | 7,180 | 4,312 | 2,868 | 574 |
| 1966–71 | 1,387 | 7,713 | 9,100 | 4,715 | 4,385 | 877 |
| 1971–76 | 2,051 | 15,891 | 17,942 | 9,153 | 8,789 | 1,758 |
| 1976–81 | 1,273 | 8,578 | 9,851 | 223 | 9,628 | 1,926 |
| Total | 9,499 | 47,565 | 57,064 | 23,551 | 33,513 | 1,117 |

SOURCES: Tables 4 and 5. Data for New Zealand from table 6, adjusted to intercensal periods.

Table 3 presents a summary of the net intercensal migration estimates for American and Western Samoa and New Zealand during the 1951–81 period and shows how net Samoan migration to the United States (columns 5 and 6) was calculated.

The method of obtaining the Western and American Samoan net migration figures is shown in detail in tables 4 and 5. The logic used is essentially the same as the balancing equation already mentioned:

$$M = (P_t - P_0) - (B - D)$$

The accuracy of the method is, of course, dependent upon the quality of the vital statistics and census figures used in the calculation. Both Western and American Samoa census data can be considered accurate, but Western Samoa vital statistics have been adjusted to allow for the underregistration of births and deaths. American Samoa vital statistics have not been adjusted because they were believed to be 95 percent complete in the 1951–72 period (Park 1972:27), and coverage has more than likely improved in the last decade.

To obtain the net inflow of Samoans to the United States, net Samoan immigration to New Zealand was subtracted from the sum of net migration from Western and American Samoa. Samoan immigration to New Zealand was obtained from the net balance of Samoan arrivals and departures (table 6), adjusted to intercensal periods.

Since all migration estimates were adjusted to Western Samoa census dates, it is difficult to check them against other sources, but some approximate comparisons are possible. According to the 1960 Annual Report for American Samoa (American Samoa 1960), "more than 4,000" persons departed American Samoa for the United States between 25 September 1956 and 1 April 1960. It is not clear if this is a net figure or refers to departures only, but it is about what would be expected for net migration on the basis of our 1951–56 estimate if migration was spread evenly throughout the period. Koenig (1961:17) estimated net emigration from American Samoa of 5,306 between 1950 and 1960, whereas we obtained the higher figure of 7,843 for the intercensal period 1951–61 (see table 3). Presumably our higher figure is a result of including the movement of Samoans from Western Samoa. An estimate of 10,000 emigrants (net) was suggested by Lewthwaite et al. (1973:146) for the 1960s, but their estimate was not an exact intercensal one. We obtained 7,253 for the 1961–71 period.

## Table 4. Estimated Net Migration, Western Samoa: 1951–81

| | Intercensal Period | | | | | |
|---|---|---|---|---|---|---|
| | 9/25/51 9/25/56 | 9/25/56 9/25/61 | 9/25/61 11/21/66 | 11/21/66 11/3/71 | 11/3/71 11/3/76 | 11/3/76 11/3/81 |
| First census | 84,909 | 97,327 | 114,427 | 131,377 | 146,627 | 151,983 |
| Second census | 97,327 | 114,427 | 131,377 | 146,627 | 151,983 | 158,130 |
| Population increase | 12,418 | 17,100 | 16,950 | 15,250 | 5,356 | 6,147 |
| Births | 18,035[a] | 25,627[b] | 29,144[b] | 27,851[c] | 25,780[c] | 17,656[c] |
| Deaths | 2,712[a] | 2,670[b] | 5,573[b] | 4,887[c] | 4,532[c] | 2,934[c] |
| Natural increase | 15,323 | 22,957 | 23,571 | 22,963 | 21,247 | 14,772 |
| Estimated migration | −2,905 | −5,857 | −6,621 | −7,713 | −15,891 | −8,578 |

SOURCES: Banister et al. 1978:18–36; McArthur 1968:122; Western Samoa 1969:11; Western Samoa 1974:2; and Western Samoa 1980:5.

