The demographic situation in Hawaii

ERRATA

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Page 24 should be replaced by the page attached.

Page 105: The 1956 citation attributed to Robert
Retherford should be

Schmitt, Robert C.

    1956   Research note on components of change in
                   marital status on Oahu, 1940–1950. *Social
                   Forces* 34(3):238–240.

ties show higher sex ratios than Honolulu. This is most likely the result of past male-dominated immigration to these counties.

Ethnic Composition

The analysis of ethnic composition presents one of the most interesting and complex statistical problems in Hawaiian demography. Because of the unique history of this island state, with the depopulation of native Hawaiians, heavy migration from many places, and much interracial marriage, there has been no racial majority for many years. Interpretations and definitions of race have varied over the years, and Hawaiian terms have often been used in social definitions of racial groups, such as *haole* (outsider or stranger) for Caucasians. Census and health surveys incorporating racial data have not followed a consistent pattern of definitions, and this has resulted in a lack of comparability of data.

In this study, persons from, or with ancestry from, China, Japan, and the Philippines are classified as Chinese, Japanese, and Filipinos. Blacks and Indians of American descent are tallied as Negro and Indian. Caucasians are defined as persons of European ancestry, including white Americans, Britons, Norwegians, Germans, Swedes, Finns, and other northern Europeans. Portuguese, Spaniards, and Puerto Ricans, who were tabulated as separate groups in the early censuses of Hawaii, are counted in this presentation with Caucasians for all censuses since 1900 (Table 9).

Intermarriage has been the source of most of the racial confusion for census tabulations. The early classification of Hawaiians as "natives" and "half-natives" was later altered to "Hawaiians" and "part-Hawaiians," and these terms were in turn refined in the period 1910–40 to "Caucasian-Hawaiian" and "Asiatic-Hawaiian." With the intermarriage of succeeding generations, persons of full and part-Hawaiian parentage were separately tallied in the censuses of 1940–60.

Through the 1960 census, other persons of mixed racial background were classified according to the race of the nonwhite parent if one parent was white, or according to the race of the father in cases of nonwhite races where no Hawaiian blood was involved. This approach was somewhat modified in 1970, with the result that several discontinuities appeared. The 1970 census classification of ethnicity was based upon self-identification of race by the respondent. Persons of mixed parentage who expressed doubt as to their classification were advised to list the race of the father. The combination of these two changes has resulted in a lack of comparability between 1960 and 1970 for several

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ABSTRACT   Fertility, mortality, and migration patterns in Hawaii during the period 1900 to the present are described using census tabulations, vital statistics, and other data sources. The study explores topics of special importance to Hawaii, including the ethnic composition of the state and the effects of the changing military presence on total population.

Population size and growth are examined by geographical and political area, and the effect of changes in the age and sex distribution on the state's population composition is observed.

Fluctuations in fertility include a recent dramatic decline in fertility as reflected in both crude birth rates and more refined fertility measures. The study examines marriage patterns in relation to their impact on fertility. Life tables are used to review the mortality decline in Hawaii.

The analysis focuses on the influence of migration on the state's population, including island-to-island shifts, immigration from abroad, and in-migration from the continental United States. Population projections using various assumptions suggest that in-migration rather than natural increase will come to dominate population growth in the years immediately ahead.

INTRODUCTION

Hawaii, which became the fiftieth U.S. state in 1959, is a chain of tropical islands situated almost midway between Asia and Central America. The islands have attracted settlers for at least a millenium. Since 1900 their heterogeneous population has grown at an average annual rate of 2.3 percent and is now approaching the one million level. Along with population growth have come profound changes in the islands' physical environment, economy, social structure, and lifestyle. The implications of continued growth are a subject of increasing concern to many of the people of Hawaii.

This paper examines demographic trends in Hawaii since the beginning of the twentieth century and charts alternative future courses of population growth. The focus is on the *demographic* components of population change—on population size and growth, fertility, nuptiality, mortality, and migration. The social and economic context in which these phenomena occur, although of enormous importance, is discussed only peripherally.

"Hard" or primary data sources are used whenever possible, in particular U.S. census and vital registration publications, and official state and territory reports. Occasionally secondary sources are cited, usually for comparison.

By setting forth a comprehensive summary of the current demographic situation of the state, the authors hope to provide a basis for judgments and decisions concerning population policy.

POPULATION SIZE AND GROWTH

Total population of the state has grown continuously if unevenly since 1900: intercensal annual growth rates have fluctuated between about 1.4 percent and 3.6 percent (Table 1). The 1970 population of 769,913 was almost five times as large as the 1900 population of 154,001, and the average annual growth rate for the 70-year period was 2.3 percent. In comparison, the conterminous United States grew at an average yearly rate of 1.4 percent during the same period. Although the growth rate during the decade 1960–70 was lower than during the previous decade (1.96 compared with 2.36 percent annually), it would cause a doubling of the 1970 population in about 36 years were it to continue.

Oahu (the County of Honolulu) has been the major center of the state's population growth since 1900. With an average annual growth rate of 3.4 percent since 1900, its 1970 population of 630,528 was about 10.75 times as large as its 1900 population of 58,504. None of the other counties has shown such a high rate of growth. The years 1930–60, in particular, were generally a time of population decline for the Neighbor Islands, and only since 1960 has growth there resumed.

Because the various geographical areas of the state have been growing at different rates, the distribution of the total population among the islands and counties has been constantly changing. The percentage distribution of the population for census years (Table 1) indicates that Honolulu County has always had the largest share of the population. Since the 1920s it has had more than half of the total population; today it has almost 82 percent of the total. The ranking among the other counties has not changed, with Hawaii always second to Honolulu County, followed by Maui and Kauai.

Figure 1 illustrates the situation. If the line for any year were on the diagonal of the square, it would indicate an even distribution of population over the land area of the state. The farther from the diagonal a line lies, the more uneven is the population distribution. The

FIGURE 1   Population distribution by county: Hawaii, 1900–70
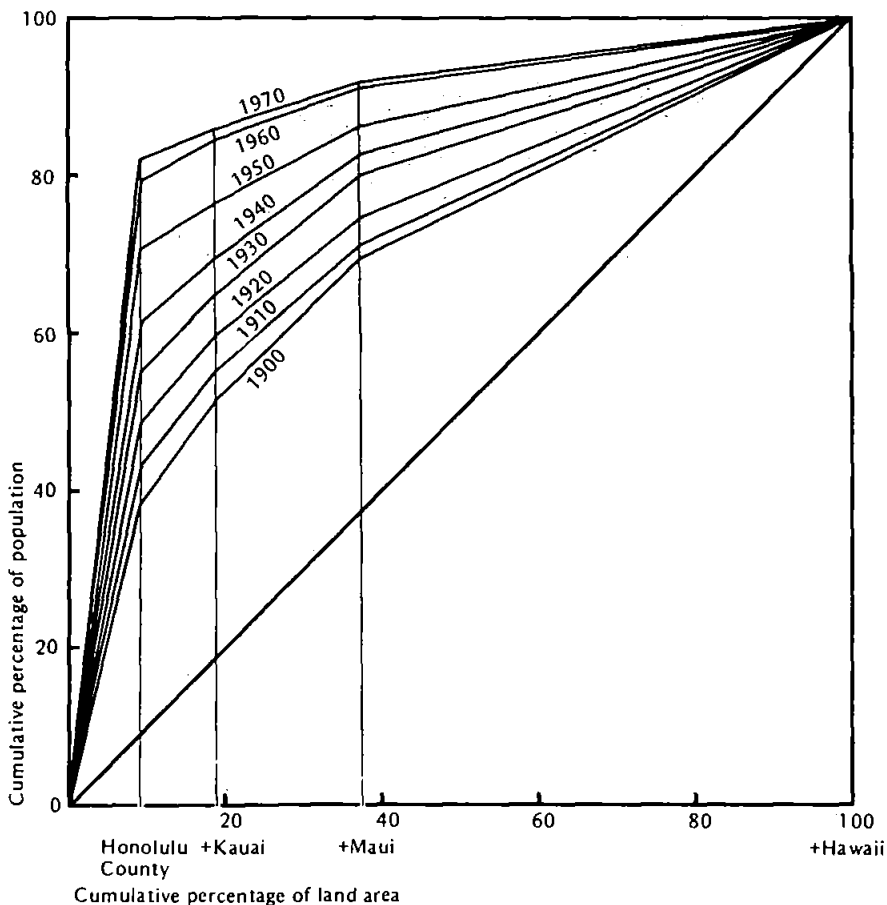
population of Hawaii has become more and more unevenly distributed since 1900, concentrating increasingly on Oahu with each successive decade.

Table 2 and Figure 2 show the population and density for the state and its geographical and political areas in 1970. Oahu, with 1,057.9 persons per square mile, is more densely populated than the Netherlands (836.7) or Japan (732.5). Hawaii and Lanai lie at the low end of the scale, with a density only 1.5 percent that of Oahu. These densities will continue to rise as long as the population of the state keeps growing.

TABLE 1 Population, distribution, and annual average growth rates:

Year[a]	State of Hawaii	Island				
		Oahu	Kauai	Maui	Lanai	Molokai
Population						
1900	154,001	58,504	20,562	25,416[b]	b	2,504
1910	191,909[c]	82,028[c]	23,744	28,623	131	1,791
1920	255,912[c]	123,527[c]	29,247	36,080	185	1,784
1930	368,336[c]	202,923[c]	35,806	48,756	2,356	5,032
1940	423,330[c]	258,256[c]	35,636	46,919	3,720	5,340
1950	499,794	353,020	29,683	40,103	3,136	5,280
1960	632,772	500,409	27,922	35,717	2,115	5,023
1970	769,913[d]	630,528[d]	29,524	38,691	2,204	5,261
Percentage distribution						
1900	100.0	38.0	13.4	16.5[b]	b .	1.6
1910	100.0	42.7	12.4	14.9	0.1	0.9
1920	100.0	48.3	11.4	14.1	0.1	0.7
1930	100.0	55.1	9.7	13.2	0.6	1.4
1940	100.0	61.0	8.4	11.1	0.9	1.3
1950	100.0	70.6	5.9	8.0	0.6	1.1
1960	100.0	79.1	4.4	5.6	0.3	0.8
1970	100.0	81.9	3.8	5.0	0.3	0.7
Average annual growth rates $(x\ 100)$[e]						
1900–10	2.20	3.38	1.44	1.23[b]	b	−3.35
1910–20	2.95	4.20	2.14	2.37	3.54	−0.04
1920–30	3.55	4.84	1.97	2.94	24.82	10.12
1930–40	1.39	2.41	−0.05	−0.38	4.57	0.59
1940–50	1.66	3.13	−1.83	−1.57	−1.71	−0.11
1950–60	2.36	3.49	−0.61	−1.16	−3.94	−0.50
1960–70	1.96	2.31	0.56	0.78	0.41	0.46
1900–70	2.30	3.40	0.52	0.60	4.70[f]	1.06

na—not applicable.

* Percentage smaller than 0.05.

a   1 April of the given year except for 1920, when census was taken on 1 January.

b   Lanai included with Maui totals in 1900.

c   Includes outlying islands, not legally part of the territory, with population of 35 in 1910, 31 in 1920, 36 in 1930, and 560 in 1940.

islands and counties of Hawaii, 1900—70

			County			
Hawaii	Niihau	Kahoolawe	Hawaii	Honolulu	Kauai	Maui
46,843	172	0	46,843	58,504	20,734	27,920
55,382	208	2	55,382	82,028[c]	23,952	30,547
64,895	191	3	64,895	123,527[c]	29,438	38,052
73,325	136	2	73,325	202,923[c]	35,942	56,146
73,276	182	1	73,276	258,256[c]	35,818	55,980
68,350	222	0	68,350	353,020	29,905	48,519
61,332	254	0	61,332	500,409	28,176	42,855
63,468	237	0	63,468	630,528[d]	29,761	46,156
30.4	0.1	0	30.4	38.0	13.5	18.1
28.9	0.1	*	28.9	42.7	12.5	15.9
25.4	*	*	25.4	48.3	11.5	14.9
19.9	*	*	19.9	55.1	9.8	15.2
17.3	*	*	17.3	61.0	8.5	13.2
13.7	*	0	13.7	70.6	6.0	9.7
9.7	*	0	9.7	79.1	4.5	6.7 ·
8.3	*	0	8.3	81.9	3.9	6.0
1.67	1.90	na	1.67	3.38	1.44	0.90
1.63	−0.87	na	1.63	4.20	2.14	2.25
1.19	−3.31	na	1.19	4.84	1.97	3.80
−0.01	2.91	na	−0.01	2.41	−0.03	−0.03
−0.70	1.99	na	−0.70	3.13	−1.80	−1.43
−1.08	1.35	na	−1.08	3.49	−0.60	−1.24
0.34	−0.69	na	0.34	2.29	0.55	0.74
0.43	0.46	na	0.43	3.40	0.52	0.72

d Final revised totals. The revised totals are not available broken down by age and sex; therefore the unrevised totals are used when such a breakdown is needed.

e Calculated by the formula $r = 100 \left[\dfrac{\log_e (\frac{P_2}{P_1})}{t} \right]$.

f 1910—70.

SOURCES: United States, Bureau of the Census (1932a, tables 3, 5; 1953, table 4; 1961, table 27; 1971b, table 35).

TABLE 2 Population and percentage change in population, 1960 and 1970, and land area and density, 1970: islands and counties of Hawaii

Area	Land area (square miles)	Population 1970	Density[a] 1970	Population 1960	Percentage change in population, 1960–70
Hawaii State	6,425	769,913	119.8	632,772	21.7
Counties					
Hawaii	4,037	63,468	15.7	61,332	3.5
Honolulu	596	630,528	1,057.9	500,409	26.0
Kauai	619	29,761	48.1	28,176	5.6
Maui	1,173	46,156	39.3	42,855	7.7
Islands					
Hawaii	4,037	63,468	15.7	61,332	3.5
Kahoolawe	45	0	0	0	0
Kauai	549	29,524	53.8	27,922	5.7
Lanai	140	2,204	15.7	2,115	4.2
Maui	728	38,691	53.1	35,717	8.3
Molokai	261	5,261	20.2	5,023	4.7
Niihau	69	237	3.4	254	−7.2
Oahu[b]	596	630,528	1,057.9	500,409	26.0
City of Honolulu[b]	87	324,871	3,734.1	294,194	10.4
Outside central city	509	305,667	600.5	206,215	48.2

a Population per square mile.

b Includes area (3 square miles) and population (31) of outlying islands.

SOURCES: State of Hawaii, Department of Planning and Economic Development, *State Data Book, 1971*, table 41; United States, Bureau of the Census (1971c, tables 9, 13).

FIGURE 2 Population density by island: Hawaii, 1970

NIIHAU 3

KAUAI 54

Kauai County
Honolulu County

OAHU 1,058

Honolulu County
Maui County

MOLOKAI 20

0 10 20 30 40 50
Scale in miles

MAUI 53

LANAI 16

KAHOOLAWE
(Uninhabited)

Maui County
Hawaii County

OAHU 601

Honolulu 3,734

0   5   10
Scale in miles

N

HAWAII 16

0–49

50–99

100–999

1,000–2,999

3,000–3,999

Persons per
square mile
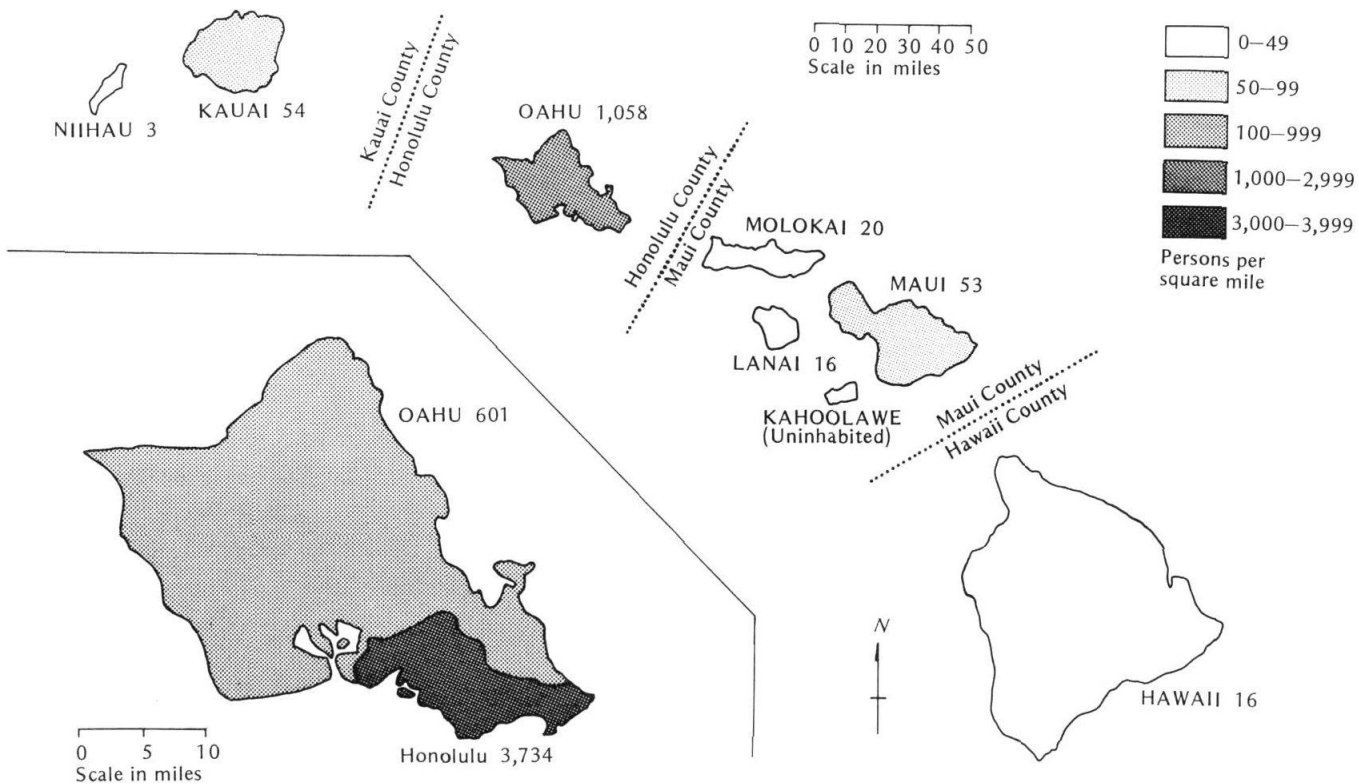
It is possible to estimate crude vital rates (births, deaths, and natural increase) for every year since 1912, the approximate date when vital registration data became fairly reliable (Table 3 and Figure 3). It appears that fertility rose after 1912, when the unadjusted crude birth rate (CBR) was 25.9 per 1,000, until about 1924, when the unadjusted CBR reached 42.0. The rise may be partly the result of increasingly complete birth registration, and it may reflect a larger proportion of women of reproductive age in the state. There may also have been a real rise in fertility. Without additional data, the exact causes of the rise in the birth rate remain unclear.

The birth rate fell from 1924 until 1944, when it reached 14.8; it then rose to about 32 in 1953–54, falling thereafter, with one small rise, to the 1973 level of about 18.3. The deep trough in Figure 3 during World War II was caused by the large numbers of military personnel, mostly males, who were stationed in the state, contributing to the denominator of the birth rate (total population) but not directly contributing to the numerator (number of births). If the members of the armed forces are removed from the calculation, the trough is flattened out and the birth rate is seen to rise irregularly after 1942.

The death rate fell irregularly from a level of 14.9 per 1,000 in 1912 to about 3.5 in 1945; it subsequently rose to about 5.5 and has stayed fairly constant since then. The trough in the graph during World War II, similar to that for the birth rate, is likewise a result of the military presence. Armed services personnel stationed in Hawaii were mostly young adults whose death rates were low.

The course of natural increase in Hawaii has paralleled that of the birth rate rather closely, since the death rate has had a rather slow and steady fall. Natural increase reached peaks of 28.9 per 1,000 in 1924 and 26.2 per 1,000 in 1954; it has since fallen to 12.8 in 1973. If net migration had been zero in 1973, the population would have grown by 1.28 percent.

The crude vital rates outline the course of fertility, mortality, and natural increase in Hawaii. In subsequent sections these phenomena will be examined with more refined measures.

POPULATION COMPOSITION

Total numbers conceal important differences and changes in population composition by age and sex, ethnicity, and civilian–military status. These compositional variables will be examined separately.