NOTES: Population increase is the difference between the two census enumerations. Natural increase is the difference between births and deaths. Estimated migration is the difference between population increase and natural increase—a minus sign indicates out-migration.

a. Adjusted assuming 25 percent underregistration.

b. Adjusted assuming 24 percent underregistration.

c. Adjusted assuming 20 percent underregistration.

## Table 5. Estimated Net Migration, American Samoa: 1950–1980

| | Intercensal Period | | | |
|---|---|---|---|---|
| | 4/1/50 9/25/56 | 9/25/56 4/1/60 | 4/1/60 4/1/70 | 4/1/70 4/1/80 |
| First census | 18,937 | 20,154 | 20,051 | 27,159 |
| Second census | 20,154 | 20,051 | 27,159 | 32,397 |
| Population increase | 1,217 | −103 | 7,108 | 5,138 |
| Births | 5,172 | 2,975 | 9,669 | 10,959 |
| Deaths | 974 | 581 | 1,301 | 1,451 |
| Natural increase | 4,198 | 2,391 | 8,398 | 9,509 |
| Estimated migration | −2,981 | −2,498 | −1,290 | −4,371 |

SOURCES: American Samoa 1971:27–28; American Samoa 1981; McArthur 1968:143; and Park 1979:12.

NOTES: Population increase is the difference between the two census enumerations. Natural increase is the difference between births and deaths. Estimated migration is the difference between population increase and natural increase—a minus sign indicates out-migration.

| | Net Samoan Migration to New Zealand | Net Departures from Western Samoa | |
|---|---|---|---|
| | | Samoan Citizens[a] | All Persons |
| 1962 | 763 | n.a. | n.a. |
| 1963 | 844 | n.a. | n.a. |
| 1964 | 595 | n.a. | n.a. |
| 1965 | 444 | n.a. | n.a. |
| 1966 | 820 | 1,024 | 1,243 |
| 1967 | 1,370 | 396 | 588 |
| 1968 | 371 | 3,436 | 1,476 |
| 1969 | 596 | 1,655 | 2,192 |
| 1970 | 1,424 | n.a. | 2,545 |
| 1971 | 1,085[b] | n.a. | 569 |
| 1972 | 1,560 | n.a. | 1,144 |
| 1973 | 2,047 | 2,029 | 3,778 |
| 1974 | 3,225 | 4,198 | 4,244 |
| 1975 | 2,635 | 2,437 | 2,670 |
| 1976 | 1,214 | 1,206 | 1,086 |
| 1977 | 336 | 3,076 | 1,287 |
| 1978 | −140 | 1,332 | 3,628 |
| 1979 | 206 | 490 | 5,087 |
| 1980 | 56 | 61 | 5,229 |
| 1981 | −454 | 2,597 | 142 |
| 1982 | 105 | 31 | 964 |

SOURCES: New Zealand 1981–82:13; Western Samoa 1967–82.

NOTES: n.a. = not available. Minus sign means net emigration from New Zealand.

a. Western and American Samoa citizens.

b. Estimated figure.

Little comparative information exists for the 1970s, but American Samoa arrival and departure data for 1977 (the only year for which statistics are presently available) indicate net emigration of 2,049 (Pereira 1978), which is close to the annual average of 1,926 that we estimated for the 1976–81 period (table 3).

To calculate the expected Samoan population in 1980, we made annual estimates of the population, starting with each of the four base estimates for 1951 and using the formula:

$$P_{t+1} = P_t + (B - D) + M$$

where $P_t$ is the population at the beginning of year $t$, $P_{t+1}$ is the population at the beginning of the next year, $M$ is the annual net migration, $B$ is births, and $D$ is deaths. The absolute numbers of births and deaths were obtained by applying the crude birth and death rates already discussed (see table 7) to the midyear population approximated by $P_t + .5M$. The formula assumes that migration is evenly distributed throughout the year.

### Results

The results of the estimations are shown by single year in table 7, and the differences between each of the four expected populations and the 1980 census count of American Samoans are summarized in table 8. The estimated 1980 population ranges from 46,600 to 50,800, depending on which 1951 base population is assumed.