FIGURE 3 Crude birth rates, crude death rates, and rates of natural
increase: Hawaii, 1912–72
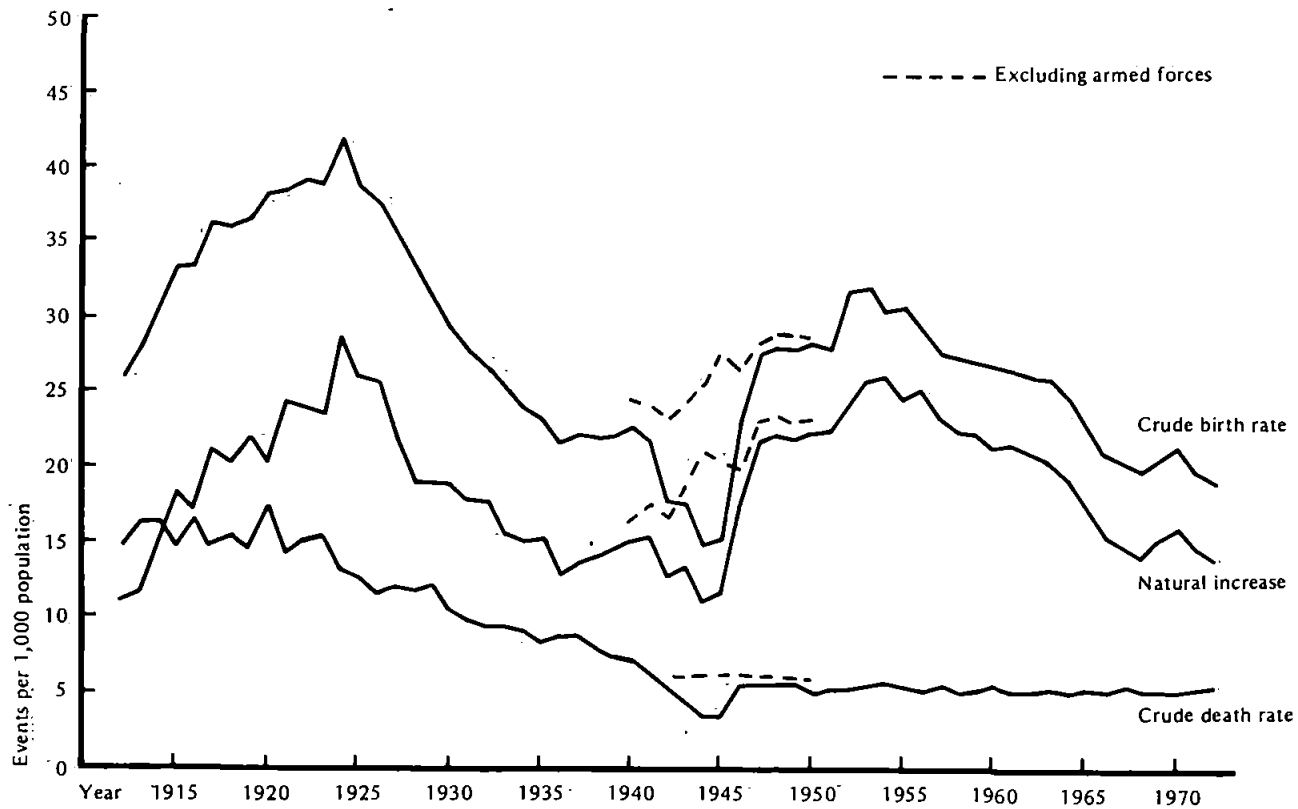
TABLE 3 Estimated mid-year population, vital events and vital rates: Hawaii, 1912–73

| Year | Mid-year population[a] | Births[b] | Deaths[c] | Natural increase | Marriages | Infant deaths | Rates per 1,000 persons | | | | Infant deaths per 1,000 births[a] |
							Births	Deaths[d]	Natural increase	Marriages	
1912	209,231	5,420	3,128	2,292	3,223	1,033	25.9	14.9	11.0	15.4	190.6
1913	217,744	6,128	3,543	2,585	3,184	1,111	28.1	16.3	11.8	14.6	181.3
1914	227,391	6,971	3,682	3,289	2,769	1,244	30.7	16.2	14.5	12.2	178.5
1915	231,210	7,719	3,447	4,272	2,705	1,210	33.4	14.9	18.5	11.7	156.8
1916	237,623	7,989	3,879	4,110	2,778	1,259	33.6	16.3	17.3	11.7	157.6
1917	250,627	9,095	3,769	5,326	2,635	1,250	36.3	15.0	21.3	10.5	137.4
1918	256,180	9,220	3,959	5,261	2,398	1,280	36.0	15.5	20.5	9.4	138.8
1919	263,666	9,633	3,881	5,752	2,013	1,019	36.5	14.7	21.8	7.6	105.8
1920	260,300	9,950	4,601	5,349	2,127	1,083	38.2	17.7	20.5	8.2	108.8
1921	275,884	10,649	3,921	6,728	2,338	1,275	38.6	14.2	24.4	8.5	119.7
1922	284,538	11,171	4,354	6,817	2,493	1,500	39.3	15.3	24.0	8.8	134.3
1923	298,500	11,724	4,644	7,080	2,795	1,587	39.3	15.6	23.7	9.4	135.4
1924	307,100	12,911	4,020	8,891	3,354	1,296	42.0	13.1	28.9	10.9	100.4
1925	323,645	12,602	4,111	8,491	2,736	1,414	38.9	12.7	26.2	8.5	112.2
1926	328,444	12,282	3,886	8,396	2,617	1,157	37.4	11.8	25.6	8.0	94.2
1927	333,420	11,821	4,037	7,784	2,626	1,150	35.5	12.1	23.4	7.9	97.3
1928	348,767	11,662	4,124	7,538	2,737	973	33.4	11.8	21.6	7.8	83.4
1929	357,649	11,235	4,383	6,852	2,565	1,135	31.4	12.3	19.1	7.2	101.0

1930	367,880	10,803	3,864	6,939	2,443	889	29.4	10.5	18.9	6.6	82.3
1931	377,530	10,469	3,730	6,739	2,629	799	27.7	9.9	17.9	7.0	76.3
1932	385,013	10,500	3,670	6,830	2,726	799	27.3	9.5	17.7	7.1	76.1
1933	383,973	9,635	3,648	5,987	2,621	695	25.1	9.5	15.6	6.8	72.1
1934	384,331	9,313	3,455	5,858	2,838	699	24.2	9.0	15.2	7.4	75.1
1935	389,562	9,199	3,306	5,893	2,985	620	23.6	8.5	15.1	7.7	67.4
1936	396,072	8,594	3,434	5,160	3,292	627	21.7	8.7	13.0	8.3	73.0
1937	400,816	8,984	3,547	5,437	3,556	617	22.4	8.8	13.6	8.9	68.7
1938	409,960	9,066	3,229	5,837	3,868	530	22.1	7.9	14.2	9.4	58.5
1939	415,705	9,271	3,128	6,143	3,963	489	22.3	7.5	14.8	9.5	52.7
1940	427,884	9,650	3,086	6,564	5,355	422	22.6	7.2	15.3	12.5	43.7
1941	459,335	10,124	2,973	7,151	6,066	408	22.0	6.5	15.5	13.2	40.3
1942	582,026	10,406	3,010	7,396	7,093	406	17.9	5.2	12.7	12.2	39.0
1943	649,650	11,638	2,902	8,736	4,984	444	17.9	4.5	13.4	7.7	38.2
1944	858,945	12,697	3,037	9,660	4,882	389	14.8	3.5	11.3	5.7	30.6
1945	814,601	12,299	2,829	9,470	4,978	340	15.1	3.5	11.6	6.1	27.6
1946	545,439	12,684	3,082	9,602	5,945	389	23.3	5.7	17.6	10.9	30.7
1947	526,238	14,597	3,118	11,479	5,846	449	27.7	5.9	21.8	11.1	30.8
1948	517,013	14,482	3,023	11,459	5,671	415	28.0	5.8	22.2	11.0	28.7
1949	511,039	14,223	2,965	11,258	5,316	358	27.8	5.8	22.0	10.4	25.2
1950	497,980	14,059	2,883	11,176	5,575	335	28.2	5.8	22.4	11.2	23.8
1951	514,256	14,463	2,819	11,644	5,860	341	28.1	5.5	22.6	11.4	23.6

TABLE 3 *(continued)*

Year	Mid-year population[a]	Births[b]	Deaths[c]	Natural increase	Marriages	Infant deaths	Rates per 1,000 persons				Infant deaths per 1,000 births[a]
							Births	Deaths[d]	Natural increase	Marriages	
1952	517,378	15,612	2,831	12,781	5,743	331	30.2	5.5	24.7	11.1	21.2
1953	509,947	16,103	2,849	13,254	5,633	338	31.6	5.6	26.0	11.0	21.0
1954	505,461	16,191	2,934	13,257	5,362	363	32.0	5.8	26.2	10.6	22.4
1955	539,292	16,305	3,087	13,218	5,431	336	30.2	5.7	24.5	10.1	20.6
1956	558,575	17,122	3,038	14,084	5,158	384	30.7	5.4	25.3	9.2	22.4
1957	584,466	17,040	3,285	13,755	4,897	407	29.2	5.6	23.6	8.4	23.9
1958	605,356	16,710	3,072	13,638	4,727	385	27.6	5.1	22.5	7.8	23.0
1959	622,087	17,050	3,246	13,804	4,958	409	27.4	5.2	22.2	8.0	24.0
1960	641,520	17,193	3,540	13,653	5,237	399	26.8	5.5	21.3	8.2	23.2
1961	658,684	17,558	3,367	14,191	5,298	381	26.7	5.1	21.6	8.0	21.7
1962	683,513	17,932	3,512	14,420	5,484	369	26.2	5.1	21.1	8.0	20.6
1963	682,241	17,744	3,643	14,101	5,750	399	26.0	5.3	20.7	8.4	22.5
1964	699,858	17,284	3,638	13,646	5,790	342	24.7	5.2	19.5	8.3	19.8
1965	703,804	16,259	3,705	12,554	6,071	349	23.1	5.3	17.8	8.6	21.5
1966	710,325	14,943	3,770	11,173	5,792	282	21.0	5.3	15.7	8.2	18.9
1967	722,528	14,765	3,897	10,868	7,345	250	20.4	5.4	15.0	10.2	16.9
1968	734,456	14,595	4,192	10,403	9,021	277	19.9	5.7	14.2	12.3	19.0
1969	750,228	15,690	4,146	11,544	9,891	298	20.9	5.5	15.4	13.2	19.0

1970	773,212	16,467	4,132	12,335	10,562	302	21.3	5.3	16.0	13.7	18.3
1971	790,413	15,845	4,304	11,541	9,734	254	20.0	5.3	14.6	12.3	16.0
1972	808,560	15,413	4,494	10,919	9,750	271	19.1	5.5	13.5	12.1	17.6
1973[e]	832,253	15,267	4,589	10,678	9,755	207	18.3	5.5	12.8	11.7	13.6

a Includes military personnel and dependents. Figures for 1912—29 are Department of Health estimates, not revised in the light of census counts.

b Births are unadjusted for underenumeration.

c Total registered deaths, 1912—39. Civilian registered deaths only, 1940—72.

d Death rate for total population, 1912—39. For 1940—72, the numerator excludes military deaths but the denominator includes military personnel. Thus, the crude death rate for 1940—72 is to some extent an underestimate of the actual death rate for the total population. For most years the number of military deaths is negligible, but for 1941, for instance, there were more than 2,500 military deaths, mostly due to the attack on Pearl Harbor, and these are not included.

e Preliminary figures.

SOURCES: State of Hawaii, Department of Planning and Economic Development, *State Data Book, 1972*, tables 3, 18; *Statistical Report*, no. 81.

Age and Sex Distribution

Tables 4 and 5 and Figure 4 reveal how the age and sex composition of Hawaii's population has changed in the past 70 years. At the start of the century the age distribution, especially that of the males, was badly distorted primarily because of the effects of heavy immigration in previous years. As time passed, the population grew, migration became a less important factor in growth, and the age and sex distribution of the state assumed a more "natural" shape (Figure 4).

Irregularities are still present, however, and may be seen in the age pyramids for recent years. In 1970 the male age distribution was distorted by the heavy concentration of military men in the 20–24 age group. The effect of recently falling fertility may be seen in the contraction of the age pyramids at the youngest ages in 1970. Similarly, the low birth rates of the 1930s show up as contractions at ages 10–19 in 1950, 20–29 in 1960, and 30–39 in 1970.

The trend in sex ratios (number of males per female) for the years 1900–70 also shows the effect of migration patterns (Table 6). In the early years of the century, sex ratios at young ages were normal (1.05–1.06 males per female is about normal at birth); but in the young adult ages the sex ratios were heavily male because of strongly male-dominant immigration from the Orient. These cohorts can be followed through time as they age, their traces eventually disappearing from the age pyramids.

Today the sex ratios for most ages are closer to normal than they once were, but they still show the effects of the past. For example, comparison of the 1960 and 1970 sex ratios by age with those that would be expected solely on the basis of current mortality reveals some striking dissimilarities (Table 6). Figure 5 illustrates the effects of several phenomena on the sex structure of Hawaii's population. The peaks for the total population in the young adult ages are caused by members of the armed forces and thus do not appear for the civilian population. By contrast, for the civilians there is a trough in the sex ratios for young adults. This might be due to several forces: out-migration of young males to the U.S. mainland, entry into the armed forces of young males, or perhaps even in-migration dominated by females. The problems in identifying the civilian and military populations, discussed below, must also be considered.

The peak in 1960 at ages 50–54 of 1.6 males per female, and in 1970 at ages 60–64 of 1.4, can be traced backward in time to 1930 and represents the aging of the cohorts subjected to strongly male immigration between 1920 and 1930. The 1960 peak at ages 70–74

FIGURE 4 Population by sex and age: Hawaii, 1900–70

Male / Female

75 and over
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4

50 40 30 20 10 0   0 10 20 30 40 50

Population in thousands

1900 1910
1920 1930 1940
1950 1960 1970

Civilian Total
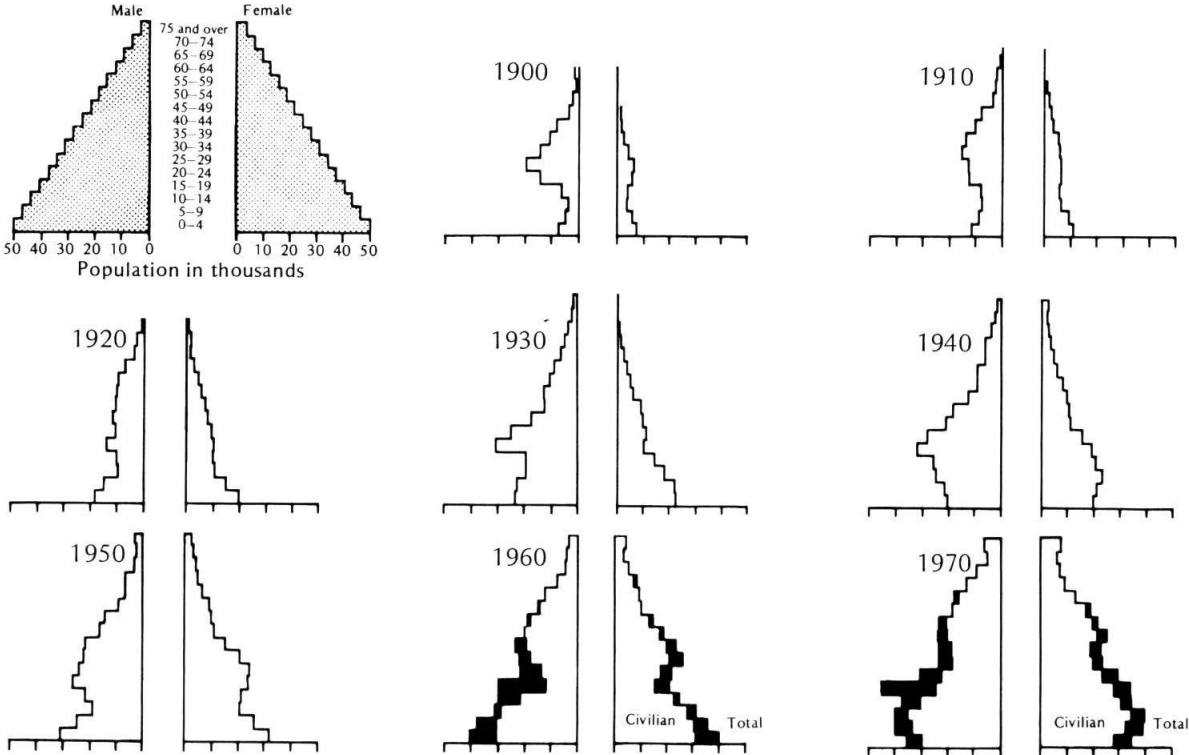
TABLE 4 Population by sex and age: Hawaii, 1900—70

Age group	1900	1910	1920	1930	1940	1950	1960	1970
Males								
0—4	7,734	12,170	19,496	24,530	20,411	32,817	41,266	36,256
5—9	5,701	9,642	15,477	23,894	21,951	26,626	37,175	40,990
10—14	4,484	7,109	11,263	19,235	24,110	20,402	32,679	40,791
15—19	6,633	7,865	11,546	19,324	26,359	23,467	30,622	37,275
20—24	15,067	13,608	14,820	31,778	32,044	27,539	30,403	46,807
25—29	20,008	13,451	11,639	25,333	27,114	25,967	22,411	30,358
30—34	15,107	15,071	12,927	17,263	21,571	23,143	24,177	23,846
35—39	11,302	14,257	11,827	12,844	17,969	22,644	25,167	23,084
40—44	7,793	10,593	11,915	12,082	12,963	17,915	21,443	23,749
45—49	4,364	7,529	10,972	10,077	9,648	15,353	19,567	23,347
50—54	2,626	4,635	7,516	8,968	9,422	10,704	15,876	19,620
55—59	1,529	2,648	4,541	6,882	6,853	7,445	13,103	17,037
60—64	1,907	2,296	3,777	4,966	6,058	7,491	8,572	13,791
65—69	851	1,073	1,887	2,849	4,472	4,979	5,527	9,671
70—74	434	567	796	1,438	2,295	3,665	5,021	5,781
75 and over	459	548	668	1,115	1,792	3,738	5,164	6,802
Unknown	370	37	79	62	103	0	0	0
All age groups	106,369	123,099	151,146	222,640	245,135	273,895	338,173	399,205

Females

Age								
0—4	7,350	11,895	19,054	23,650	19,674	31,174	39,696	34,555
5—9	5,448	9,413	14,718	23,225	21,480	25,168	35,603	38,846
10—14	3,954	6,428	10,797	18,807	23,384	19,950	31,339	39,021
15—19	4,211	5,785	9,099	14,166	21,979	20,441	24,199	34,568
20—24	6,003	6,468	9,943	10,989	19,033	22,817	20,203	34,748
25—29	6,533	6,995	9,856	11,338	15,215	23,717	22,142	29,101
30—34	4,371	6,453	7,758	10,211	11,816	19,747	24,759	23,787
35—39	3,102	5,409	7,085	9,407	10,919	14,883	24,078	23,601
40—44	2,004	3,416	5,646	6,674	9,148	10,831	18,915	25,095
45—49	1,447	2,327	4,144	5,560	7,839	9,790	13,918	22,852
50—54	900	1,590	2,550	4,472	5,694	8,202	10,189	18,433
55—59	617	956	1,540	3,061	4,275	6,480	8,909	13,306
60—64	566	606	1,098	1,859	3,332	4,662	7,199	9,581
65—69	332	431	651	1,009	2,193	3,449	5,432	7,987
70—74	263	284	365	575	1,152	2,306	3,667	6,050
75 and over	338	335	428	652	1,010	2,282	4,351	7,825
Unknown	193	19	34	41	52	0	0	0
All age groups	47,632	68,810	104,766	145,696	178,195	225,899	294,599	369,356
Both sexes	154,001	191,909[a]	255,912[a]	368,336[a]	423,330[a]	499,794	632,772	768,561[b]

a   Includes population of outlying islands not legally part of the territory. See footnote c, Table 1.

b   Revised total for the state is 769,913; breakdown by age and sex is unavailable.

SOURCES: United States, Bureau of the Census (1953, table 11; 1961, table 16; 1971b, table 20).

TABLE 5 Percentage distribution of the population by sex and age: Hawaii, 1900—70

Age group	1900	1910	1920	1930	1940	1950	1960	1970
Males								
Under 1 year	1.68	2.26	2.92	2.20	1.74	2.36	2.56	1.96
1—4	5.59	7.62	9.98	8.82	6.59	9.63	9.64	7.12
5—9	5.36	7.83	10.24	10.73	8.95	9.72	10.99	10.27
10—14	4.22	5.78	7.45	8.64	9.84	7.45	9.66	10.22
15—19	6.24	6.39	7.64	8.68	10.75	8.57	9.06	9.34
20—24	14.16	11.05	9.81	14.27	13.07	10.05	8.99	11.73
25—29	18.81	10.93	7.70	11.38	11.05	9.48	6.63	7.60
30—34	14.20	12.24	8.56	7.75	8.80	8.45	7.15	5.97
35—39	10.63	11.58	7.83	5.77	7.33	8.27	7.44	5.78
40—44	7.33	8.61	7.89	5.43	5.29	6.54	6.34	5.95
45—49	4.10	6.12	7.26	4.53	3.94	5.61	5.79	5.85
50—54	2.47	3.77	4.97	4.03	3.84	3.91	4.69	4.91
55—59	1.44	2.15	3.01	3.09	2.80	2.72	3.87	4.27
60—64	1.79	1.87	2.50	2.23	2.47	2.73	2.53	3.45
65—69	0.80	0.87	1.25	1.28	1.82	1.82	1.63	2.42
70—74	0.41	0.46	0.53	0.65	0.94	1.34	1.48	1.45
75 and over	0.43	0.45	0.44	0.50	0.73	1.36	1.53	1.71
Unknown	0.35	0.03	0.05	0.03	0.04	0	0	0
All age groups	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Females								
Under 1 year	3.45	3.97	3.97	3.21	2.28	2.73	2.78	1.99
1—4	11.99	13.32	14.21	13.02	8.77	11.07	10.69	7.37
5—9	11.44	13.68	14.05	15.94	12.05	11.14	12.09	10.52
10—14	8.30	9.34	10.31	12.91	13.12	8.83	10.64	10.56
15—19	8.84	8.41	8.69	9.72	12.33	9.05	8.21	9.36
20—24	12.60	9.40	9.49	7.53	10.68	10.10	6.86	9.41
25—29	13.72	10.17	9.41	7.78	8.54	10.50	7.52	7.88
30—34	9.18	9.38	7.41	7.01	6.63	8.74	8.40	6.44
35—39	6.51	7.86	6.76	6.46	6.13	6.59	8.17	6.39
40—44	4.21	4.96	5.39	4.58	5.13	4.79	6.42	6.79
45—49	3.04	3.38	3.96	3.82	4.40	4.33	4.72	6.19
50—54	1.89	2.31	2.43	3.07	3.20	3.63	3.46	4.99
55—59	1.30	1.39	1.47	2.10	2.40	2.87	3.02	3.60
60—64	1.19	0.88	1.05	1.28	1.87	2.06	2.44	2.59
65—69	0.70	0.63	0.62	0.69	1.23	1.53	1.84	2.14
70—74	0.55	0.41	0.35	0.39	0.65	1.02	1.24	1.64
75 and over	0.71	0.49	0.41	0.45	0.57	1.01	1.48	2.12
Unknown	0.41	0.03	0.03	0.03	0.03	0	0	0
All age groups	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

SOURCE: Table 4.

TABLE 6 Sex ratios by age for total population, 1900—70; for civilian population, 1960—70; and for stationary population, 1970: Hawaii

(Males per female)

| Age group | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | Civilian population | | Stationary population[a] |
									1960	1970	1970
0—4	1.052	1.023	1.023	1.037	1.037	1.053	1.040	1.049	1.042	1.061	1.0626
5—9	1.046	1.024	1.052	1.029	1.022	1.058	1.044	1.055	1.062	1.049	1.0625
10—14	1.134	1.106	1.043	1.023	1.031	1.023	1.043	1.045	1.044	1.038	1.0623
15—19	1.575	1.360	1.269	1.364	1.199	1.148	1.265	1.078	1.019	1.004	1.0602
20—24	2.510	2.104	1.490	2.892	1.684	1.207	1.505	1.347	0.822	0.833	1.0562
25—29	3.062	1.923	1.181	2.234	1.782	1.095	1.012	1.043	0.857	0.954	1.0513
30—34	3.456	2.336	1.666	1.691	1.826	1.172	0.976	1.002	0.853	0.908	1.0475
35—39	3.643	2.636	1.669	1.365	1.646	1.521	1.045	0.978	0.984	0.941	1.0443
40—44	3.889	3.101	2.110	1.810	1.417	1.654	1.134	0.946	1.108	0.879	1.0375
45—49	3.016	3.236	2.648	1.812	1.231	1.568	1.406	1.022	1.343	0.992	1.0264
50—54	2.918	2.915	2.947	2.005	1.655	1.305	1.558	1.064	1.470	1.045	1.0102
55—59	2.478	2.770	2.949	2.248	1.603	1.149	1.471	1.280	1.427	1.285	0.9877
60—64	3.369	3.789	3.440	2.671	1.818	1.607	1.191	1.439	1.215	1.451	0.9514
65—69	2.643	2.490	2.899	2.823	2.039	1.444	1.017	1.211	0.992	1.226	0.8950
70—74	1.650	1.996	2.181	2.501	1.992	1.589	1.369	0.956	1.321	0.967	0.8243
75 and over	1.358	1.636	1.561	1.711	1.775	1.638	1.187	0.870	1.204	0.873	0.6154
Unknown	1.917	1.947	2.324	1.512	1.981	0	0	0	0	0	0
All age groups	2.234	1.789	1.443	1.528	1.376	1.212	1.148	1.081	1.058	1.007	0.9763

a Calculated by multiplying the 1970 sex ratio at birth by the male $_5L_x$ column of the 1969—71 life table and dividing by the female $_5L_x$ column.