Since each of the four estimates employed the same rates of natural increase and immigration, the difference between them reflects the size of the starting population. Thus, the difference of 1,850 between estimates I and IV in 1951 increases to a difference of 4,260 by 1980, representing the natural increase of the additional base population. This rather small difference suggests that even if historical data were located indicating that many more Samoans were in the United States in 1951 than can be reconstructed from available information (say, twice as many as suggested in estimate I), either natural increase or immigration would have to have been substantially higher than we have estimated for the population to have reached the level of 100,000, the upper limit indicated in table 1. According to our calculations, the Samoan population could not have grown to this size at reasonable levels of natural increase and immigration unless the 1951 population had been at least 23,000. Since the population of American Samoa was only 19,000 in 1950, the possibility of there being 23,000 Samoans in the United States the following year is extremely remote. Alternatively, if the 1951 population was equivalent to estimate IV (3,039), immigration levels 52 percent higher than we estimated and a constant 4.5 percent annual rate of natural increase would have been necessary for the population to reach 100,000 in 1980. Neither of these conditions is plausible.

### Conclusion and Discussion

Demographic analysis combined with reasonable assumptions about immigration, natural growth, and the size of the base population in 1951 results in an estimated 1980 Samoan population of between 46,600 and 50,800. These estimates are from 10.0 to 17.5 percent higher than the census count. It is highly unlikely that the gap between the true Samoan population and the census count could be any wider than indicated here, and there are no plausible circumstances in which the population could have reached 100,000. The largest percentage difference of 17.5 percent was predicated on a 1951 Samoan population of 3,039 for which there is presently no supporting evidence.

Independent corroboration of our analysis is, of course, desirable. But if we had better quality data than have been used in the analysis it would not have been necessary to resort to estimates and assumptions; this is the dilemma of all coverage checks.

One type of test that can lend indirect support to our results is a check of the consistency between census details on place of birth and what would be expected on the basis of our estimates. The 1980 census indicated 22,600 Samoa-born in the Samoan population, 13,200 of whom were born in Western Samoa and 9,400 in American Samoa. If our migration estimates were correct, however, we would have expected about 18,000 Western Samoans and 11,800 American Samoans (by birthplace) to be enumerated. On the other hand, the fertility and mortality assumptions used in the analysis implied a United States-born population of 16,100, whereas the census counted 19,350. If the census was correct, the "error" in our migration estimates would be about 7,150 and the natural increase "error" would be about −3,250. These "errors" do not cancel each other out, since they leave a residual of 3,900. Most of this residual would disappear if the lowest of our esti-