SOURCES: Tables 4 and 10.

FIGURE 5 Sex ratios of the civilian and total populations, 1960 and 1970, and of the stationary population, 1970: Hawaii
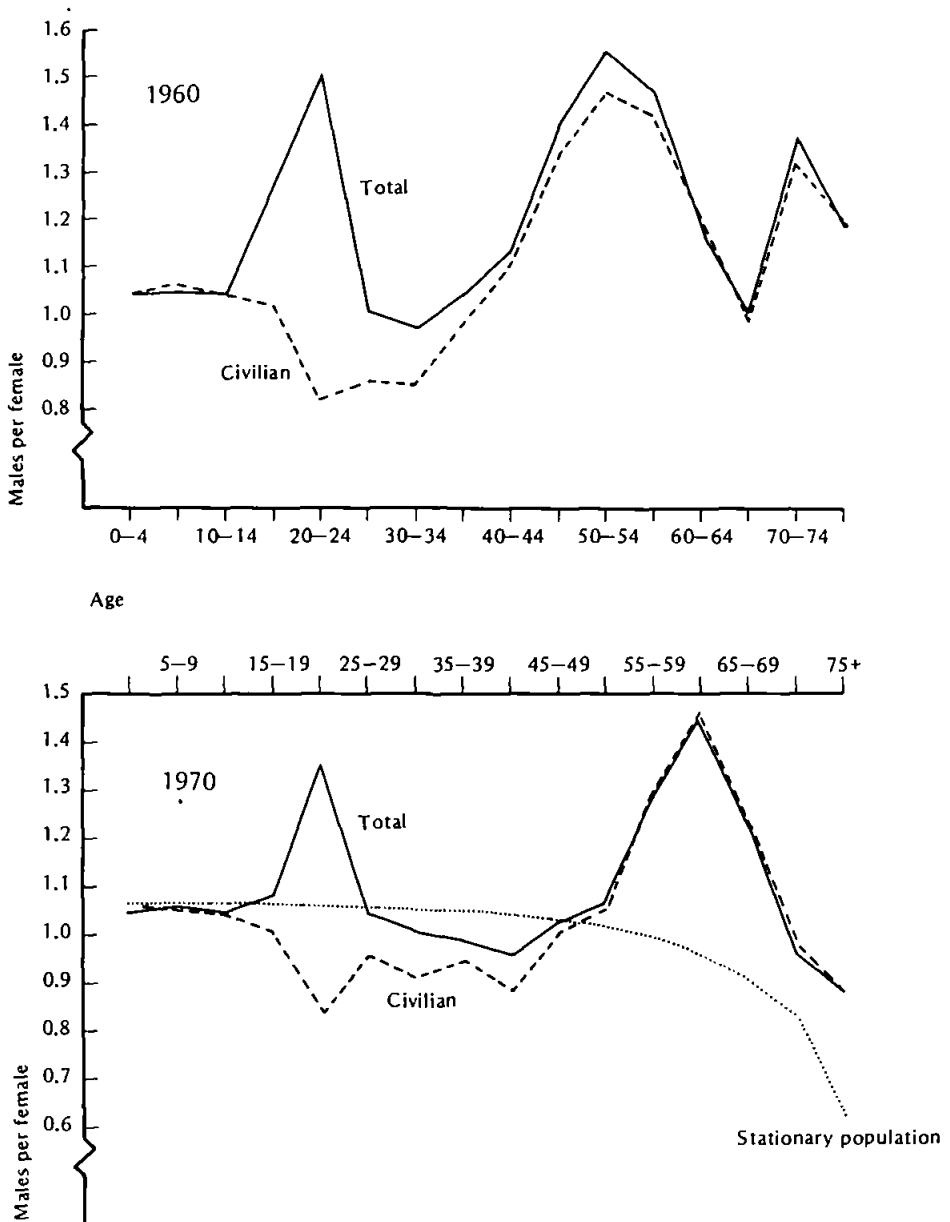
TABLE 7 Sex ratios of five-year birth cohorts: Hawaii, 1900—70
(Males per female)

Approximate date of birth of cohort	1900	1910	1920	1930	1940	1950	1960	1970
1870—74	3.062	2.636	2.648	2.248	2.039	1.638	u	u
1875—79	2.510	2.336	2.110	2.005	1.818	1.589	1.218	u
1880—84	1.575	1.923	1.669	1.812	1.603	1.444	1.160	u
1885—89	1.134	2.104	1.666	1.810	1.655	1.607	1.369	0.967
1890—94	1.046	1.360	1.181	1.365	1.231	1.149	1.017	0.773
1895—99	1.052	1.106	1.490	1.691	1.417	1.305	1.191	0.956
1900—04	u	1.024	1.269	2.234	1.646	1.568	1.471	1.211
1905—09	u	1.023	1.043	2.892	1.826	1.654	1.558	1.439
1910—14	u	u	1.052	1.364	1.782	1.521	1.406	1.280
1915—19	u	u	1.023	1.023	1.684	1.172	1.134	1.064
1920—24	u	u	u	1.029	1.199	1.095	1.045	1.022
1925—29	u	u	u	1.037	1.031	1.207	0.976	0.946
1930—34	u	u	u	u	1.022	1.148	1.012	0.978
1935—39	u	u	u	u	1.037	1.023	1.505	1.002
1940—44	u	u	u	u	u	1.058	1.265	1.043
1945—49	u	u	u	u	u	1.053	1.043	1.347
1950—54	u	u	u	u	u	u	1.044	1.078
1955—59	u	u	u	u	u	u	1.040	1.045
1960—64	u	u	u	u	u	u	u	1.055
1965—69	u	u	u	u	u	u	u	1.049

u—unavailable.
SOURCE: Table 6.

of 1.4 can similarly be traced back to 1910. By 1970 this cohort had its male dominance partly eroded by differential mortality favoring females and further masked by its inclusion with older cohorts in the table.

An alternate way of looking at the pattern of sex ratios over time is to follow approximate birth cohorts (Table 7). This reveals changes in the sex ratios that are due to various forces. For instance, the sex ratio

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TABLE 8 Sex ratios by age: counties of Hawaii, 1970
(Males per female)

Age group	County Honolulu	Hawaii	Kauai	Maui	State of Hawaii
0–4	1.048	1.043	1.093	1.054	1.049
5–9	1.054	1.056	1.085	1.045	1.055
10–14	1.048	1.094	0.953	1.015	1.045
15–19	1.091	1.016	1.079	1.002	1.078
20–24	1.401	0.946	0.949	0.949	1.347
25–29	1.056	1.045	0.936	0.891	1.043
30–34	1.020	0.907	0.887	0.914	1.002
35–39	1.001	0.869	0.906	0.832	0.978
40–44	0.943	0.970	1.032	0.910	0.946
45–49	1.017	1.006	1.082	1.060	1.022
50–54	1.059	1.081	1.023	1.126	1.064
55–59	1.246	1.339	1.507	1.378	1.280
60–64	1.331	1.701	2.014	1.671	1.439
65–69	1.126	1.439	1.436	1.472	1.211
70–74	0.859	1.235	1.213	1.301	0.956
75 and over	0.782	1.148	1.280	1.010	0.869
All age groups	1.083	1.076	1.095	1.056	1.081

SOURCES: United States, Bureau of the Census (1971b, tables 21, 35).

of the 1900–04 cohort rises until 1930 when it peaks at 2.2 males per female, almost certainly because of immigration. It then falls, probably primarily because of heavier male mortality. The transient effect of the military is also noticeable, for example in 1940 for the 1910–19 cohort, in 1960 for the 1935–39 cohort, and in 1970 for the 1945–49 cohort.

That the sex ratios of Honolulu County closely parallel those of the state is not unexpected, since the population of the county makes up such a large percentage of the total (Table 8). The other counties have values lower than those of Honolulu County for the young adult ages (15–39), when men might be expected to leave in search of greater opportunities. In contrast, at the ages of 55 and above, the other coun-

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marriage of succeeding generations, persons of full and part-Hawaiian parentage were separately tallied in the censuses of 1940–60.

Through the 1960 census, other persons of mixed racial background were classified according to the race of the nonwhite parent if one parent was white, or according to the race of the father in cases of nonwhite races where no Hawaiian blood was involved. This approach was somewhat modified in 1970, with the result that several discontinuities appeared. The 1970 census classification of ethnicity was based upon self-identification of race by the respondent. Persons of mixed parentage who expressed doubt as to their classification were advised to list the race of the father. The combination of these two changes has resulted in a lack of comparability between 1960 and 1970 for several censuses of Hawaii, are counted in this presentation with Caucasians for all censuses since 1900 (Table 9).

Intermarriage has been the source of most of the racial confusion for census tabulations. The early classification of Hawaiians as "natives" and "half-natives" was later altered to "Hawaiians" and "part-Hawaiians," and these terms were in turn refined in the period 1910–40 to "Caucasian-Hawaiian" and "Asiatic-Hawaiian." With the interties show higher sex ratios than Honolulu. This is most likely the result of past male-dominated immigration to these counties.

Ethnic Composition

The analysis of ethnic composition presents one of the most interesting and complex statistical problems in Hawaiian demography. Because of the unique history of this island state, with the depopulation of native Hawaiians, heavy migration from many places, and much interracial marriage, there has been no racial majority for many years. Interpretations and definitions of race have varied over the years, and Hawaiian terms have often been used in social definitions of racial groups, such as *haole* (outsider or stranger) for Caucasians. Census and health surveys incorporating racial data have not followed a consistent pattern of definitions, and this has resulted in a lack of comparability of data.

In this study, persons from, or with ancestry from, China, Japan, and the Philippines are classified as Chinese, Japanese, and Filipinos. Blacks and Indians of American descent are tallied as Negro and Indian. Caucasians are defined as persons of European ancestry, including white Americans, Britons, Norwegians, Germans, Swedes, Finns, and other northern Europeans. Portuguese, Spaniards, and Puerto Ricans, who were tabulated as separate groups in the early

racial groups, notably the Caucasians, whose percentage of the total seemed to increase, and the Japanese, whose percentage dropped. In 1970 the Hawaiian and part-Hawaiian categories were combined. The decrease in the number of "part-Hawaiians" between 1960 and 1970 is attributable at least in part to the reclassification of part-Hawaiians as Chinese and Caucasians and not necessarily to a reduction in the number of persons of part-Hawaiian ancestry.

The residual "other" category includes East Indians, South Pacific Islanders, and others. Although the number of Samoans and Micronesians who arrived in Hawaii between 1960 and 1970 is known to be significant, these persons were not tabulated as separate ethnic groups in the 1970 census.

An excellent, short discussion of the problem of racial definition in Hawaii is found in Schmitt (1973). This source also has a useful table comparing figures from the 1930–70 censuses and the 1969–71 Health Survey.

Keeping in mind the definitional problems, one can make several observations about the ethnic composition of the state since 1900 (Figure 6). With the exception of the Hawaiians, all of the ethnic groups have shown almost continuous, though erratic, growth. Of the major groups, the Filipinos have experienced the fastest average annual growth rate for the period: 6.16 percent (1910–70). Caucasians rank next, at 3.35 percent, whereas the Koreans at 1.25 percent and the Chinese at 1.01 percent show the lowest growth rates.

As a result of these differentials, Caucasians now make up over 39 percent of the population, according to U.S. Census definitions, whereas the Japanese have fallen from 42.7 percent in 1920 to 28.3 percent in 1970. The Filipinos have gone from 17.1 percent in 1930 to 10.9 percent in 1960 and back to 12.4 percent in 1970.[1] Definitional discrepancies are evident when U.S. Census and Health Survey figures are compared, especially for Chinese and part-Hawaiians.

Civilian—Military Composition

A problem almost as confusing and as important as the ethnic problem is that of the military status of the population. (The military population

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[1] Figures from the 1969–71 Health Survey (Hawaii, Department of Health, 1973b) show the following: Caucasian, 231,896 (31.37 percent); Chinese, 31,023 (4.20 percent); Filipino, 58,667 (7.94 percent); Hawaiian and part-Hawaiian, 135,152 (18.28 percent); Japanese, 199,099 (26.93 percent); Korean, 6,352 (0.86 percent); Negro, 4,847 (0.66 percent); Samoan, 6,753 (0.91 percent); others, 65,472 (8.86 percent).

TABLE 9 Ethnic composition and rates of growth: Hawaii, 1900–70

Year[a]	Total	Caucasian[b]	Negro	Japanese	Indian	Chinese	Hawaiian	Part-Hawaiian	Filipino	Korean	Other
Population											
1900	154,001	28,819	233	61,111	u	25,767	29,799	7,857	u	u	415
1910	191,909	44,048	695	79,675	u	21,674	26,041	12,506	2,361	4,533	376
1920	255,912	54,742	348	109,274	u	23,507	23,723	18,027	21,031	4,950	310
1930	368,336	80,373	563	139,631	u	27,179	22,636	28,224	63,052	6,461	217
1940	423,330	112,087	255	157,905	u	28,774	14,375	49,935	52,569	6,851	579
1950[c]	499,769	124,344	2,651	184,598	u	32,376	12,245	73,845	61,062	7,030	1,618
1960	632,772	202,230	4,943	203,455	472	38,197	11,294	91,109	69,070	u	12,306
1970[d]	768,559	301,429	7,517	217,669	1,216	52,375	e	71,274	95,354	9,625	12,100
Percentage distribution											
1900	100.0	18.7	0.2	39.7	u	16.7	19.3	5.1	u	u	0.3
1910	100.0	23.0	0.4	41.5	u	11.3	13.6	6.5	1.2	2.4	0.1
1920	100.0	21.4	0.1	42.7	u	9.2	9.3	7.0	8.2	1.9	0.2
1930	100.0	21.8	0.2	37.9	u	7.4	6.1	7.7	17.1	1.8	0.1
1940	100.0	26.5	0.1	37.3	u	6.8	3.4	11.8	12.4	1.6	0.2
1950	100.0	24.9	0.5	36.9	u	6.5	2.5	14.8	12.2	1.4	0.3
1960	100.0	32.0	0.8	32.2	0.1	6.0	1.7	14.4	10.9	u	1.9
1970	100.0	39.2	1.0	28.3	0.2	6.8	e	9.3	12.4	1.3	1.6

Average annual growth rates $(\times 100)^f$

1900–10	2.20	4.24	10.93	2.65	u	−1.73	−1.35	4.65	u	u	g
1910–20	2.95	2.23	7.09	3.24	u	0.83	0.96	3.75	22.43	0.88	g
1920–30	3.55	3.75	4.69	2.39	u	1.42	0.46	4.37	10.71	2.66	g
1930–40	1.39	3.32	−7.92	1.23	u	0.57	−4.54	5.71	−1.82	0.59	g
1940–50	1.66	1.04	23.41	1.56	u	1.18	−1.60	3.91	1.50	0.26	g
1950–60	2.36	4.86	6.23	0.97	u	1.65	−1.54	2.15	1.23	} 1.57^h	g
1960–70	1.94	3.99	4.19	0.68	9.46	3.16	u	−2.51	3.22		g
1910–70	2.30	3.35	4.96	1.81	u	1.01	$−1.62^i$	3.15	6.16	1.25	g

u—unavailable. '

a 1 April of the given year, except for 1920, when census was taken on 1 January.

b Includes Puerto Ricans, Portuguese, Spaniards, and "other Caucasians."

c Difference between this table and Table 1 reflects differences in the underlying census tables.

d Figures for 1970 are not directly comparable with other years because of changed census definitions of race.

e Included with figure for "part-Hawaiian."

f Calculated by the formula $r = 100 \left[\dfrac{\log_e (\frac{P_2}{P_1})}{t} \right]$.

g Not calculated.

h 1950–70.

i 1900–60.

SOURCES: Lind (1967, table 2); United States, Bureau of the Census (1961, table 15; 1972a, table 139); Schmitt (1968:20).

FIGURE 6 Population by ethnic group: Hawaii, 1900—70
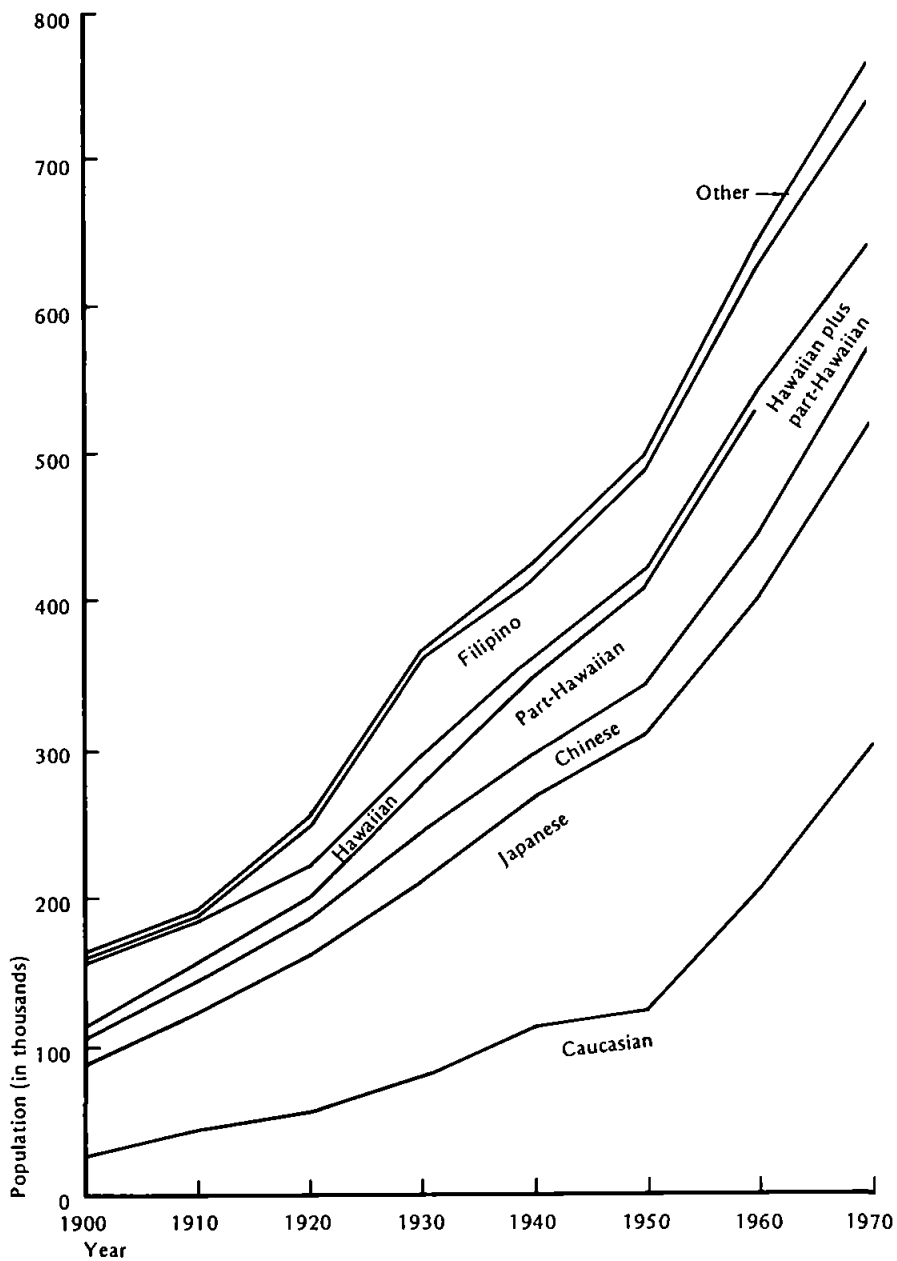
is always defined here as including all of the members of the armed forces plus all of their dependents.) As a military center of major importance, Hawaii is the location of many bases for the armed services, and the combined numbers of their personnel over the years have had many effects on the demography of the state, not all of which can be thoroughly uncovered or documented.[2] As we have seen in Table 3, for example, the total population has fluctuated greatly because of military movements, and today the military population is at least 110,000, or over 13 percent of the state's total population. Estimates differ somewhat, however, as will be discussed below.

Birth rates are affected by the military presence, both because a majority of military wives are in the childbearing ages and because within these ages fertility is higher among military wives than among women in the general population. Furthermore, large numbers of males can affect the denominator used to calculate rates; this has already been noted above (Figure 3). If the military is excluded from the calculation of the birth rate and other measures, a different picture emerges.

Migration statistics are especially affected by the military presence, because military dependents show a heavy out-migration due to the departure of the numerous babies born in the state. Figures for the 1960—70 decade reveal a net migration into Hawaii of about 10,000, but this figure climbs to about 50,000 when the military movements are excluded and represents much more realistically what is happening in Hawaii.

There are two basic approaches to estimating the division of the population of the state into military and civilian components. The method used here involves use of data from the U.S. Census. Census figures on labor force status plus special tabulations on labor force status of heads of households enable us to produce estimates of military personnel and their dependents, and by subtraction the number of civilians can be calculated.

The other approach, used by the State Department of Planning and Economic Development (DPED), involves gathering information from the military commanders of the various bases in the state. These data can be collected for periods other than census years. The DPED estimate of the civilian population is lower. Such differences create

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2 Although the absolute size of its military population ranks only twelfth among the states, Hawaii has the second highest percentage of its population (not including dependents) in the military, exceeded only by Alaska. The percentages are: Alaska, 10.5; Hawaii, 6.5; United States, 1.0.

differences in any calculations based upon them, such as birth rates and migration rates distinguished by military status.

Table 10 shows estimates of the population of the state in 1960 and 1970 by military status, age, and sex. Summary figures from the DPED are also presented for comparison; these have not been tabulated by age and sex.

As we have already observed, the contribution of the military to the total population is unevenly distributed by age and sex. The age imbalances are most obvious for the young males: the total number of military males in the age group 20–24 is three times the total of military males in any other age group. The females, mostly dependents, are also strongly concentrated in certain age groups, although not so much as the males. Because of these problems involving the military population, many of the tables and much of the analysis in this paper deal only with the civilian population. An estimate of the military, using Table 10 or DPED figures, may be added to the civilian totals for any date if one desires a count of the actual total resident population of the state.