## Table 7. Four Estimates of the Samoan Population of the United States by Single Year, 1951–80

| | Estimated Population, Using Different 1951 Bases | | | | Growth Assumptions | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | Net Migration | Birth Rate | Death Rate | Natural Increase |
| 1951 | 1,200 | 1,634 | 2,249 | 3,039 | 408 | .045 | .0093 | .0357 |
| 1952 | 1,657 | 2,106 | 2,743 | 3,561 | 408 | .045 | .0093 | .0357 |
| 1953 | 2,131 | 2,596 | 3,255 | 4,101 | 408 | .045 | .0093 | .0357 |
| 1954 | 2,621 | 3,103 | 3,785 | 4,661 | 408 | .045 | .0093 | .0357 |
| 1955 | 3,129 | 3,628 | 4,334 | 5,241 | 408 | .045 | .0093 | .0357 |
| 1956 | 3,654 | 4,171 | 4,902 | 5,690 | 1,161 | .0436 | .0093 | .0343 |
| 1957 | 4,959 | 5,493 | 6,249 | 7,063 | 1,161 | .0436 | .0093 | .0343 |
| 1958 | 6,308 | 6,859 | 7,641 | 8,436 | 1,161 | .0436 | .0093 | .0343 |
| 1959 | 7,722 | 8,295 | 9,105 | 9,978 | 1,161 | .0436 | .0065 | .0371 |
| 1960 | 9,189 | 9,783 | 10,623 | 11,528 | 1,161 | .0436 | .0065 | .0371 |
| 1961 | 10,710 | 11,325 | 12,196 | 13,134 | 574 | .042 | .0065 | .0355 |
| 1962 | 11,671 | 12,308 | 13,210 | 14,181 | 574 | .042 | .0065 | .0355 |
| 1963 | 12,666 | 13,325 | 14,259 | 15,265 | 574 | .042 | .0065 | .0355 |
| 1964 | 13,697 | 14,379 | 15,346 | 16,387 | 574 | .042 | .0065 | .0355 |
| 1965 | 14,793 | 15,470 | 16,470 | 17,548 | 574 | .037 | .005 | .0320 |
| 1966 | 15,817 | 16,545 | 17,578 | 18,689 | 877 | .037 | .005 | .0320 |
| 1967 | 17,211 | 17,962 | 19,028 | 20,174 | 877 | .037 | .005 | .0320 |
| 1968 | 18,649 | 19,424 | 20,524 | 21,707 | 877 | .035 | .005 | .030 |
| 1969 | 20,085 | 20,894 | 22,026 | 23,244 | 877 | .035 | .005 | .030 |
| 1970 | 21,584 | 22,406 | 23,573 | 24,827 | 877 | .035 | .005 | .030 |
| 1971 | 23,118 | 23,964 | 25,166 | 26,458 | 1,758 | .035 | .005 | .030 |
| 1972 | 25,592 | 26,463 | 27,701 | 29,031 | 1,758 | .035 | .005 | .030 |
| 1973 | 28,139 | 29,037 | 30,311 | 31,681 | 1,758 | .035 | .005 | .030 |
| 1974 | 30,763 | 31,687 | 32,999 | 34,410 | 1,758 | .035 | .005 | .030 |
| 1975 | 33,465 | 34,417 | 35,768 | 37,221 | 1,758 | .035 | .005 | .030 |
| 1976 | 36,247 | 37,227 | 38,619 | 40,115 | 1,926 | .035 | .005 | .030 |
| 1977 | 39,283 | 40,292 | 41,725 | 43,267 | 1,926 | .035 | .005 | .030 |
| 1978 | 42,409 | 43,448 | 44,924 | 46,512 | 1,926 | .035 | .005 | .030 |
| 1979 | 45,629 | 46,699 | 48,219 | 49,854 | 1,926 | .035 | .005 | .030 |
| 1980 | 46,573 | 47,652 | 49,186 | 50,834 | — | — | — | — |

NOTE: Census dates used were 25 September for 1951, 1956, and 1961; 21 November for 1966; 3 November for 1971 and 1976; and 1 April for 1980.

mates (46,600) were the true population. In this case it would follow that we had overestimated immigration (particularly from Western Samoa) and underestimated natural increase. The former is plausible in the light of Western Samoa "frontier" data (table 6) for Samoan citizens which indicate about 2,400 fewer immigrants in the 1976–80 period than indicated by the vital statistics method.

There are two reasons why a discrepancy between community perceptions of the size of the Samoan population and a census count is to be expected. First, the census does not attempt to define who is Samoan: the count is based entirely on self-identification by the respondent (or in the case of children, a parent or other adult householder). This introduces an element of indeterminacy where, as in Hawaii, the proportion of part-Samoans is high. Second, the Samoan population is a highly mobile one. The total number of Samoans who spend various periods of time in the United States during a typical year is probably greater than could be recorded in a population census which is concerned with the population "stock," not the gross flow. There is little doubt that the application of a "flow" concept would result in a larger population than was counted by the census, but how much larger is presently a matter of speculation.    □

## Table 8. Difference Between Four Estimates of the "Expected" Samoan Population of the United States in 1980 and the 1980 United States Census Count

| | Estimated Populations, Using Different 1951 Bases | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Estimated population, 25 September 1951 | 1,200 | 1,634 | 2,249 | 3,039 |
| Expected population, 1 April 1980 | 46,573 | 47,652 | 49,186 | 50,834 |
| Enumerated population, 1 April 1980 | 41,948 | 41,948 | 41,948 | 41,948 |
| Difference between expected and enumerated | 4,625 | 5,704 | 7,238 | 8,886 |
| Percent of expected population | 9.90 | 12.00 | 14.72 | 17.48 |
| Implied coverage (percent complete) | 90.10 | 88.00 | 85.28 | 82.52 |
| Implied growth rate (average annual percent) | 12.97 | 11.90 | 10.83 | 9.85 |

contract to the United States Department of Labor. We are grateful to these organizations for permission to publish this version.