NUPTIALITY

An important aspect of Hawaii's demography is the population's marital structure and changes in that structure over time. Because the proportion of married persons in the population is a determinant of fertility, knowledge of marital patterns sheds light on fertility behavior.

The crude marriage rate (number of marriages per 1,000 persons per year) has assumed an irregular pattern since 1912, peaking in 1924 (10.9 per 1,000 persons), 1941 (13.2), 1946–53 (10.9–11.6), and apparently in 1970 (13.7). (See Table 3.) Troughs show up in 1919 (7.6), 1930–33 (about 7), 1944 (5.7), and 1958–62 (about 8). It is possible to relate these movements to many events, some of which are purely demographic, others economic and social. For instance, the large number of marriages in 1941 were precipitated by World War II. The much lower crude marriage rate that followed can be attributed both to the influx of military personnel, which increased the denominator of the marriage rate, and to the fact that a large number of marriages that might have occurred in the mid-1940s had taken place earlier. The recent rise and plateau (1967–73) in the crude marriage rate is partly due to the many marriages that took place in Hawaii between nonresident soldiers on leave from Vietnam and their brides from the U.S. mainland.

The crude marriage rate is a relatively poor measure of the marital

behavior of a population because its denominator both is affected by such fluctuations and furthermore is not restricted to the population at risk, i.e., the unmarried population. Unfortunately, more refined measures are difficult to obtain, since they require information on the marital status of the population, information that is usually found only in the decennial census. Most of this section is devoted to an analysis of census data on marriage.

For the purposes of the following discussion we will assume the statistical effect of illegitimacy in Hawaii to be negligible and all fertility to be marital fertility.[3] If births occur only within marriage, the percentage of the married female population in the childbearing years is a determinant of the upper limits of fertility. As seen in Table 11, the percentage of married women within the ages 15–44 declined steadily from 1900 (80 percent) to 1940 (58 percent); it rose until 1960 (70 percent) and then dropped until 1970 (62 percent). For the five-year groups within the childbearing years, the general trend of the percentage married has also been downward: all ages show a decline between 1900 and 1970, although some ages do not show the steady decline until 1940 that the 15–44 age group figures do, and some of the ages, in particular the older ones, show little decline at all.

Although the percentage of the population that is currently married may fluctuate because of changing rates of divorce and widowhood, the percentage never married is not subject to such forces. The data on women in Table 12, however, agree with those in Table 11: marriage has become less prevalent over the first 70 years of this century, especially at the younger ages.

The same is not true for men. At all ages above 19, it appears that a smaller percentage of the male population was in the never-married class in 1970 than in 1900. The reason is that there was such a predominance of males in the early years of the century that it was impossible for all of them, or even a large percentage of them, to marry. As the sex ratios fell, so too did the percentage of men who were single. At all ages above 14, however, there are still higher percentages of single men than of single women.

Table 13 shows the median age at marriage for all marriages since 1946 with the exception of the years 1950–52, for which data were not published. The data show a general fall in the female median age at marriage from 1946 (23.7) until 1962 (22.8) and a gentle rise since

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.3 This is not necessarily a valid assumption (see below). The argument, however, is not seriously vitiated by the weakness of the assumption.

TABLE 10 Distribution of population by military status, age, and sex: Hawaii, 1960 and 1970

Age group	1960				1970			
	Total	Military	Dependents	Civilians	Total	Military	Dependents	Civilians
Males								
0–4	41,478	0	8,737	32,741	36,256	0	5,812	30,444
5–9	37,655	0	5,398	32,257	40,990	0	6,408	34,582
10–14	32,542	12	3,465	29,065	40,791	0	4,498	36,293
15–19	30,780	6,935	1,038	22,807	37,275	3,557	2,175	31,543
20–24	30,216	17,401	136	12,679	46,807	22,837	356	24,064
25–29	22,675	7,806	17	14,852	30,358	7,162	219	22,977
30–34	23,940	5,765	28	18,147	23,846	5,204	105	18,537
35–39	24,969	4,609	13	20,347	23,084	4,897	21	18,166
40–44	21,623	2,743	9	18,871	23,749	3,046	15	20,688
45–49	19,027	957	11	18,059	23,347	1,625	18	21,704
50–54	15,681	314	18	15,359	19,620	844	29	18,747
55–59	13,372	76	21	13,275	17,037	138	34	16,865
60–64	8,528	12	18	8,498	13,791	0	29	13,762
65–69	5,330	4	35	5,291	9,671	0	56	9,615
70–74	4,921	4	14	4,903	5,781	0	23	5,758
75 and over	4,815	0	20	4,795	6,802	0	32	6,770
All age groups	337,552	46,638	18,978	271,936	399,205	48,860	19,830	330,515

Females

0–4	39,513	0	8,101	31,412	34,555	0	5,877	28,684
5–9	35,505	0	5,119	30,386	38,846	0	5,892	32,961
10–14	31,360	0	3,509	27,851	39,021	0	4,077	34,951
15–19	24,629	26	2,219	22,384	34,568	61	3,079	31,434
20–24	20,184	224	4,525	15,435	34,748	666	5,187	28,901
25–29	21,871	83	4,456	17,332	29,101	66	4,958	24,082
30–34	25,092	60	3,762	21,270	23,787	29	3,342	20,420
35–39	23,975	58	3,236	20,681	23,601	28	4,273	19,305
40–44	18,615	65	1,520	17,030	25,095	31	1,473	23,525
45–49	14,083	51	585	13,447	22,852	25	952	21,880
50–54	10,658	40	175	10,443	18,433	19	485	17,933
55–59	9,437	14	122	9,301	13,306	0	187	13,122
60–64	7,060	4	62	6,994	9,581	0	95	9,488
65–69	5,430	4	94	5,332	7,987	0	144	7,845
70–74	3,776	0	64	3,712	6,050	0	98	5,954
75 and over	4,032	0	49	3,983	7,825	0	75	7,752
All age groups	295,220	629	37,598	256,993	369,356	925	40,194	328,237
Both sexes[a]	632,772	47,267	56,576	528,929	768,561	49,785	60,024	658,752
Both sexes (DPED)[a]	632,772	52,881	60,057	519,834	768,561	56,085	61,858	650,618

a See text for discussion of differences between U.S. Census data and the State Department of Planning and Economic Development (DPED) data.

SOURCES: State of Hawaii, Department of Planning and Economic Development (1967, table 13); United States, Bureau of the Census (1972a, tables 19, 20; 1971c, table 53; Public Use Sample Tapes for Hawaii, 1970 census).

TABLE 11 Married women, and married women as a percentage of all women, by age: Hawaii, 1900—70

Age	1900	1910	1920	1930	1940	1950	1960	1970
Number married								
14	u	u	u	u	u	4	41	78
15—19	1,569	1,640	2,027	1,739	u	1,607	3,004	3,026
20—24	5,028	5,136	7,941	6,751	u	11,460	12,855	19,429
25—29	5,833	6,292	8,957	9,743	u	18,311	18,535	23,123
30—34	3,982	5,906	7,180	9,255	u	16,981	21,988	21,317
35—44	4,496	7,921	11,645	14,345	u	21,985	37,550	41,259
14 and over	24,048	31,380	45,550	53,948	66,569	94,516	129,308	166,702
15—44	20,908	26,895	37,750	41,833	u	70,344	93,932	108,154
Percentage married								
14	u	u	u	u	u	0.1	0.7	1.0
15—19	37.3	28.3	22.3	12.3	u	7.9	12.2	8.6
20—24	83.8	79.4	79.9	61.4	u	50.2	63.7	56.4
25—29	89.3	89.9	90.9	85.9	u	78.4	84.7	79.1
30—34	91.1	91.5	92.5	90.6	u	85.9	87.6	87.7
35—44	88.1	89.8	91.5	89.2	u	85.1	88.2	87.1
14 and over	75.9	79.3	73.3	64.7	56.3	61.6	66.4	62.9
15—44	79.7	77.9	76.4	66.6	57.8[a]	62.7	69.9	61.7

u—unavailable.

a Estimated by averaging the differences between ages 14 and over and 15—44 for 1930 and 1950.

SOURCES: United States, Bureau of the Census (1953:52-48; 1962, table 105; 1972a, table 152).

1969. The male median age fell more steeply from a high in 1947 (27.4) to a low in 1968 (24.4) and has also risen since then (to 25.5 in 1971).

The difference between the male and female median ages at marriage was rather steady at between 2.5 and 2.1 years from 1953 until 1965, after which time it fell, and then rose again in 1971.

TABLE 12 Percentage never married by sex and age: Hawaii, 1900—70

Age	1900	1910	1920	1930	1940	1950	1960	1970
Females								
14	100.0	100.0	100.0	100.0	u	99.8	99.2	98.6
15—19	62.4	70.9	77.2	87.4	u	92.0	87.6	91.1
20—24	14.9	18.9	18.6	36.8	u	48.3	34.6	41.5
25—29	7.0	7.4	7.2	11.3	u	18.6	12.4	15.7
30—34	5.2	5.1	4.5	5.6	u	9.4	8.2	8.1
35—44	4.7	3.6	3.3	4.1	u	7.1	5.7	6.0
45—54	3.8	4.0	3.3	3.6	u	4.6	5.8	5.2
14 and over	17.2	18.7	20.4	27.6	34.5	28.3	22.7	25.6
15—44	17.0	18.8	21.0	30.2	38.6[a]	33.8	26.6	32.5
Males								
14	100.0	100.0	100.0	100.0	u	99.8	99.5	98.4
15—19	95.7	97.6	98.1	99.0	u	98.7	96.7	96.8
20—24	83.4	80.5	78.5	87.0	u	78.4	68.0	68.0
25—29	67.8	55.6	49.3	56.0	u	40.3	30.8	31.9
30—34	53.8	44.6	27.3	32.8	u	21.1	18.2	14.4
35—44	43.3	34.6	24.1	20.0	u	24.0	11.9	10.3
45—54	35.5	27.5	25.7	17.4	u	17.7	17.1	10.4
14 and over	60.1	50.0	44.8	52.1	56.1	41.4	36.2	36.3
15—44	64.4	55.3	50.9	60.4	64.3[a]	49.6	43.6	46.2

u—unavailable.

a Estimated by averaging the differences between ages 14 and over and 15—44 for 1930 and 1950.

SOURCES: United States, Bureau of the Census (1953:52-48; 1962, table 105; 1972a, table 152).

A measure called the *singulate mean age at marriage* enables derivation of figures on marriage age by translating census data on the percentage of never-married persons without the use of any registration data at all. We can thus obtain data on marriage age prior to its availability from registration forms.

Table 14 presents the singulate mean age at marriage for the

TABLE 13 Median age at marriage by sex: Hawaii, 1946—71

Year	Males	Females	Difference in years
1946	26.9	23.7	3.2
1947	27.4	22.7	4.7
1948	26.6	23.7	2.9
1949	26.6	23.6	3.0
1950	u	u	u
1951	u	u	u
1952	u	u	u
1953	26.1	23.6	2.5
1954	25.9	23.4	2.5
1955	25.9	23.5	2.4
1956	25.6	23.6	2.0
1957	25.7	23.3	2.4
1958	25.8	23.4	2.4
1959	25.7	23.4	2.3
1960	25.5	23.1	2.4
1961	25.4	23.1	2.3
1962	25.1	22.8	2.3
1963	25.0	22.9	2.1
1964	24.9	23.1	2.2
1965	25.1	23.0	2.1
1966	24.8	23.0	1.8
1967	24.5	22.9	1.6
1968	24.4	22.9	1.5
1969	24.4	22.8	1.6
1970	24.5	23.0	1.5
1971	25.5	23.4	2.1

u—unavailable.

SOURCES: Territory of Hawaii, Board of Health; *Annual Reports;* State of Hawaii, Department of Health, *Annual Statistical Reports.*

TABLE 14   Singulate mean age at marriage by sex: Hawaii, 1900–70

Year	Males	Females	Difference in years
1900	27.5	18.8	8.7
1910	26.7	19.5	7.2
1920	25.1	19.9	5.2
1930	27.5	21.6	5.9
1940	u	u	u
1950	25.2	22.8	2.4
1960	23.8	21.4	2.4
1970	24.7	22.2	2.5

u—unavailable.
SOURCE: Table 12.

census years from 1900 to 1970. The figures confirm our other indicators of nuptiality. The mean age has risen almost 3.5 years for women since 1900 (from 18.8 to 22.2), dropping, as far as we can tell, only between the censuses of 1950 and 1960, the same period that included a rising percentage of married women in the population. Data necessary for calculating the mean age are not available for 1940.

For men the singulate mean age at marriage fell rather than rose between 1900 and 1920, very likely because of the high, but declining, sex ratios in that period. Since 1920 its movements have roughly paralleled those of the female mean age, although the age differential shrank between 1930 and 1950.

FERTILITY

Fertility[4] is of special interest in the study of Hawaii's demography because of its changing patterns and effects on growth. The figures presented in this section are based upon state, territory, and federal information on birth registrations and on census data.

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4 In American demographic usage, fertility, defined as the actual production of children, is contrasted with fecundity, the physiological ability to have children. This usage is exactly the reverse of that employed by the biological sciences and also of that found in the Romance languages of Europe.

Analysis of the material prior to about 1920 becomes hazardous because of the increasing unreliability of the data. Examination of data classified by ethnic group is also somewhat risky because of the problems discussed above with regard to racial definitions.

Age-Standardized Birth Rate

Hawaii's crude birth rate, presented in Table 3, has been affected by the age structure of the population over the years. The CBR is also somewhat inaccurate because of an underregistration of births, especially in the earlier years. The adjusted crude birth rates presented in Table 15 are standardized on the 1960 U.S. age distribution. (That is, it is assumed that Hawaii's age distribution was the same every year as that of the 1960 U.S. population.) This adjustment allows comparability with figures in Keyfitz and Flieger (1971 and 1968), where figures for many nations and years are presented. The Hawaiian rates drop from 46.2 births per 1,000 population in 1920 to less than one-half that number (20.8) in 1940, rise to 25.1 in 1960, and drop to a half-century low of 17.7 by 1970.

General Fertility Rate

From Table 15, the general fertility rate[5] (GFR) may be seen to drop from 245.7 (per 1,000 women) in 1920 to 112.1 in 1940, rise to 128 in 1960, then fall to a low of 96.4 for the century in 1970. Between 1960 and 1970 (Table 16), the GFR fell by almost one-fourth for the total population and by over 20 percent for the civilian population. The civilian GFR of 84.8 remained well below that of the total population. (It should be noted that the figures for the civilian population are less reliable than those for the total population, because of the problems mentioned previously with respect to the military composition of the population and ascertaining the actual numbers of the civilian population and its age distribution.)

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5 The general fertility rate removes the effect of the sex composition of a population and most of the effects of the age composition of the females by relating births only to women of childbearing ages.

TABLE 15   Age-specific fertility rates and summary indices of
fertility: Hawaii, 1920—70

Age group	1920	1930	1940	1950	1960	1970
15—19	75.0 91.5	66.7 71.8	52.1 53.3	58.6 58.7 }	75.5	62.6
20—24	274.0 334.2	243.6 261.9	176.4 180.5	200.7 200.9 }	284.3	173.8
25—29	293.4 357.8	260.9 280.6	179.8 184.0	195.6 195.8 }	221.0	169.8
30—34	242.8 296.1	215.8 232.0	109.3 111.8	125.9 126.0 }	125.1	91.7
35—39	167.5 204.3	148.9 160.1	73.5 75.2	64.4 64.5 }	54.8	38.5
40—44	92.3 112.6	82.0 88.2	32.2 32.9	17.3 17.3 }	15.8	8.8
45—49	14.4 17.6	12.9 13.9	3.2 3.3	1.0 1.0 }	0.9	0.6
Summary indices						
Crude birth rate	38.2	29.4	22.6	28.2	26.8	21.3

Standardized
  adjusted crude
  birth rate
	46.2	36.2	20.8	21.5	25.1	17.7

General fertility rate	201.5 245.7	172.1 185.0	109.5 112.1	125.0 125.2 }	128.0	96.4
Total fertility rate	5,797.0 7,070.5	5,154.0 5,542.5	3,132.5 3,205.0	3,317.5 3,321.0 }	3,887.0	2,729.0
Gross reproduction rate	2,814.1 3,432.3	2,481.7 2,668.8	1,516.4 1,551.5	1,633.8 1,635.5 }	1,883.2	1,318.7
Net reproduction rate	1,954.3 2,383.7	2,034.7 2,188.1	1,381.6 1,413.6	1,566.5 1,568.1 }	1,821.5	1,281.4

NOTE: Upper figures in brackets are for births unadjusted for underregistration; lower figures
are adjusted. All figures are per 1,000 women or per 1,000 persons (crude birth rate).

SOURCES: Tables 5, 16, 28—33.

TABLE 16 Age-specific fertility rates and summary indices of fertility: Hawaii, civilian and total populations, 1960, 1965, and 1970

	Civilian population						Total population					
	Rate			Rate as percentage of 1960			Rate			Rate as percentage of 1960		
Age group	1960	1965[a]	1970	1960	1965[a]	1970	1960	1965[a]	1970	1960	1965[a]	1970
15–19[b]	55.8	52.9	56.3	100.0	94.8	100.9	75.5	64.7	62.6	100.0	85.7	82.9
20–24	229.1	179.6	151.9	100.0	78.4	66.3	284.3	214.6	173.8	100.0	75.5	61.1
25–29	204.3	170.8	158.0	100.0	83.6	77.3	221.0	183.1	169.8	100.0	82.9	76.8
30–34	116.1	93.0	81.3	100.0	80.1	70.0	125.1	101.5	91.7	100.0	81.1	73.3
35–39	52.0	41.8	36.6	100.0	80.4	70.4	54.8	43.7	38.7	100.0	79.7	70.3
40–44	14.8	10.8	8.2	100.0	73.0	55.4	15.8	11.3	8.8	100.0	71.5	55.7
45–49	c	c	c	c	c	c	0.9	0.7	0.6	100.0	77.8	66.7
Summary indices												
General fertility rate	106.2	91.2	84.8	100.0	85.9	79.8	128.0	106.5	96.4	100.0	83.2	75.3
Total fertility rate	3,360.5	2,744.5	2,461.5	100.0	81.7	73.2	3,887.0	3,098.0	2,729.0	100.0	79.7	70.2
Gross reproduction rate	1,633.7	1,331.1	1,191.0	100.0	81.5	72.9	1,883.2	1,513.3	1,318.7	100.0	80.4	70.0
Net reproduction rate	1,580.1	1,290.5	1,157.3	100.0	81.7	73.2	1,821.5	1,467.1	1,281.4	100.0	80.5	70.4

NOTE: All figures except percentages are per 1,000 women.

a 1965 figures estimated from 1960 and 1970 data by interpolation, adjusted to give the actual number of 1965 births.

b Births to women under 15 years of age are assigned to those 15–19.

c Births to women over 44 years of age are assigned to women 40–44 years old.

SOURCES: State of Hawaii, Department of Planning and Economic Development (1967, tables 13, 23, 24; *Statistical Report*, no. 79); State of Hawaii, Temporary Commission on Population Stabilization (1972); United States, Bureau of the Census (1971b, tables 20,28).

Age-Specific Fertility Rates

Figure 7 illustrates the pattern of age-specific fertility in Hawaii over the decades 1920–70.[6] Until 1960, the fertility of women in the age group 25–29 declined relative to that of women in the age group 20–24. Since 1920 it appears that women have been having a higher percentage of their children at the early ages. The sharp peak in the curve for 1960, at ages 20–24, represents the "baby boom" that occurred at that time. The GFR and other measures indicate that there was higher fertility in 1960 than in 1950 or 1970. Use of census-year data prohibits us from making a more exact determination of the timing of the fertility changes, because the intercensal years do not have the requisite data. When total fertility shows a sudden rise going against a long-time downward trend, as in 1960, it is typical for the change to be manifested most sharply in the age group 20–24, for the reason that during "baby booms" women tend to marry earlier and have their families sooner than usual. The demographic reasons for the 1960 fertility peak will be examined below, in the section dealing with the combined effects of nuptiality and marital fertility.

As the percentage columns of Table 16 show, over the decade 1960–70 fertility at the oldest ages fell fastest for both the total and the civilian population; but since the levels were very low to begin with, this had little effect on the overall decline. The second fastest decline occurred in the age group 20–24; the disappearance of the spike after 1960 (Figure 7) indicates a rapid decline of fertility in this age group.

At ages under 30, the total population showed a greater percentage decline in ASFRs than did the civilian component, indicating that military fertility at these ages was falling very rapidly. At ages above 30, civilian fertility fell as fast or faster than that of the total population.

6 Age-specific fertility rates (ASFRs) remove the effects of both age and sex distributions on fertility, since they are specific for age and do not consider the male sex in the population at risk. The disadvantage to their use is that one must look at as many as seven figures in order to examine fertility at any given time. ASFRs may be summarized to obtain more convenient measures (see text below); their very specificity, however, allows insights into fertility behavior that summary measures do not.

FIGURE 7 Age-specific fertility rates: Hawaii, 1920–70
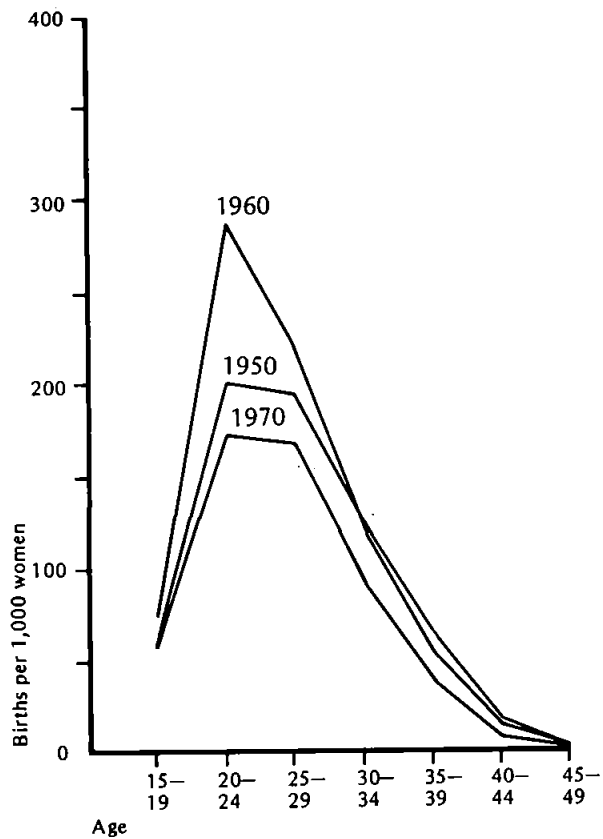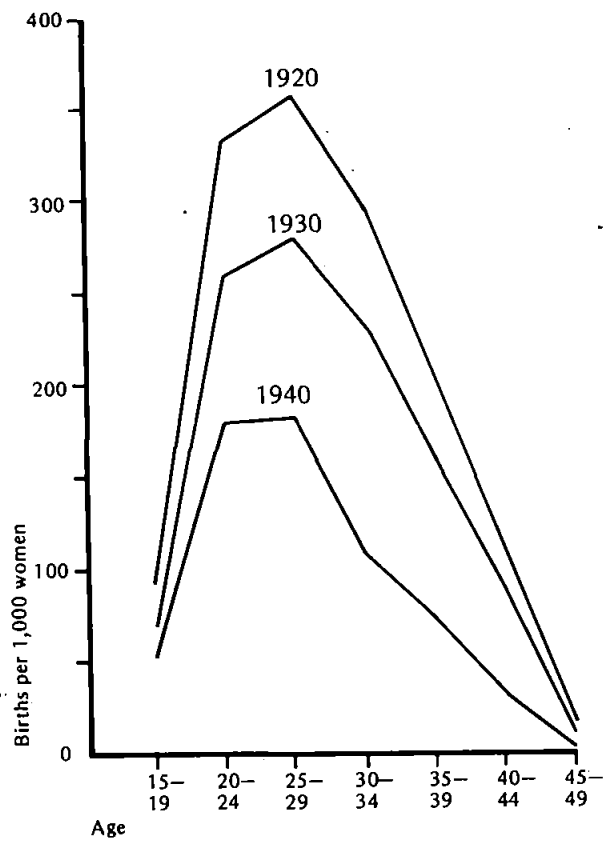
Summary Measures

The course of the total fertility rate (TFR), the gross reproduction rate (GRR), and the net reproduction rate (NRR)[7] has paralleled that of the GFR, falling during the period 1920—40, rising until 1960, then falling to a lower level again in 1970. Over the period 1920—70, these summary measures indicate that fertility fell by about 60 percent; because of declining mortality, however, the NRR fell by only about 46 percent. During the 1960s the TFR and GRR declined by about 30 percent for the total population and about 27 percent for the civilian population. Because mortality changed hardly at all during this period, the NRR fell by like amounts.

Age-Parity Fertility Patterns

A recent innovation in the presentation and analysis of fertility patterns has been the development of the age-parity grid (Ravenholt et al., 1972). This procedure plots the median age of all women having children in a given period against their median parity (children ever born) after their latest birth. Figure 8 shows the results of the application of this approach to the data for Hawaii for 1960—71. There has been a steady trend toward lower parity and lower median age at childbirth for mothers in Hawaii. The trend could indicate a real movement toward smaller families, the formation of families earlier in the lives of the parents, or some postponement of higher-order births. Along with the other populations represented in Figure 8, Hawaii shares a common tendency toward both lowered median ages at childbirth and lowered median parities in recent years. The civilian population of the state shows a high median age at childbirth compared with the country as a whole and compared with the total population of the state.

"Military" women (in most cases wives of members of the armed forces) would seem to be having their births at very young ages, largely because the age distribution of these women is concentrated at the younger ages (Table 10). In addition, the civilian figures do not include illegitimate births, whereas the total figures do. Since most illegitimacy

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7 The *total fertility rate* is a measure of the number of children a hypothetical cohort of 1,000 women would have if they lived to the end of the childbearing years and experienced a given set of age-specific fertility rates. The *gross reproduction rate* represents the number of *female* children such a cohort would have by the end of the childbearing years if it experienced a given set of age-specific fertility rates; the *net reproduction rate* takes into account age-specific mortality rates experienced by the 1,000 women from the time of their birth.

FIGURE 8 Live births by median parity and median age of mother:
Hawaii and selected countries, recent data
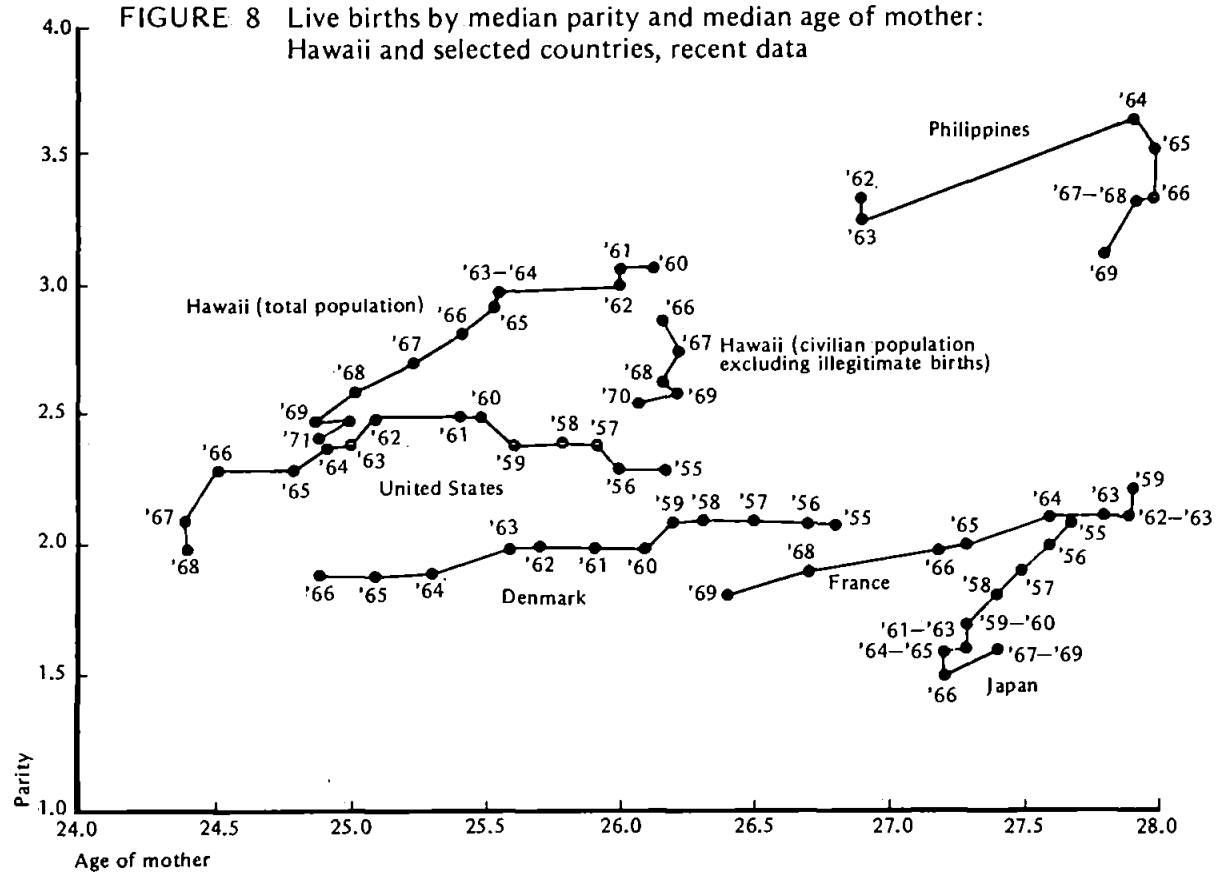
occurs at young ages—20.3 years is the average—the omission would tend to bias the civilian figures upward.

Measures of Cohort Fertility

Thus far we have been examining period rates—measures of the fertility experienced by women of different ages within a given period. An alternative approach to the study of fertility is the use of cohort rates, which measure the fertility experience of a group, or cohort, of women born at the same time (usually within the same year or same five-year period). This approach provides greater insight into the real fertility experiences of women during their lifetimes.

In Hawaii every birth cohort for which we have sufficient data, up to the 1921—25 cohort, experienced lower fertility than its predecessor (Table 17). It appears that the 1926—35 cohorts will show a rise in fertility, however, and the 1936—40 cohort another increase before the downward trend is resumed. The cohorts of 1931—40 were in their prime childbearing ages during the period of high fertility in the decade or so after the end of World War II. Later cohorts seem to be following patterns of lower fertility.

The census provides additional indications of cohort fertility by eliciting information on children ever born. Table 18 presents cohort-fertility data from the 1960 and 1970 censuses, the only ones that tabulated replies by five-year age groups. Such data must be examined with care, for up to a given age differences in fertility for two cohorts of women may not precisely indicate eventual differences in their completed fertility. Data on cohorts that have completed their childbearing, however, may be more safely compared. Thus for ages 45 and over it is safe to say that the 1900—04 cohort had much higher fertility than the 1905—09 cohort, the first to enter the childbearing ages during the Depression. On the other hand, when a cohort has not finished its childbearing, we cannot be certain how its future fertility will influence its eventual cumulative experience. In 1960, the 1925—29 cohort had had more children per woman (2.47) than the younger 1930—34 cohort (2.00), but by 1970 the younger cohort had surpassed the older, and both had had more children per woman than the cohorts of 1915—24.

Comparisons of white cohorts (Caucasians and Puerto Ricans) with nonwhite cohorts (all other ethnic groups combined) indicate that the former have recently tended to have slightly higher fertility at young ages than the latter, but for older cohorts the fertility of nonwhites has been much higher.

TABLE 17 Age-specific fertility rates by approximate birth cohort: Hawaii, 1881–1955

Approximate birth cohort	Age group							All age groups (total fertility)
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	
1881–85					204.3	100.4[a]	13.9	
1886–90				296.1	182.2[a]	88.2	8.6[a]	
1891–95	113.1[b]	372.5[b]	357.8	264.1[a]	160.1	60.6[a]	3.3	6,657.5
1896–1900	102.0[b]	334.2	319.2[a]	232.0	117.7[a]	32.9	2.2[a]	5,701.0
1901–05	91.5	298.1[a]	280.6	171.9[a]	75.2	25.1[a]	1.0	4,717.0
1906–10	81.7[a]	261.9	232.3[a]	111.8	69.9[a]	17.3	1.0[a]	3,879.5
1911–15	71.8	221.2[a]	184.0	118.9[a]	64.5	16.6[a]	0.9	3,390.0
1916–20	62.6[a]	180.5	189.9[a]	126.0	59.7[a]	15.8	0.8[a]	3,176.5
1921–25	53.3	190.7[a]	195.8	125.6[a]	54.8	11.4	0.6	3,161.0
1926–30	56.0[a]	200.9	208.4[a]	125.1	43.7	8.8		3,216.5[b]
1931–35	58.7	242.6[a]	221.0	101.5	38.5			3,311.5[b]
1936–40	67.1[a]	284.3	183.1	91.7				
1941–45	75.5	214.6	169.8					
1946–50	64.7	173.8						
1951–55	62.6							

NOTE: Rates are based on number of births per 1,000 women, corrected for underregistration. Total fertility equals the sum of the rates for all age groups multiplied by five.

a Interpolated figure.

b Estimate based on later patterns and trends.

SOURCE: Table 15.

TABLE 18 Children ever born per 1,000 women by age, color, and approximate birth cohort of women: Hawaii, 1960 and 1970

Age group	Birth cohort in specified year 1960	1970	Children ever born All children 1960	1970	White 1960	1970	Nonwhite 1960	1970
15–19	1940–44	1950–54	105	56	177	68	82	49
20–24	1935–39	1945–49	988	570	1,099	590	917	553
25–29	1930–34	1940–44	2,003	1,585	2,031	1,517	1,988	1,644
30–34	1925–29	1935–39	2,466	2,495	2,370	2,449	2,509	2,526
35–39	1920–24	1930–34	2,800	2,945	2,586	2,916	2,898	2,962
40–44	1915–19	1925–29	2,886	2,930	2,265	2,910	3,156	2,939
45–49	1910–14	1920–24	2,937	2,912	2,166	2,698	3,282	3,006
50–54	1905–09	1915–19	3,163	2,822	2,139	2,334	3,652	3,054
55–59	1900–04	1910–14	4,151	2,933	2,498	2,246	4,790	3,274
60–64	1895–99	1905–09	4,701	3,101	2,788	2,060	5,407	3,732
65 and over	pre-1895	pre-1905	5,000	4,205	3,321	2,593	5,667	4,939

SOURCES: United States, Bureau of the Census (1962, table 113; 1972a, table 161).

Ethnic Differentials

Past fertility, as shown by children-ever-born data from the 1970 census, has generally been highest among Hawaiians and lowest among whites, although Japanese and Chinese fertility has often been lower than that of whites (Table 19). Because of the small sample on which Table 19 is based (2 percent of the census returns), the most trustworthy values are probably those for the larger ethnic groups—i.e., whites, Japanese, Chinese, Filipinos, and Hawaiians—and for the civilian population.

Other measures of fertility have been calculated by ethnic group from data of varying reliability (Tables 20 and 21). Especially for 1970, these data suffer from the problem of definitional comparability between the numerator and the denominator. As explained earlier, between 1960 and 1970 the U.S. Census changed its procedures and definitions for recording race. The State Department of Health did not, however, and as a result the definitions used for the numerators (births) do not match those for the denominators (women). A further

TABLE 19 Children ever born per 1,000 women by age and ethnicity of women: Hawaii, 1970

Age group	Ethnicity								Military	Civilian
	Caucasian	Japanese	Chinese	Filipino	Hawaiian	Korean	Other	Total		
15 and over	1,816	2,250	2,151	2,483	2,936	2,232	2,889	2,163	1,661	2,217
15–19	93	43	44	129	127	118	111	85	143	79
20–24	693	365	275	1,017	1,033	444	1,333	628	654	623
25–29	1,491	1,174	1,733	1,604	2,407	1,500	2,636	1,557	1,554	1,558
30–34	2,440	2,230	2,667	2,862	3,095	2,727	3,571	2,525	2,412	2,543
35–39	2,960	2,580	2,968	3,614	4,026	2,500	8,250	3,041	2,798	3,095
40–44	2,917	2,459	2,824	3,356	4,488	2,214	2,000	2,881	2,774	2,888
45–49	2,740	2,285	2,273	3,884	5,321	3,182	8,667	2,829	3,158	2,815
50–54	2,230	2,709	2,838	2,824	4,960	4,333	4,000	2,737	2,000	2,757
55–59	2,513	2,792	2,964	4,409	4,280	3,750	6,500	3,075	3,000	3,076
60–64	2,378	4,561	3,118	6,333	4,000	2,400	0	3,486	1,000	3,514
65 and over	2,685	5,149	3,723	5,120	5,833	5,111	5,333	4,323	1,429	4,371

NOTE: Data are based on a 2 percent sample of the total population and hence are of low and varying statistical reliability.

SOURCE: Derived from data on the Public Use Sample of the United States 1970 Census.

TABLE 20 Crude birth rates, general fertility rates, and total
fertility rates by ethnic group: Hawaii, 1930—70

Ethnic group	1930	1940	1950	1960	1970
Crude birth rate					
All groups	29.4	22.2	28.1	27.2	21.4
Chinese	26.4	17.9	25.9	18.7	10.5
Japanese	33.0	20.6	24.8	19.3	13.5
Filipino	23.2	20.4	25.7	27.4	26.2
Hawaiian	18.8	19.8 }	43.7	{ 8.0 }	50.9
Part-Hawaiian	63.0	31.2		51.5	
Caucasian	20.1	18.7	23.5	26.3	20.3
Negro	u	u	u	41.8	23.8
General fertility rate					
All groups	172.2	106.8	125.0	128.1	96.4
Chinese	154.1	74.8	104.9	88.3	50.4
Japanese	176.9	87.4	95.8	80.0	58.3
Filipino	320.6	237.3	212.6	182.1	131.4
Hawaiian	79.8	85.4 }	204.8	{ 38.6 }	221.7
Part-Hawaiian	328.7	145.7		249.1	
Caucasian	101.3	87.8	103.5	125.4	90.3
Negro	u	u	u	289.1	149.3
Total fertility rate					
All groups	5,158.5	3,056.0	3,316.5	3,887.0	2,728.5
Chinese	4,820.0	2,298.0	u	u	1,636.0
Japanese	5,618.5	2,784.5	2,490.0	u	1,978.5
Filipino	8,427.0	7,252.0	u	u	3,787.0
Hawaiian	2,347.5	2,509.5 }	5,666.0	{ u }	6,121.5
Part-Hawaiian	9,703.5	3,957.0		u	
Caucasian	2,887.5	2,428.5	2,838.5	3,571.0	2,290.0
Negro	u	u	u	u	3,505.5

NOTE: All figures are per 1,000 persons (crude birth rate) or per 1,000 women.

u—unavailable.

SOURCES: United States, Bureau of the Census (1913, tables 8, 10, 13, 24, 27; 1933, table 4; 1953, table 29; 1962, table 139); United States, Department of Health, Education and Welfare, *Vital Statistics of the United States* (1940, part 1, tables 2, 3, 5; 1950, vol. 1, table 10.09; 1960, vol. 1, tables 1-A-C, 2-4, 2-14); Territory of Hawaii, Board of Health, *Annual Report* (1930, table 5); State of Hawaii, Department of Health, *Annual Statistical Report* (1960, table 12; 1970, table 12).

TABLE 21 Gross reproduction rates, 1930—70, and child-woman ratios, 1900—70, by ethnic group: Hawaii

Ethnic group	1900	1910	1920	1930	1940	1950	1960	1970
Gross reproduction rate								
All groups[a]	u	u	u	2,483.5	1,479.5	1,633.5	1,853.5	1,318.0
Chinese	u	u	u	2,321.0	1,113.0	u	u	790.5
Japanese	u	u	u	2,705.5	1,347.5	1,235.0	u	956.0
Filipino	u	u	u	4,057.0	3,510.5	u	u	1,830.0
Hawaiian	u	u	u	1,130.5	1,214.0	} 2,816.6	2,957.5	{ u
Part-Hawaiian	u	u	u	4,672.0	1,916.0			u
Caucasian	u	u	u	1,390.0	1,175.5	1,405.0	1,730.5	1,106.5
Negro	u	u	u	u	u	u	u	1,694.0
Child-woman ratio								
All groups								
15—44	575.2	697.0	780.6	767.3	454.9	569.1	602.9	414.3
15—49	545.1	653.0	720.1	705.0	417.8	523.5	546.3	365.5
Chinese								
15—44	1,073.6	894.9	917.2	724.7	314.8	495.8	517.4	380.2
15—49	u	840.5	u	u	294.3	448.9	456.9	345.2
Japanese								
15—44	402.0	686.2	819.5	837.0	387.8	462.1	432.7	282.0
15—49	u	657.1	u	u	355.3	429.2	388.2	237.2

Filipino								
15–44	u	u	851.2	1,251.5	1,034.3	902.1	874.2	586.0
15–49	u	u	u	u	959.3	813.3	820.1	528.5
Hawaiian								
15–44	460.1	435.5	455.7	464.4	323.0	303.4	373.5	u
15–49	u	389.6	u	415.0	282.6	261.1	317.9	u
Part-Hawaiian								
15–44	1,047.0	1,016.8	1,166.2	1,170.1	876.4	954.8	913.1	514.5
15–49	u	970.8	u	1,103.5	822.5	893.7	843.9	464.8
Caucasian								
15–44	769.6	751.6	480.4	472.1	307.4	487.3	611.7	428.8
15–49	u	698.2	u	430.8	279.6	441.5	554.7	388.1
Negro								
15–44	u	u	u	u	u	u	994.1	797.7
15–49	u	u	u	u	u	u	981.1	780.2
Other								
15–44	u	828.3	1,207.5	1,058.4	462.6	609.1	761.3	560.7
15–49	u	783.9	u	u	433.0	567.8	717.9	510.1

NOTE: All figures are per 1,000 women.

u—unavailable.

a   Differences between this table and Tables l5 and 26 reflect differences in the source data.

confusion is created by the dual classification of births by race of mother and by race of child—the Department of Health uses both classifications, based on its own definitions. (This practice does not affect the children-ever-born data, however, as the race of the child is never considered, just the race of the mother.)

Nevertheless, the picture presented is generally clear and consistent. If we exclude Blacks from the analysis, because few historical data are available for them, the group with the highest fertility over the period 1900–70 is the part-Hawaiians, followed in turn by the Filipinos, Japanese, Chinese, and Caucasians. In the last decade, however, part-Hawaiians, Filipinos, and Negroes had the highest fertility; Chinese and Japanese, the lowest.

Illegitimacy

Recent data on illegitimacy (Table 22) show that the number of illegitimate births rose from 1960 (882) to 1970 (1,577), then began to fall. The illegitimacy ratio (number of illegitimate births per 1,000 total live births) shows a similar course, peaking one year earlier .. (Table 23). There are indications that the legalization of abortion in Hawaii in March 1970 may have contributed to the reversal of the decade-long trend. (A detailed study of women giving birth and women having abortions has been under way since the inception of the liberalized abortion law. For recent results of this study, see Diamond, Palmore, Smith, and Steinhoff 1973.)

Trends in the illegitimacy ratio by ethnic group show roughly similar patterns throughout. Illegitimacy is generally the highest among the Samoans and Puerto Ricans (who are designated as a separate ethnic group by the State Department of Health statistics but recorded with Caucasians by the Census Bureau), followed by Hawaiians and part-Hawaiians. Lowest ratios are usually shown by the Japanese and Chinese.

Relative Effects of Nuptiality and Marital Fertility

Ansley Coale (1967) has developed measures of the relative effects of marital distribution and marital fertility on overall fertility. The measures are based on a theoretical maximum marital fertility achieved by the Hutterites, a small religious group of the north central United States. The Hutterite index of marital fertility (I_g) is set at 1.00. The Hutterite values for proportion married (I_m) and overall fertility (I_f) are 0.70.