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relationship between ethics and public policy. They pose the question: Should sex preselection be encouraged or discouraged?

This is timely and provocative reading for the demographer, social scientist, and family counselor alike. The book would be useful not only in population libraries but also in large public and university collections as well. It can be ordered from local bookstores or by writing directly to Academic Press, 111 Fifth Avenue, New York, N.Y. 10017.

*Biological and Social Aspects of Mortality and the Length of Life.* Proceedings of a Seminar at Fiuggi, Italy, May 13–16, 1980. Edited by Samuel H. Preston. Liège, Belgium: Ordina Editions, 1982. ISBN 2-87040-024-1. 483 pp. US$30.00.

In 1977 the International Union for the Scientific Study of Population appointed a Committee on Factors Affecting Mortality and the Length of Life. This committee was encouraged to investigate and integrate research findings and methodologies from related scientific disciplines into demographic research on mortality. The committee's first activity was to sponsor the Seminar on Biological and Social Aspects of Mortality and the Length of Life, which was held in Fiuggi Terme, Italy, 13–16 May 1980. The Instituto di Demografia, University of Rome, cosponsored the seminar. This volume contains the papers presented at the seminar, incorporating revisions made in response to comments received during the seminar and in the scientific editing process.

Papers presented at the seminar are organized into three major groups: environmental and social influences on mortality, genetic and biological influences on mortality, and behavioral influences on mortality. According to editor Samuel Preston, although these labels represent "tidy compartments," death is usually the result of several of these influences in combination. This organization was preferred to the more conventional one based on a more-developed/less developed country distinction because the same factors influence mortality in both types of countries. Increasing life expectancy throughout the world means that "death from diseases associated with old age is the fate of the majority of persons in developed and less developed countries alike" (p. 2), and this situation will persevere as communicable diseases come under better control.

The first paper, by Hugo Behne and Jacques Vallin, reviews the dimensions of variation in estimated mortality levels among and, especially, within national population groups. Mortality differences by sex, marital status, place of residence, and social status are briefly described, and a list of references is given to readers interested in further details.

Chapter 2 by Henry Mosley develops a useful analytic framework for studying biological processes as intervening variables between mortality determinants and mortality levels. He describes the role of infectious diseases and immunity so that even those without extensive medical backgrounds can understand the disease patterns observed.

In chapter 3, Moriyama examines the physical and chemical pollutants introduced into the environment by man, particularly those that seem to relate to increased risks of cancer. Several chapters on the relation between nutrition and mortality follow. This is a very complex subject but one with strong implications for developing countries.

The chapters in part II cover the biological and genetic influences on mortality. The authors note that most improvements in mortality have been effected at earlier ages and that the degenerative diseases of old age have been the least susceptible to medical advances. Papers by Everitt and Walford, however, suggest that the time may come when aging can be slowed down or even averted.

The papers on behavioral influences on mortality show how human choice can affect mortality outcomes. Overnutrition, alcohol consumption, and smoking—all forms of consumption that are influenced by higher incomes—are being subjected to ever closer scrutiny as causes of death. In these personal habits there is an element of choice, which is not the case with biological influences on mortality.

The papers taken together represent a wealth of facts on mortality. Most of the papers contain extensive bibliographies and indicate the important research monographs in any given field. The book should be useful for all health and population libraries. It can be ordered from Ordina Editions, 10, place Saint Jacques, B 4000 Liège, Belgium. □

## HOW MANY SAMOANS?

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