The fertility of any population can be compared with that of the

TABLE 22 Illegitimate births by age of mother: Hawaii, 1960—72

Year	Age of mother								Total illegitimate births	Illegitimate births as percentage of total births	Median age of mother at illegitimate childbirth
	10—14	15—19	20—24	25—29	30—34	35—39	40—44	45—49			
1960	13	278	305	137	92	46	9	2	882	5.1	22.5
1961	19	369	321	151	101	41	8	1	1,011	5.8	21.8
1962	12	386	349	160	109	56	9	0	1,081	6.0	22.0
1963	12	416	374	169	105	50	11	0	1,137	6.4	21.9
1964	16	403	374	203	94	54	7	0	1,151	6.7	22.1
1965	16	408	417	182	93	47	14	0	1,177	7.2	22.0
1966	12	447	468	189	79	48	9	1	1,253	8.4	21.8
1967	15	481	475	177	91	42	11	0	1,292	8.8	21.6
1968	20	554	500	176	90	35	8	0	1,383	9.5	21.2
1969	22	630	552	192	80	30	9	0	1,516	9.7	21.0
1970	30	698	521	198	85	40	5	0	1,577	9.6	20.6
1971	29	647	437	181	83	25	7	1	1,400	8.8 ·	20.3
1972	26	667	458	166	77	32	7	0	1,433	9.3	20.3

SOURCES: State of Hawaii, Department of Health, *Annual Statistical Reports.*

TABLE 23 Illegitimacy ratio by ethnicity of mother: Hawaii, 1960—72

(Number of illegitimate births per 1,000 total live births)

Year	Caucasian	Hawaiian	Part-Hawaiian	Chinese	Filipino	Japanese	Puerto Rican	Korean	Samoan	Negro	Other	Total
1960	24.4	112.5	118.4	25.0	70.0	18.3	112.1	26.8	a	a	66.0	51.3
1961	26.8	108.8	132.5	17.8	69.3	23.6	144.6	23.7	a	a	79.3	57.6
1962	33.9	176.1	119.5	23.9	67.7	29.4	148.6	46.7	a	a	80.5	60.3
1963	40.1	171.4	124.8	19.3	67.5	28.6	186.8	66.3	145.0	39.2	76.2	64.1
1964	45.5	186.7	130.9	27.8	63.6	29.3	174.8	43.8	117.4	31.9	82.6	66.6
1965	52.2	164.3	132.9	28.0	76.0	31.1	182.5	26.1	170.4	40.3	93.2	72.4
1966	65.7	207.1	146.1	42.6	79.9	34.8	190.7	47.6	144.3	66.7	72.7	83.9
1967	72.7	152.3	148.3	24.8	73.9	40.0	213.6	69.2	190.0	86.7	137.6	87.5
1968	75.9	140.2	174.7	45.5	86.1	37.7	234.7	85.4	123.9	70.4	171.3	94.8
1969	73.1	145.8	172.9	45.8	88.4	40.3	234.4	67.9	148.6	119.7	264.4	96.6
1970	72.2	136.1	175.8	41.9	92.4	38.8	250.0	50.3	212.4	66.7	83.8	95.8
1971	57.8	195.7	174.4	38.2	89.4	34.6	242.3	52.9	177.5	65.1	79.2	88.4
1972	61.3	159.2	191.6	39.1	82.3	36.3	204.4	51.2	227.4	65.9	69.3	93.0

a   Figure for "other" includes Samoan and Negro categories.

SOURCES: State of Hawaii, Department of Health, *Annual Statistical Reports.*

Hutterites to ascertain how important marital fertility and the marital distribution are in relation to each other and to the maximum. In Table 24 and Figure 9 Hawaii's fertility (I_f) is seen to fall until 1940, slowly rise, then fall after 1960, in much the same manner as the gross reproduction rate and the total fertility rate.

From data on the percentage married, discussed in the section on nuptiality, it appears that the marital distribution of the population played an important part in determining the 1960 fertility levels. The evidence from the Coale measures corroborates this hypothesis, indicating that the effect of fertility within marriage on overall fertility has been diminishing since 1920, and that the 1960 peak in fertility was due to a rise in the proportion of the population that was married. The subsequent fertility decline (1960–70) was due to a decrease in both marital fertility and the proportion married.

Another way of analyzing changes in Hawaii's fertility pattern is by applying a decomposition technique to the crude birth rate (Cho and Retherford 1973). This method allows one to attribute changes in the birth rate to three factors: the age distribution of the female population in relation to the total population, the marital structure of the female population, and the marital fertility of the female population. Thus it is slightly more specific than the Coale measures and also allows one to deal with the most common measure of fertility (the CBR).

TABLE 24   Coale indices of fertility: Hawaii, 1920–70

Index	Total population						Civilian population	
	1920	1930	1940	1950	1960	1970	1960	1970
I_f	{.4739 / .5779	.4125 / .4435	.2614 / .2375	.2901 / .2904}	.3103	.2310	.2612	.2001
I_g	{.5907 / .7204	.5837 / .6276} u		{.4323 / .4327}	.4069	.3206	u	u
I_m	.7862	.6879	u	.6378	.7234	.6517	u	u

NOTE: Where two indices are given, the top figure is derived from registered births, the bottom from births adjusted for underregistration. For explanation of indices, see text.

u—unavailable.

SOURCES: Tables 4, 11, 15.

FIGURE 9   Indices of fertility: Hawaii, 1920—70
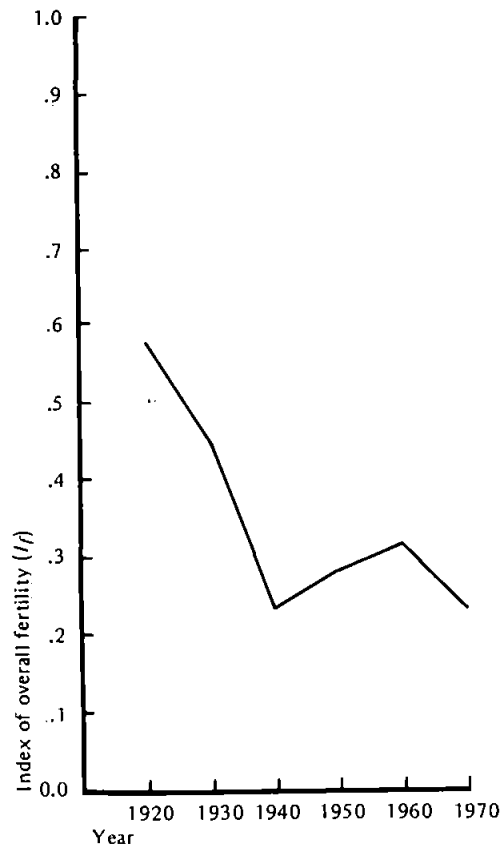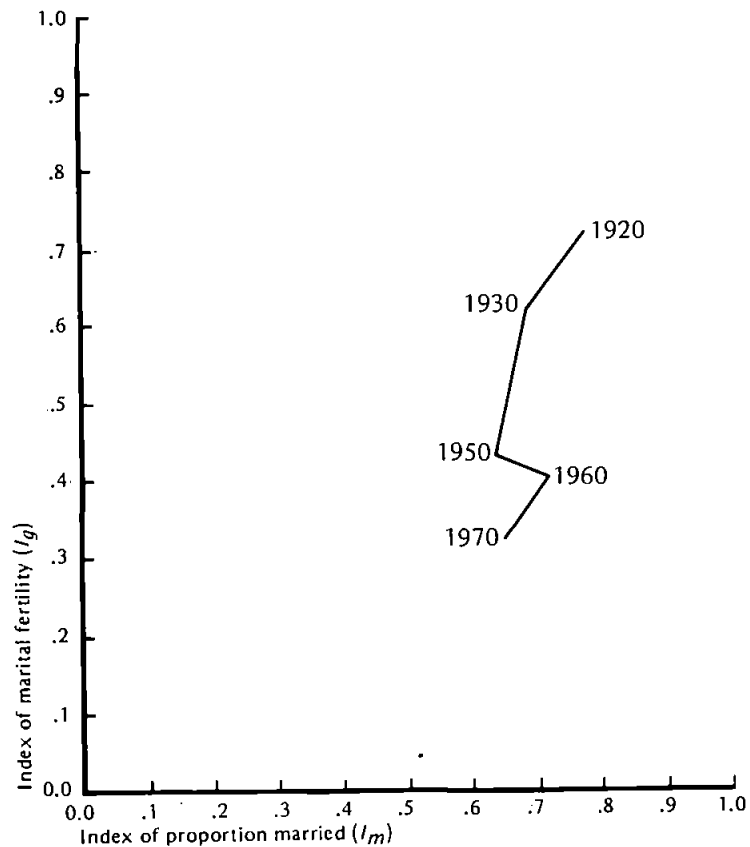
Results of this method when applied to Hawaii's CBR since 1920 appear in Table 25. The "all ages" column shows the relative influence of the three factors on the change in the birth rate for each period. Since marital data by age are not available for 1940, the years 1930–50 are treated as a single period, even though we know that fertility underwent various changes during those years.

For the decade 1950–60, Table 25 indicates that almost all of the upward pressure on the birth rate came from changes in the marital structure; a very small upward push was contributed by the effect of marital fertility. The effect of the changing age structure between 1950 and 1960, however, was such that the birth rate actually moved downward by 1.4 births per 1,000. If only the age structure had changed, and no changes had occurred in the marital structure or in marital fertility, the birth rate would have fallen significantly. If only the marital distribution had changed, on the other hand, the birth rate would have risen.

For the period 1960–70, in contrast to 1950–60, the age–sex structure exerted an upward pressure on the birth rate. Nevertheless, both the marital structure and marital fertility worked to push the birth rate downward, with the result that it fell by over 20 percent.

The decomposition technique also allows these effects to be observed by age group. For instance, for the period 1950–60, over half of the upward pressure on the CBR from the marital distribution came from the changing marital distribution at ages 20–24, while less than one-sixth came from ages 25–29.

Intrinsic Vital Rates

A series of intrinsic vital rates can be calculated that are unaffected by the age structure of a population at the time of the censuses, and these indicate the "actual" levels of vital processes.[8] Table 26 presents the intrinsic vital rates for Hawaii since 1920, as well as the GRR and NRR, which can be thought of as intrinsic measures of fertility and growth, since they are also independent of the age structure of the

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8 If a closed population were exposed to the same age-specific death and birth rates for several generations, it would eventually come to have a mathematically determined age structure with certain crude birth and death rates, all of which would be constant over time. Such a population is called a *stable population*, and the eventual crude rates are called the *intrinsic rates* of the original population, indicating that they are contained within the original age schedule of rates but not expressed directly in the original crude rates because of the age structure.

TABLE 25 Percentage distribution of changes in the crude birth rate by specified factor: Hawaii 1920—70

Period	Change in CBR	Factor	Percentage by age group					
			All age groups	15—19	20—24	25—29	30—34	35—44
1920—30	−15/1,000	Age—sex structure	41.1	−1.5	17.0	15.6	4.3	5.7
	(−32.2%)	Marital structure	34.6	11.7	16.9	3.9	1.0	1.1
		Marital fertility	24.3	−7.0	−1.2	13.0	10.8	8.8
		All factors	100.0	3.1	32.7	32.4	16.1	15.5
1930—50	−3.4/1,000	Age—sex structure	−331.1	−5.0	−114.5	−124.3	−66.0	−21.3
	(−10.8%)	Marital structure	137.4	36.5	54.7	31.0	9.8	5.5
		Marital fertility	293.7	−20.3	17.4	72.8	101.7	122.10
		All factors	100.0	11.3	−42.5	−20.5	45.5	106.2
1950—60	−1.4/1,000	Age—sex structure	553.3	18.0	336.5	262.4	4.9	−68.5
	(−5.0%)	Marital structure	−437.2	−123.3	−222.4	−70.1	−16.1	−5.3
		Marital fertility	−16.1	56.1	−104.5	−34.9	19.7	47.5
		All factors	100.0	−49.2	−9.6	157.5	8.4	−26.3
1960—70	−5.5/1,000	Age—sex structure	−53.0	−8.1	−53.0	−9.8	15.5	2.4
	(−20.5%)	Marital structure	44.1	17.6	19.7	6.4	−0.6	1.1
		Marital fertility	108.9	−8.2	54.6	26.1	21.0	15.4
		All factors	100.0	1.3	21.3	22.7	35.9	18.9
1920—70	−25.3/1,000	Age—sex structure	−13.8	−2.8	−6.3	0.7	−0.5	−4.9
	(−54.3%)	Marital structure	33.6	11.9	14.3	5.1	0.7	1.5
		Marital fertility	80.2	−7.4	11.9	22.8	23.6	29.3
		All factors	100.0	1.7	19.9	28.6	23.9	25.9

NOTE: Crude birth rate is adjusted for underenumeration. Positive percentages indicate changes in favor of a falling CBR; negative percentages, changes in favor of a rising CBR.

SOURCES: Tables 4, 11, 15; Cho and Retherford (1973).

TABLE 26   Intrinsic vital rates, gross reproduction rates, and net
reproduction rates for the total population, 1920—70,
and for the civilian population, 1960 and 1970: Hawaii

Rate	Total population						Civilian population	
	1920	1930	1940	1950	1960	1970	1960	1970
Births	47.7	38.2	23.0	22.3	29.0	18.7	24.5	16.3
Deaths	17.6	12.1	12.3	8.2	5.9	8.9	7.3	10.4
Natural increase	30.1	26.1	10.7	14.1	23.1	9.8	17.2	5.9
Gross repro-duction rate	3.43	2.67	1.55	1.64	1.88	1.32	1.63	1.19
Net repro-duction rate	2.37	2.13	1.35	1.55	1.83	1.30	1.58	1.17

NOTE: Calculations are based on female expectations of life at birth, age patterns of births,
and gross reproduction rates, using the Coale—Demeny model stable populations. All
values except the gross reproduction rates are generated by the calculations; the GRR is
calculated from the population data. Intrinsic vital rates are per 1,000 population; GRR
and NRR are per woman.

SOURCE: Table 15.

population. (There is a necessary correspondence between the NRR
and the intrinsic rate of growth, r, such that if no growth is implied by
a population's vital rates, the NRR will equal 1.00 and r will equal 0.)
The intrinsic birth rate shows a continuous fall until 1950 to 22.3 per
1,000, a rise until 1960 to 29.0, and a rapid fall until 1970 to 18.7.
The intrinsic death rate falls in 1960 (5.9), then rises (to 8.9). This rise
indicates an increase in mortality, in contrast to the life tables of the
next section, which show mortality falling continuously until 1970.
The reason for the apparent contradiction is that the death rate re-
flects the age structure of the stable population. The stable population
implied by 1970's age-specific fertility and mortality rates is "older"
than that of 1960, and this means a higher death rate because of the
higher death rates at older ages. The life table is not affected by age
distribution of either the original or the stable population.
   The intrinsic rate of growth reaches a low in 1940 (10.7, or about
1.1 percent), rises until 1960, then falls again until 1970 (to less than
1 percent). The NRR and GRR closely parallel the growth rate and
the birth rate, as might be expected. Civilian rates are seen to give

evidence of lower fertility and higher mortality than is the case for the total population. Actually, one follows from the other: low fertility implies an older age structure, which exerts an upward pressure on the crude death rate.

Summary

Fertility in Hawaii, no matter how measured, stood in 1970 at a record low for the century. A recent peak around 1960 was followed by a sharp fall during the subsequent decade. The prolonged fertility decline since 1920 has occurred despite changes in the age and sex structure that were favorable to rising fertility; on the other hand, the marital structure and marital fertility both changed in a manner that tended to lower fertility levels.

Can anything be said about the probable future course of fertility in Hawaii? To answer this question we must examine the separate components of fertility—i.e., the age and sex structure, the marital structure, and marital fertility.

A glance at Table 4 indicates that during the present decade the number of women aged 15–24 is likely to rise. Beyond 1980, however, the number will probably fall for at least a short period of time. We can predict, therefore, that the age and sex structure may exert an upward pressure on the birth rate for about ten years, and afterward perhaps a slight downward pressure for about ten years. Later the influence of the age and sex structure will depend on the number of births occurring in the years after 1970.

Since 1960 the changing marital structure has exerted a downward force on the birth rate. There is no easy way of predicting the future course of this factor: the percentage married in the 20–24 age group ten years from now will depend not so much on demographic considerations as on socioeconomic factors. *If* the percentage of single women in the prime childbearing ages continues to rise (Table 12), the effect will be to lower the birth rate. The ultimate determinants of fertility, however, will be social and cultural, and are outside the scope of this paper.

To an extent the same is true of fertility within marriage. We cannot deal here with many of the factors that affect marital fertility. We may venture the opinion, however, that increased opportunities for education and greater availability of contraception and abortion may act to lower the birth rate, in the absence of other changes; these developments would also enable more couples to have the family size they desire. More general access to contraception and abortion would tend to reduce illegitimate fertility as well.

The conclusion to be drawn from all of this, then, is that influences we can "predict" support both a rising birth rate (age and sex structure) and a falling birth rate (contraception and abortion). Influences we cannot predict, however, are certainly powerful enough to override these. The trend in fertility during the 1960s would indicate a further decline, but whether it is sustained and for how long are conjectural.

MORTALITY

The course of the crude death rate has already been examined above. A more valid indicator of mortality, which is not confounded by the effects of age structure, is the standardized death rate. Table 27 gives standardized death rates for the census years since 1920, based on the 1960 U.S. age distribution; the rates may thus be compared with many other countries and periods through the use of Keyfitz and Flieger (1968 and 1971). The standardized death rate in Hawaii has fallen steadily since 1920, from 21.8 to 7.3 in 1970, with the rate of decrease slowing down in recent years.

TABLE 27   Unstandardized and standardized crude death rates: Hawaii, 1920–70

Crude death rate[a]	1920	1930	1940	1950	1960	1970
Unstandardized	17.7	10.5	7.2	5.8	5.5	5.3
Standardized[b]	21.8	18.2	13.5	9.7	8.4	7.3

a   Deaths per 1,000 persons.

b   Standardized rates are based on U.S. age distribution in 1960.

SOURCES: Derived from Tables 28–33; Keyfitz and Flieger (1968:152).

By 1969–70 the unstandardized CDR in Hawaii was 5.5 per 1,000, compared with a rate of 9.4 per 1,000 for the United States in the same period. Part of this difference was due to Hawaii's having a younger population with relatively few people at the older, high death-rate ages. Part of the difference was due to real differences in mortality.[9]

9   Cause-of-death data are not discussed in this paper. For data on causes of death, see the United States Vital Statistics; State of Hawaii, Department of Health *Annual Statistical Reports;* Schmitt (1968); Park and Matsumoto (1971). Also, mortality by race has not been considered here.

Life Expectancy

These real differences can be seen by examining the life tables for Hawaii (Tables 28—33) and recent life expectancies for the United States (Table 34).[10] The 1969—71 life table for Hawaii (Table 33) shows a life expectancy at birth (e_0') of 70.5 years for males and 77.2 years for females, compared with corresponding values of 66.8 years and 74.3 years for the United States in 1969 (Table 34). The probability of dying before the first birthday ($_1q_0$ in life table notation) is also lower for Hawaii: .0227 and .0163 for males and females, respectively, compared with U.S. values of .0237 and .0183. In fact, recent data show Hawaii ranking very high in life expectancy for both sexes among all the low-mortality areas of the world.

Life expectancies at ages 0, 30, and 60 in the decades 1920—70 are also presented to show how longevity has increased during the present century (Table 35). For example, a female baby living out her life under 1969—71 mortality conditions could expect to live almost 30 years longer (to age 77.2) than one living under 1919—20 conditions (to age 47.3). For males, the corresponding improvement in life expectancy was nearly 23 years (from age 47.8 in 1920 to 70.5 in 1970).

Sex Differentials

The life tables show that female mortality has fallen faster than male mortality, to the point that today females have considerably longer life expectancy. This faster fall and consequent advantage for females has been noted in other areas of the world.

The changing age pattern of mortality between 1919—20 and

10 The life table is a device for removing the effects of age structure on mortality measurement and thus allowing a clearer view of the actual mortality of a population. Because the age structure of the real population does not affect the life table, it is not necessary to create separate life tables for the civilian population of the state; the military population does not distort the data.

Comparing the values for expectation of life at birth (e_0) in these tables with those of the State of Hawaii, Department of Health, *1963 Annual Report, Statistical Supplement:*4, one finds some small differences due to differences in methodology and sources of data. A life table for 1939—41 prepared by the Bureau of Health Statistics of the Territorial Board of Health apparently does not reflect the 2,186 deaths that resulted from the 7 December 1941 attack on Pearl Harbor. Separate calculation by the authors of a 1939—41 life table including these deaths gives a life expectancy at birth for males of 55.7 years, whereas a 1940-only life table for males yields an e_0 of 60.3, much closer to the Board of Health values of 59.5. The latter values are more indicative of the *normal* mortality of the period, no doubt, but the exclusion of the military deaths should be explicitly noted.

1969—71 (Figure 10) underscores the advantage that females now hold over males. In 1919—20, however, males had lower mortality at ages 10—39. As generally observed in mortality declines, the shape of the mortality curve has not changed drastically while the level has been falling.

Infant Mortality

Infant mortality (mortality to children under one year of age) is a topic of special interest because it is usually accepted as one of the best single indicators of the health status of a population. Since 1912 the infant mortality rate (IMR) has shown a steep downward trend, starting at 190.6 deaths per 1,000 births and flattening out since about 1950, when it was 23.8, to a more gentle decline (Table 3).[11] The 1972 IMR of 17.6 places Hawaii in a slightly worse position than the low-mortality countries of Europe but better off than the United States as a whole, where the rate for the twelve-month period ending in March 1973 was 18.4.

The $_1q_0$ values of the life tables, closely related to the infant mortality rates, are given for the sexes separately. Examination of these since 1919—20 shows that infant mortality ($_1q_0$) now stands at levels only 17—21 percent as high as it was in 1919—20. Here, as at most other ages, female mortality has fallen faster than male mortality. This is true whether one examines the absolute or percentage changes in the $_nq_x$ values or the ratios of male to female values.

To summarize, Hawaii's mortality is lower than that of the nation as a whole and ranks among the lowest in the world. Although mortality in the state can be expected to fall still further, changes in age-specific death rates are not likely to be great in the near future, barring major medical breakthroughs. Lowered fertility, which creates an older population, could even result in a higher crude death rate in the face of falling age-specific death rates. An illustration of this was seen in the higher intrinsic death rate for 1970 than for 1960: the implied stable population for 1970 was older than that for 1960.

MIGRATION

A major component of Hawaii's growth since 1900 has been net migration into the state: the preponderance of in-migrants over out-

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11 The IMR was biased upward in the early years of this period, because births were underregistered more than deaths.

TABLE 28 Abridged life table by sex: Hawaii, 1919—20

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	.108200	100,000	94,375	4,780,228	47.80
1	.045276	89,180	348,410	4,685,853	52.55
5	.024423	85,085	420,230	4,337,443	50.98
10	.019757	83,007	410,935	3,917,213	47.20
15	.032888	81,367	400,145	3,506,278	43.10
20	.046511	78,691	384,305	3,106,133	.39.48
25	.051779	75,031	365,443	2,721,828	36.28
30	.052793	71,146	346,340	2,356,385	33.12
35	.058288	67,390	327,130	2,010,045	29.83
40	.065220	63,462	306,963	1,682,915	26.52
45	.079699	59,323	284,795	1,375,952	23.20
50	.102573	54,595	258,975	1,091,157	19.99
55	.127095	48,995	229,408	832,182	16.99
60	.161920	42,768	196,528	602,774	14.09
65	.220210	35,843	159,483	406,246	11.33
70	.301538	27,950	118,680	246,763	8.83
75	.423932	19,522	76,920	128,083	6.56
80	.597813	11,246	39,423	51,163	4.55
85	1.000000	4,523	11,740	11,740	2.60

Females

0	.096950	100,000	95,257	4,729,855	47.30
1	.046077	90,305	352,898	4,634,598	51.32
5	.023100	86,144	425,745	4,281,700	49.70
10	.022875	84,154	415,958	3,855,955	45.82
15	.042455	82,229	402,418	3,439,997	41.83
20	.057787	78,738	382,315	3,037,579	38.58
25	.069297	74,188	358,088	2,655,264	35.79
30	.074558	69,047	332,365	2,297,176	33.27
35	.071566	63,899	308,063	1,964,811	30.75
40	.066109	59,326	286,825	1,656,748	27.93
45	.071132	55,404	267,168	1,359,923	24.73
50	.082720	51,463	246,673	1,102,755	21.43
55	.105643	47,206	223,563	856,082	18.14
60	.158602	42,219	194,355	632,519	14.98
65	.216620	35,523	158,378	438,164	12.33
70	.292475	27,828	118,793	279,786	10.05
75	.380111	19,689	79,735	160,993	8.18
80	.742155	12,205	48,213	81,258	6.66
85	1.000000	7,080	33,045	33,045	4.67

SOURCE: United States, Bureau of the Census (1922b).

TABLE 29 Abridged life table by sex: Hawaii, 1929–31

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	0.105302	100,000	92,250	5,309,319	53.093
1	0.039142	89,470	349,124	5,217,069	58.311
5	0.012002	85,968	427,259	4,867,945	56.625
10	0.007267	84,936	423,233	4,440,686	52.283
15	0.017705	84,319	418,079	4,017,453	47.646
20	0.020051	82,826	410,043	3,599,374	43.457
25	0.022254	81,165	401,439	3,189,331	39.294
30	0.028687	79,359	391,335	2,787,893	35.130
35	0.037863	77,082	378,396	2,396,559	31.091
40	0.048881	74,164	362,107	2,018,163	27.212
45	0.065228	70,539	341,814	1,656,057	23.477
50	0.100338	65,938	313,730	1,314,344	19.932
55	0.124693	59,321	278,489	1,000,515	16.866
60	0.161985	51,925	239,196	722,026	13.905
65	0.236324	43,514	192,585	482,830	11.096
70	0.357935	33,230	138,718	290,245	8.734
75	1.000000	21,336	151,526	151,526	7.102

Females

0	0.076584	100,000	93,939	5,627,599	56.276
1	0.031688	92,342	352,051	5,533,660	59.926
5	0.011708	89,416	444,460	5,171,609	57.838
10	0.007682	88,369	440,219	4,727,149	53.494
15	0.015906	87,690	435,258	4,286,931	48.887
20	0.024358	86,295	426,428	3,851,673	44.634
25	0.028408	84,193	415,128	3,425,246	40.683
30	0.034043	81,801	402,124	3,010,118	36.798
35	0.035066	79,017	388,349	2,607,995	33.006
40	0.048711	76,246	372,240	2,219,646	29.112
45	0.057803	72,532	352,412	1,847,407	25.470
50	0.070833	68,339	330,057	1,494,996	21.876
55	0.100998	63,499	301,885	1,164,940	18.346
60	0.120562	57,085	269,065	863,056	15.119
65	0.208452	50,203	225,969	593,391	11.832
70	0.307987	39,738	171,642	368,022	9.261
75	1.000000	27,499	196,380	196,380	7.141

SOURCES: Derived from data in United States, Bureau of the Census (1932b, 1933, 1934).

TABLE 30 Abridged life table by sex: Hawaii, 1939–40

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	0.053240	100,000	96,145	5,946,237	59.46
1	0.013873	94,676	375,232	5,850,092	61.79
5	0.007471	93,363	464,868	5,474,860	58.64
10	0.005982 —	92,665	461,992	5,009,992	54.07
15	0.010300	92,111	458,265	4,548,000	49.38
20	0.010399	91,162	453,342 .	4,089,735	44.86
25	0.015930	90,214	447,644	3,636,193	40.31
30	0.019719	88,777	439,706	3,188,549	35.92
35	0.027445	87,026	429,456	2,748,843	31.59
40	0.037485	84,638	415,728	2,319,387	27.40
45	0.056996	81,465	396,150	1,903,659	23.37
50	0.068303	76,822	371,624	1,507,509	19.62
55	0.107348	71,575	339,473	1,135,885	15.87
60	0.142367	63,892	297,535	796,412	12.46
65	0.212697	54,796	245,672	498,877	9.10
70	0.302316	43,141	162,899	253,205	5.87
75	1.000000	30,099	90,306	90,306	3.00

Females

0	0.041892	100,000	96,967	6,260,041	62.60
1	0.012615	95,811	380,023	6,163,074	64.32
5	0.005585	94,602	471,536	5,783,051	61.13
10	0.003842	94,074	469,480	5,311,515	56.46
15	0.006330	93,713	467,236	4,842,035	51.67
20	0.011733	93,120	463,044	4,374,799	46.98
25	0.015635	92,027	456,635	3,911,755	42.51
30	0.017209	90,588	449,136	3,455,120	38.14
35	0.021286	89,029	440,621	3,005,984	33.76
40	0.029638	87,134	429,483	2,565,363	29.44
45	0.037582	84,552	415,251	2,135,880	25.26
50	0.057440	81,374	385,800	1,720,629	21.14
55	0.079900	76,700	363,777	1,324,829	17.27
60	0.106952	70,572	339,958	961,052	13.62
65	0.169696	63,031	289,154	621,094	9.85
70	0.214140	52,335	208,555	331,940	6.34
75	1.000000	41,128	123,385	123,385	3.00

SOURCE: Territory of Hawaii, Department of Health (1957).

TABLE 31   Abridged life table by sex: Hawaii, 1949–51

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	0.028841	100,000	97,912	6,775,867	67.76
1	0.006065	97,116	386,968	6,677,955	68.77
5	0.002935	96,527	481,844	5,290,987	65.17
10	0.003179	96,244	480,515	5,809,143	60.36
15	0.005878	95,938	478,355	5,328,628	55.54
20	0.006937	95,374	475,238	4,850,273	50.86
25	0.007800	94,707	471,759	4,375,035	46.20
30	0.010742	93,968	467,414	3,903,276	41.54
35	0.012948	92,959	451,953	3,435,862	36.96
40	0.019813	91,755	454,586	2,973,909	32.41
45	0.032397	89,937	443,002	2,519,323	28.01
50	0.054033	87,023	424,295	2,076,321	23.86
55	0.089898	82,321	393,971	1,652,026	20.07
60	0.118271	74,921	353,244	1,258,055	16.79
65	0.169530	66,060	303,340	904,811	13.70
70	0.252323	54,861	240,187	601,471	10.96
75	0.330222	41,018	170,819	361,284	8.81
80	0.432600	27,473	106,558	190,465	6.93
85	1.000000	15,588	83,907	83,907	5.38

Females

0	0.021663	100,000	98,432	7,126,513	71.27
1	0.004712	97,834	390,110	7,028,081	71.84
5	0.002643	97,373	483,545	6,637,971	68.17
10	0.002251	97,116	485,051	6,154,426	63.37
15	0.003580	96,897	483,659	5,669,375	58.51
20	0.004301	96,550	481,748	5,185,716	53.71
25	0.005411	96,135	479,431	4,703,968	48.93
30	0.007140	95,615	475,468	4,224,536	44.18
35	0.010557	94,932	472,387	3,748,069	39.48
40	0.019114	93,930	465,498	3,275,682	34.87
45	0.028414	92,135	454,380	2,810,184	30.50
50	0.033445	89,517	440,676	2,355,804	26.32
55	0.062188	86,523	420,166	1,915,128	22.13
60	0.096247	81,142	387,162	1,494,926	18.42
65	0.137327	73,332	342,470	1,107,800	15.11
70	0.198211	63,262	285,835	765,330	12.10
75	0.281196	50,723	218,250	479,495	9.45
80	0.382343	36,460	147,218	261,245	7.16
85	1.000000	22,520	114,027	114,027	5.66

TABLE 32 Abridged life table by sex: Hawaii, 1959–61

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	0.02597	100,000	97,731	6,978,675	69.79
1	0.00300	97,403	388,932	6,880,944	70.64
5	0.00224	97,111	484,994	6,492,012	66.85
10	0.00234	96,893	483,959	6,007,018	.62.00
15	0.00504	96,666	482,215	5,523,059	57.14
20	0.00672	96,178	479,263	5,040,844	52.41
25	0.00527	95,532	476,379	4,561,581	47.75
30	0.00673	95,029	473,647	4,085,202	42.99
35	0.01068	94,389	469,616	3,611,555	38.26
40	0.01689	93,381	463,175	3,141,939	33.65
45	0.02451	91,804	453,901	2,678,764	29.18
50	0.04573	89,554	438,301	2,224,863	24.84
55	0.07020	85,459	413,178	1,786,562	20.91
60	0.10769	79,460	377,088	1,373,384	17.28
65	0.16170	70,903	326,625	996,296	14.05
70	0.21162	59,438	266,463	669,671	11.27
75	0.31731	46,860	197,669	403,208	8.60
80	0.44941	31,991	123,025	205,539	6.42
85	1.00000	17,614	82,514	82,514	4.68

Females

0	0.01977	100,000	98,257	7,400,946	74.01
1	0.00328	98,023	391,309	7,302,689	74.50
5	0.00178	97,701	488,049	6,911,380	70.74
10	0.00175	97,527	487,211	6,423,331	65.86
15	0.00192	97,356	486,348	5,936,120	60.97
20	0.00337	97,169	485,060	5,449,772	56.09
25	0.00369	96,841	483,312	4,964,712	51.27
30	0.00430	96,484	481,482	4,481,400	46.45
35	0.00841	96,069	478,425	3,999,918	41.64
40	0.01061	95,261	474,017	3,521,493	36.97
45	0.02193	94,250	466,581	3,047,476	32.33
50	0.03586	92,183	453,106	2,580,895	28.00
55	0.04897	88,877	433,904	2,127,789	23.94
60	0.06648	84,525	409,416	1,693,885	20.04
65	0.10747	78,906	374,487	1,284,469	16.28
70	0.15916	70,426	325,381	909,982	12.92
75	0.24490	59,217	260,800	584,601	9.87
80	0.35288	44,715	184,663	323,801	7.24
85	1.00000	28,936	139,138	139,138	4.81

SOURCE: United States, National Center for Health Statistics (n.d.).

TABLE 33   Abridged life table by sex: Hawaii, 1969–71

Age x	Probability of dying in interval following age x q_x	Survivors at exact age x l_x	Years lived in interval following age x L_x	Total years lived after exact age x T_x	Average number of years lived after exact age x (expectation of life) e_x
Males					
0	0.022737	100,000	97,975	7,045,604	70.456
1	0.003089	97,726	390,151	6,947,629	71.093
5	0.001524	97,424	486,751	6,557,479	67.308
10	0.001846	97,276	486,023	6,070,728	62.407
15	0.006087	97,096	484,107	5,584,705	57.517
20	0.006977	96,505	480,868	5,100,598	52.853
25	0.007391	95,832	477,418	4,619,730	48.206
30	0.008488	95,124	473,703	4,142,313	43.547
35	0.012718	94,317	468,782	3,668,610	38.897
40	0.018885	93,117	461,468	3,199,829	34.364
45	0.027847	91,358	450,931	2,738,361	29.974
50	0.046749	88,814	434,262	2,287,431	25.755
55	0.062402	84,662	410,812	1,853,169	21.889
60	0.095102	79,379	379,182	1,442,358	18.170
65	0.151000	71,830	333,164	1,063,176	14.801
70	0.212720	60,984	273,374	730,012	11.971
75	0.314555	48,011	202,223	456,637	9.511
80	0.382856	32,909	132,378	254,414	7.731
85	1.000000	20,310	122,036	122,036	6.009

Females

0	0.016250	100,000	98,534	7,718,058	77.181
1	0.003080	98,375	392,743	7,619,524	77.454
5	0.001672	98,072	489,950	7,226,782	73.689
10	0.001092	97,908	489,297	6,736,832	68.808
15	0.002893	97,801	488,331	6,247,535	63.880
20	0.002730	97,518	486,918	5,759,204	59.058
25	0.002590	97,252	485,696	5,272,286	54.213
30	0.006011	97,000	483,664	4,786,591	49.346
35	0.008650	96,417	480,074	4,302,928	44:628:
40	0.009817	95,583	475,702	3,822,855	39.995
45	0.015597	94,645	469,878	3,347,153	35.365
50	0.027898	93,168	459,733	2,877,275	30.883
55	0.036897	90,569	444,841	2,417,543	26.693
60	0.049049	87,227	426,234	1,972,702	22.616
65	0.086142	82,949	398,125	1,546,469	18.644
70	0.135163	75,804	354,712	1,148,345	15.149
75	0.204799	65,558	295,483	793,634	12.106
80	0.312503	52,132	220,749	498,151	9.556
85	1.000000	35,840	277,402	277,402	7.740

SOURCES: Table 4 and unpublished data from State of Hawaii, Department of Health.

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TABLE 34   Life expectancies at birth (e_0) for selected low-mortality
areas: recent data

Area	Date	e_0 Male	Female
Hawaii	1969–71	70.5	77.2
Canada	1965–67	68.9	75.2
England and Wales	1968–70	68.6	74.9
Hong Kong	1968	66.7	73.3
Iceland	1961–65	70.8	76.2
Japan	1968	69.1	74.3
Netherlands	1970	70.7	76.5
Norway	1961–65	71.0	76.0
Sweden	1967	71.9	76.5
United States	1969	66.8	74.3

SOURCE: United Nations, *Demographic Yearbook, 1971,* table 34.

migrants.[12] Data on migration are less complete and reliable than those
on fertility and mortality, and conclusions as to the volume and char-
acter of the state's migration must therefore be viewed with less con-
fidence.

Because of concern over growth in the state in recent years, there
has been much discussion of migration, how it can be better measured,
whether it can be controlled, and what its effects are. The subject is
of great importance but cannot be fully explored here. Rather, we
present some basic data on migration and refer the interested reader to
other sources, especially Hood and Bell (1973); Nordyke (1973);
Schmitt (1968); State of Hawaii, Department of Planning and Eco-
nomic Development, *Statistical Report* no. 94 and others; and United
States, Bureau of the Census (1972b, 1973).

One indirect method of estimating migration is the residual method,

12 Strictly speaking, the terms in-migration and out-migration refer to migration
within a country, while the terms immigration and emigration refer to inter-
national migration. For simplicity, we will use the former to refer to both
types of migration unless specifying otherwise.

TABLE 35 Expectation of life in years at ages 0, 30, and 60 by sex, and sex differentials: Hawaii, 1920–70

Expectation of life	1920	1930	1940	1950	1960	1970
At age 0						
Male	47.8	53.1	59.5	67.8	69.8	70.5
Female	47.3	56.3	62.6	71.3	74.0	77.2
Female minus male	−0.5	3.2	3.1	3.5	4.2	6.7
At age 30						
Male	33.1	35.1	35.9	41.5	43.0	43.5
Female	33.3	36.8	38.1	44.2	46.5	49.3
Female minus male	0.2	1.7	2.2	2.7	3.5	5.8
At age 60						
Male	14.1	13.9	12.5	16.8	17.3	18.2
Female	15.0	15.1	13.6	18.4	20.0	22.6
Female minus male	0.9	1.2	1.1	1.6	2.7	4.4

SOURCES: Tables 28–33.

based upon successive census counts. Between censuses a population can change in size only through births, deaths, and migration: if a population grows by 1,000 persons in a year, with 500 births and 300 deaths, then there must have been 800 net in-migrants. The estimates of migration presented in this section, which underlie the projections of the section that follows, are based on this method. These net migration estimates offer no way to distinguish between internal and international migrants, nor do they tell how many people left and how many arrived.

More direct information on migration, although incomplete, has been prepared for the state by the Department of Planning and Economic Development (DPED) on the basis of a 20 percent sample collected by the Hawaii Visitors Bureau (HVB) from a voluntary State Department of Agriculture baggage declaration form. This survey is limited in scope since the questionnaire is used only by westbound carriers. There is no tally by the state of persons arriving on eastbound and northbound carriers and there is no count of persons leaving the state. The survey does give some information on in-migration from the

FIGURE 10 Age-specific death probabilities ($_nq_x$) by sex: Hawaii, 1919—20 and 1969—71
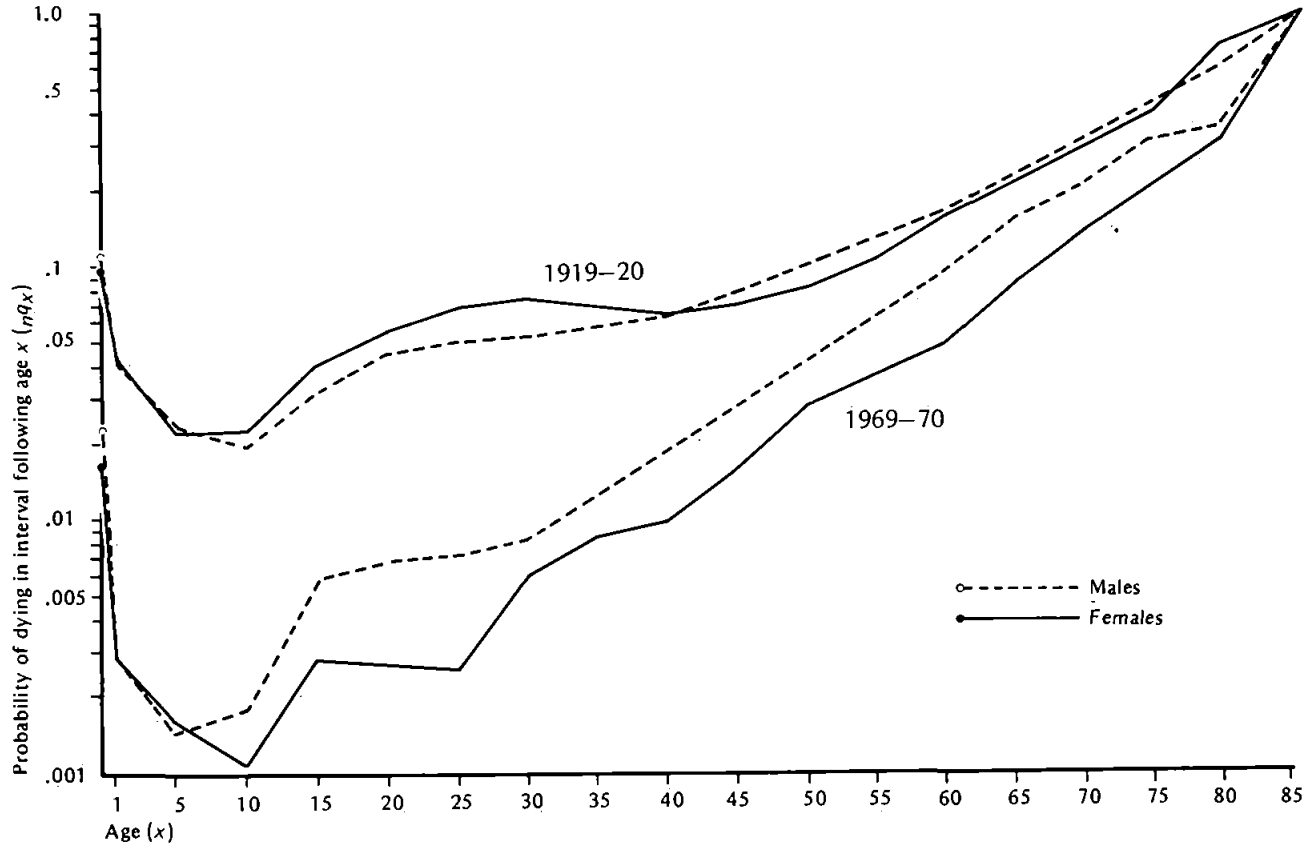
mainland, which is an important component of the total. Data from the sample survey are presented here only as comparative material. Details are found in the series "Hawaii's In-Migration" (State of Hawaii, Department of Planning and Economic Development, *Statistical Reports,* nos. 13, 65, 70, 80, 89, 94).

Residual Method

The relative influence of natural increase and of migration on population growth for the civilian and total populations of the state during the decade 1960–70 is seen in Table 36. The calculations are based on the residual method and use census data. For the total population it appears that the state experienced a low rate of positive net migration and that natural increase is responsible for over 90 percent of the intercensal growth. The reason is that the large number of military babies who were born here but left the state with their parents offset most of the considerable in-migration by civilians.

For the civilian population alone, natural increase is also seen as the major source of growth during the past decade, accounting for over 60 percent of the growth. We know, however, that fertility has fallen recently, and we know from the HVB data that in-migration rose markedly toward the end of the decade. If the recent rates continue, we can expect migration rather than natural increase to dominate growth in the near future. There is no way of knowing, of course, what the actual trends will be. The projections in the section that follows are based on several assumptions about fertility and migration, but there is no guarantee that any of these projections will hit the mark.

According to Table 37, which presents migration data for various subpopulations of the state population based on the population alive on 1 April 1960, females are migrating to the state in greater numbers than males, or leaving in smaller numbers, or both; whites are migrating in at a high rate, while nonwhites seem to be leaving; and Oahu is growing at least partly by absorbing migrants from the Neighbor Islands. Care should be exercised in interpretation of all of these figures because of the indirect nature of the calculations.

Data on migration by age are even harder to secure than overall totals. Such data are necessary, however, for making the projections of the civilian population by age and sex found in the next section. The procedure followed to secure estimates of migration by age and sex is much the same as that used in Tables 36 and 37. These age-specific rates indicate that, with regard to five-year age groups and their experience for the five years following their enumeration, ages 10–14

and 15—19 are likely to show net out-migration for civilian males and low rates of net in-migration for civilian females. Male in-migration rates peak at ages 20—34, as do those of females; at these ages, an augmentation of 10 percent or more may be expected due to net in-migration in five years. Some slightly negative rates are found at ages 55—59 and 60—64, but otherwise all ages show net in-migration for both sexes.

Lifetime Migration

In addition to being a source of figures for calculating net migration by the residual method, the census provides more direct information on migration. Twenty percent of the 1970 census forms contained a question on place of birth and 15 percent contained a question on place of residence five years prior to the census. From data obtained in answers to these questions it is possible to describe lifetime and five-year migration to and from Hawaii, especially for natives of the United States. The data tell nothing about when the migration occurred, or about intermediate residence. Nevertheless, they are of interest. For example, we know that of all natives of Hawaii who were living in the United States and its territories in 1970 (637,408), 71.8 percent were living in Hawaii and 28.2 percent were living elsewhere. Of all the 1970 residents of Hawaii who were born in the United States and its territories (637,168), 71.8 percent were born in Hawaii, 28.2 percent elsewhere. Apparently the exchange has been almost exactly equal, with similar numbers leaving and coming to the state. It should be noted, however, that the figures concern only persons alive in 1970, and they include the military. The effect of the military presence has been to inflate the ranks of those born in Hawaii and living elsewhere, because of the large number of babies born to the military while on duty in the state.

Among U.S. natives living in Hawaii in 1970 (Table 38), over three-fourths of almost every age group below 20 and over 40 years were born in Hawaii, and it is clear that the age groups 20—39 are strongly affected by the presence of the military.

Five-Year Migration

Because our data on five-year migration (Table 39) do not distinguish between military and civilian populations, they do not provide as clear a picture of recent migration as we would like. Nevertheless, they do shed some light on the situation. All figures refer to the Hawaiian population aged five years and over in 1970, both native and foreign born.

TABLE 36 Migration and natural increase, civilian and total populations: Hawaii, 1960—70

Topic	Civilian population			Total population		
	Both sexes	Male	Female	Both sexes	Male	Female
1 1960 population	528,929	271,936	256,993	632,772	337,552	295,220
2 Births, 1960—70	119,857	61,942	57,915	164,055	84,394	79,661
3 Deaths, 1960—70	36,304	22,644	13,660	38,216	23,954	14,262
4 Imputed 1970 population (1+2−3)	612,482	311,234	301,248	758,611	397,992	360,619
5 1970 population	658,752	330,515	328,237	768,561	399,205	369,356
6 Net migration (5−4)	46,270	19,281	26,989	9,950	1,213	8,737
7 Actual increase (5−1)	129,823	58,579	71,244	135,789	61,653	74,136
8 Natural increase (2−3)	83,553	39,298	44,255	125,839	60,440	65,399
9 Natural increase as percentage of total increase (8/7)	64.36	67.09	62.12	92.67	98.03	88.21
10 Migration as percentage of total increase (6/7)	35.64	32.91	37.88	7.33	1.97	11.79

NOTE: Transfers from civilian to military status and vice versa are not considered. For 1960—70 it is estimated that a net of 5,607 persons left civilian status for military status. This would have the following effect on imputed 1970 population, net migration, and migration as percentage of total increase:

	Civilian population		
	Both sexes	Male	Female
Imputed 1970 population	606,875	305,627	301,248
Net migration	51,877	24,888	26,989
Migration as percentage of total increase	39.96	42.49	37.88

SOURCES: Tables 4, 10; Kaku (1971); State of Hawaii, Department of Health, *Annual Statistical Reports.*

TABLE 37 Net migration and rates of migration for civilian and total populations, white and nonwhite populations, and Oahu and Neighbor Island populations: Hawaii, 1960–70

Population	1960 population	Population aged 10 and over in 1970	Expected population aged 10 and over in 1970[a]	Net migration (2–3)	Rate of migration (4/1)	Imputed decadal deaths (1–3)	Change in 1960 population (2–1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total							
Both sexes	632,772	617,914	599,000	18,914	.02989	33,772	−14,858
Male	338,173	321,959	316,149	5,810	.01718	22,024	−16,214
Female	294,599	295,955	282,851	13,104	.04448	11,748	1,356
Civilian							
Both sexes	528,929	523,081	496,072	36,009	.06808	32,857	3,152
Male	271,936	265,489	251,197	14,292	.05256	20,739	−6,477
Female	256,993	266,592	244,875	21,717	.08450	12,118	9,599
White							
Both sexes	202,230	238,075	193,150	44,925	.22215	9,080	35,845
Male	112,915	129,411	107,388	22,023	.19504	5,527	16,496
Female	89,315	108,664	85,762	22,902	.25642	3,553	19,349
Nonwhite							
Both sexes	430,542	379,839	405,853	−26,014	−.06041	24,689	−50,703
Male	225,258	192,548	208,763	−16,215	−.07198	16,495	−32,710
Female	205,284	187,291	197,090	−9,799	−.04773	8,194	−17,993

Oahu							
Both sexes	500,409	504,774	476,497	28,277	.05651	23,912	4,365
Male	267,123	263,289	251,850	11,439	.04282	15,273	−3,834
Female	233,286	241,485	224,647	16,838	.07218	8,639	8,199
Neighbor Islands							
Both sexes	132,363	113,140	122,506	−9,366	−.07076	9,857	−19,223
Male	71,050	58,670	64,299	−5,629	−.07923	6,751	−12,380
Female	61,313	54,470	58,207	−3,737	−.06095	3,106	−6,843

a   Based on 1969–71 life table survival ratios by age. Because of rounding, the total for the state may not exactly equal the sum of the component parts.

SOURCE: United States, Bureau of the Census (1971b, table 35).

TABLE 38 Lifetime migration of United States natives by age:
Hawaii, as of 1970

Age group	U.S. native population for whom state of birth was reported	Born in Hawaii	Percentage born in Hawaii
0–4	65,497	53,246	81.3
5–9	72,689	53,371	73.4
10–14	73,417	53,677	73.1
15–19	64,499	48,816	75.7
20–24	70,387	34,427	48.9
25–29	50,319	30,308	60.2
30–34	40,658	25,832	63.5
35–39	39,477	26,306	66.6
40–44	40,508	30,466	75.2
45–49	39,284	30,197	76.9
50–54	31,154	24,301	78.0
55–59	23,907	18,695	78.2
60–64	15,889	12,307	77.5
65–69	10,328	8,227	79.7
70–74	5,515	3,945	71.5
75 and over	5,833	3,552	60.9
All age groups	649,361[a]	457,673	70.5

a Includes 12,193 native Americans born outside the United States.

SOURCE: United States, Bureau of the Census (1973, table 22).

Almost 23 percent of the 1970 population–or more than 24 percent of those reporting a 1965 residence–lived outside the state in 1965. Most of these were living on the mainland in 1965. Of Honolulu County's 1970 population over age five, more than 26 percent lived outside the state in 1965, and another 1.2 percent lived on other islands (28 percent and 1.3 percent of the reporting population, respectively).

Table 40 gives some direct information on in- and out-migration, with reference not to the state as a whole but to the two economic regions devised by the Census Bureau: Honolulu County and the balance of the state. The data do not allow state-wide figures to be generated, unfortunately.

Honolulu County gained about 14,000 males and 3,700 females

TABLE 39   Residence in 1965 of 1970 residents: Hawaii

Residence	Number	Percentage
State		
Population aged five and above, 1970	697,840	99.99
Lived in same county in 1965	482,379	69.12
Lived in Hawaii, different county, in 1965	13,347	1.91
Lived in different state in 1965	125,732	18.02
Lived abroad in 1965	33,518	4.80
Lived elsewhere, not specified, in 1965	42,864	6.14
Honolulu County		
Population aged five and above, 1970	570,580	100.00
Lived in Honolulu County in 1965	378,617	66.36
Lived in Hawaii, different county, in 1965	6,887	1.21
Lived in different state in 1965	119,383	20.92
Lived abroad in 1965	30,090	5.27
Lived elsewhere, not specified, in 1965	35,603	6.24

NOTE: Total percentages may not add to 100.00 because of rounding.
SOURCE: United States, Bureau of the Census (1972b, table 1).

through net migration between 1965 and 1970. Of the 1970 population aged five and above, 22.1 percent consisted of recent migrants from outside the county. By age, both sexes showed strong in-migration to the county at the (1970) ages of 20–24; this is undoubt-edly due to the movement of military personnel and their dependents. Males show a strong outflow at ages 25–34, probably also largely due to military movements.

For the Neighbor Islands in general, strong out-migration occurred at ages 15–24, with some movement back at 25–29. Economic forces and educational opportunities may have caused much of this move-ment. Overall, the Neighbor Islands lost some 2,200 females and about 2,300 males through migration during the five years. (These figures, like all of the above, refer only to persons living in the United States on 1 April 1970 and thus exclude emigrants. Emigration, of course, would increase the losses of the Neighbor Islands and lessen the net inflow to Honolulu County.)

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TABLE 40   Five-year in-migration and out-migration by age and sex:

| Age group | Honolulu County | | | | | |
| | Male | | | Female | | |
	Population	In-migrants	Out-migrants	Population	In-migrants	Out-migrants
5–9	33,453	7,763	8,417	32,062	7,134	8,317
10–14	33,762	6,384	6,126	31,761	5,665	6,649
15–19	30,592	6,873	4,923	27,719	4,699	4,503
20–24	42,364	22,266	6,886	30,460	10,832	5,559
25–29	26,740	8,733	11,016	25,146	8,137	8,118
30–34	20,300	5,308	6,114	20,339	5,770	5,444
35–39	19,679	5,109	4,667	19,595	4,233	4,220
40–44	19,047	3,084	3,552	20,033	2,657	2,668
45–54	34,581	3,927	3,733	32,910	3,402	3,595
55–64	21,422	1,044	1,025	17,022	1,268	1,259
65 and over	15,184	732	638	16,409	1,210	959
All age groups	297,124	71,263	57,097	273,456	55,007	51,291

SOURCE: United States, Bureau of the Census (1972b, table 2).

Approximately one-fourth of those who were residing in Hawaii at the time of the 1970 census and reported their place of residence in 1965 stated that they had lived outside the state in 1965. By sex, recent arrivals in the state comprised 22.2 percent of all females, 26.3 percent of all males, and 15.3 percent of all civilian males (including dependents). Figure 11 illustrates the preponderance among young adults of in-migrants during the five-year period. In contrast to lifetime data on migration, the age pattern of Figure 11 shows a lowering of migration rates at the older ages.

With respect to the other 49 states and the District of Columbia, Hawaii had net out-migration to 10 states, net in-migration from 39 and the District, and an overall gain of more than 13,000 people in five years (Table 41). These figures include military personnel.

Honolulu and other counties, 1965—70

| Other counties | | | | | |
| Male | | | Female | | |
Population	In-migrants	Out-migrants	Population	In-migrants	Out-migrants
7,365	744	856	6,856	890	807
7,855	578	852	7,559	601	580
6,905	542	1,202	6,545	457	1,326
3,682	639	2,171	4,229	827	2,382
4,038	963	833	4,132	1,013	691
3,179	503	649	3,753	568	636
3,289	496	516	4,081	368	445
4,694	404	297	4,428	294	287
9,110	516	498	8,323	398	448
8,712	307	301	5,889	371	257
7,097	269	194	5,539	236	349
65,926	5,961	8,369	61,334	6,023	8,208

Summary

The various approaches to the study of migration in Hawaii paint a fairly consistent picture. Military personnel aside, migration definitely has added to Hawaii's population. The young adult ages are the ages of highest migration rates. There is some indication that civilian males actually leave the state in greater numbers than they arrive at these ages, but the result is greatly outweighed by the movements of the military. Honolulu County seems to be growing through intrastate as well as interstate migration, whereas the Neighbor Islands are losing population through migration.

We can say much less about foreign migration. We do know that almost 10 percent of the 1970 resident population was foreign-born, and about 5 percent of the population over five years of age had lived

TABLE 41   Migration between Hawaii and other states: 1965—70

State	Living in specified State in 1965, Hawaii in 1970	Living in Hawaii in 1965, specified State in 1970	Gain or loss to Hawaii
Alabama	1,180	1,168	12
Alaska	1,118	608	510
Arizona	1,568	1,730	−162
Arkansas	535	557	−22
California	34,257	35,595	−1,338
Colorado	2,406	2,196	210
Connecticut	1,527	1,173	354
Delaware	271	239	32
Florida	4,479	4,552	−73
Georgia	1,978	2,092	−114
Idaho	787	616	171
Illinois	4,376	3,182	1,194
Indiana	1,471	1,251	220
Iowa	1,088	717	371
Kansas	1,420	1,090	330
Kentucky	780	560	220
Louisiana	1,281	789	492
Maine	615	410	205
Maryland	3,161	3,596	−435
Massachusetts	2,515	1,719	796
Michigan	2,680	1,606	1,074
Minnesota	1,527	996	531
Mississippi	718	633	85
Missouri	1,815	1,399	416
Montana	548	334	214
Nebraska	1,448	752	696
Nevada	660	615	45
New Hampshire	326	238	88
New Jersey	2,596	2,966	630
New Mexico	1,395	858	537
New York	4,729	2,300	2,429
North Carolina	3,108	2,075	1,033
North Dakota	521	256	265
Ohio	3,487	2,434	2,053
Oklahoma	1,289	1,247	42
Oregon	2,020	2,331	−311

TABLE 41 *(continued)*

State	Living in specified State in 1965, Hawaii in 1970	Living in Hawaii in 1965, specified State in 1970	Gain or loss to Hawaii
Pennsylvania	2,675	2,233	442
Rhode Island	658	537	121
South Carolina	2,295	1,864	431
South Dakota	370	165	205
Tennessee	1,378	904	474
Texas	6,937	6,715	222
Utah	1,087	787	300
Vermont	176	259	-83
Virginia	6,938	7,542	-604
Washington	4,712	5,794	-1,082
West Virginia	397	206	191
Wisconsin	1,415	1,046	369
Wyoming	469	93	376
District of Columbia	545	418	127
Total	125,732	112,443	13,289

SOURCE: United States, Bureau of the Census (1972b, table 4).

abroad five years before (but not whether these were U.S. natives or foreign-born). Data from other sources indicate that foreign immigration is substantial. For example, the Department of Planning and Economic Development lists 15,073 alien in-migrants during the period 1 April 1970 to 30 June 1972 (State of Hawaii, DPED, *Statistical Report*, no. 95, table 4). The number of immigrants to this country reporting Hawaii as their state of intended future residence increased fiftyfold (from 179 to 9,013) between 1950 and 1970, declined in 1971, and then rose slightly in 1972 (Table 42).

PROJECTIONS OF THE CIVILIAN POPULATION

This section describes the assumptions and results of six different projections of the civilian population of the state for the period 1970–2070.[13] The purpose of these projections is not to predict the future but rather to make explicit some important features—absolute numbers,

13 A preliminary draft appeared as Demeny, Gardner, and Nordyke (1971).

FIGURE 11 Percentage of reporting population in 1970 who lived outside the state in 1965 by age and sex: Hawaii
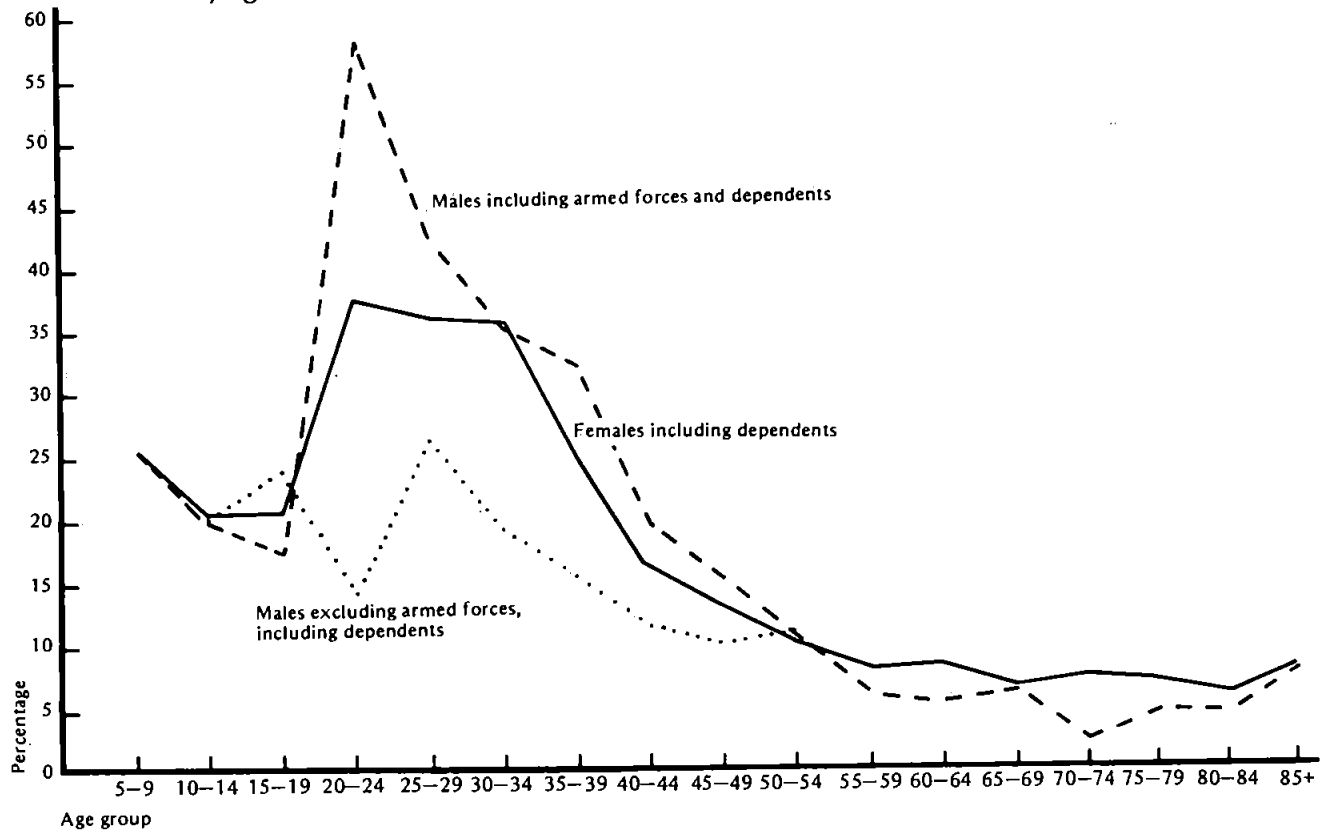
TABLE 42 Foreign migration to Hawaii: 1950—72

Year	Number of immigrants
1950	179
1951	294
1952	702
1953	613
1954	821
1955	951
1956	1,087
1957	1,384
1958	1,407
1959	1,616
1960	1,619
1961	1,762
1962	2,048
1963	1,767
1964	1,623
1965	1,721
1966	3,070
1967	3,825
1968	4,693
1969	5,199
1970	9,013
1971	6,055
1972	6,765

NOTE: Immigrants admitted to the United States reporting Hawaii as their state of intended future residence, for years ending June 30.

SOURCE: State of Hawaii, Department of Planning and Economic Development, *Statistical Report*, no. 94, table 17.

growth rates, and age distributions—of the future population of the state that would result from various well-specified courses of fertility, mortality, and external migration. The intention is to highlight the alternative implications of certain exceedingly simple assumptions based on the continuation of specified demographic trends.

It is not suggested that these projections bracket the full range of plausible future courses of the civilian population, particularly as far as the upper bound is concerned. But from the point of view of current policy concerns, an illustration of the quantitative implications of projections—ranging from the immediate achievement of zero population growth, to maintenance of current fertility and mortality combined with external migration as experienced during the last decade— seems to be of particular interest.

The projections were calculated by the standard component method. This requires a base population distributed by age and sex, female age-specific fertility rates, male and female age-specific survival rates, and, when relevant, age- and sex-specific "rates" of net migration.

The starting figure for each projection is 658,752—the approximate civilian population of the state on 1 April 1970. The survival rates are based upon the 1969—71 Hawaii life tables (Table 33). The age-specific fertility rates are those found in Table 16. These rates imply a gross reproduction rate of 1.19, a total fertility rate of 2.46, and a net reproduction rate of 1.16. For several of the projections, given the female life table and the assumption of an unchanged age *pattern* of fertility, age-specific fertility rates corresponding to an NRR of 1.0 were calculated. This is the level that, if maintained indefinitely, would eventually result in a zero rate of growth.

Estimates of the average age- and sex-specific migration rates for the 1960—70 period appear in Table 43.

Assumptions Underlying the Projections

The assumptions on which the projections are based are summarized in Table 44. All six projections assume that the mortality conditions reflected in the 1969—71 life tables will prevail unchanged during the entire 100-year period of the projections. Projections I and II assume that the rate of net migration by age and sex will continue at the same levels as those observed during the period 1960—70. The remaining four projections all assume that the population is closed, i.e., not subject to either in- or out-migration.

The fertility assumptions are as follows: Projections I and III assume that 1970 fertility will remain unchanged in the indefinite future. Pro-

TABLE 43 Five-year age- and sex-specific net migration probabilities for the civilian population: Hawaii, 1960–70.

Age at start of five-year period	Migration probability[a]	
	Male	Female
Births during period	.04953	.05634
0–4	.05216	.05902
5–9	.02285	.03678
10–14	−.04736	.02016
15–19	−.03829	.03022
20–24	.10317	.09112
25–29	.15310	.10221
30–34	.09588	.06034
35–39	.05804	.04991
40–44	.04438	.04389
45–49	.02674	.03376
50–54	.02113	.00700
55–59	−.00805	−.01255
60–64	−.02564	.02385
65 and over	.00289	.06259

a   Defined as the number of net migrants for each specified sex and age group in five years, divided by the population at the start of the period.

SOURCES: Table 10; Kaku (1971).

jections II and V assume that, from its 1970 level, fertility declines instantaneously to a level resulting in a net reproduction rate of 1.0, remaining constant thereafter. Projection IV assumes that fertility will decline from its 1970 level linearly to a level that will bring about a net reproduction rate of 1.0 by 1985–90, remaining constant thereafter.

Projection VI differs from all of the other projections insofar as it makes no direct explicit assumption about the course of fertility but, instead, specifies a zero population growth rate beginning in 1970 that is maintained for the entire projection period. Since the projections as explained above assume that net migration is zero and that mortality is fixed, the zero growth projection requires an adjustment of fertility from period to period to a level that produces the number of births that just equals the number of deaths.

TABLE 44 Assumptions underlying projections of the civilian
population: Hawaii, 1970—2070

| Projection | Assumption | | |
	Fertility	Mortality	Migration
I	1970	1970	1960—70
II	NRR=1.0 at once	1970	1960—70
III	1970	1970	Closed population
IV	NRR=1.0 by 1985—90	1970	Closed population
V	NRR=1.0 at once	1970	Closed population
VI	Adjusted so that births equal deaths	1970	Closed population

Implications

The results of the projections are shown in Figure 12 and Tables 45—
47.[14] If migration were to continue at 1960—70 levels while fertility
and mortality stabilized at 1970 levels (Projection I), the civilian pop-
ulation would reach the one million mark in early 1990 and 1.5 mil-
lion by 2013. It would continue to grow thereafter at the relatively
rapid rate of roughly 1.47 percent annually. At such a growth rate the
population doubles in approximately 47 years. All age groups would
participate in the growth, although there would be a marked shift to-
ward an older age composition. Notably, the proportion of the popula-
tion under 15 years of age would decline from the 1970 level of some
30 percent to a level of about 24 percent. The proportion of those
over 60 would increase from the 1970 level of 10.2 percent to approx-
imately 18 percent.

Net in-migration is responsible for much of the population growth
in Projection I, as is evident from a comparison of Projections I, II,
and III. Projection I shows the combined effects of continued migra-
tion above replacement, i.e., net in-migration, and of continued fer-
tility and mortality levels above replacement, i.e., of the current NRR
which is greater than 1.0. Projection II drops the NRR to replacement,

14 The computer program used for the projections, printouts covering a 200-year
period, and additional data (sex ratios by age over time, percentage distribu-
tions by five-year age groups, and five-year values of vital rates and summary
measures) are available in the Institute's Resource Materials Collection.

FIGURE 12 Projections of the civilian population: Hawaii, 1970–2070

I 1970 fertility
1970 mortality
1960–70 migration

II NRR=1.0
1970 mortality
1960–70 migration

III 1970 fertility
1970 mortality
no migration

IV NRR=1.0 by 1985–90
1970 mortality
no migration

V NRR=1.0 in 1970
1970 mortality
no migration

VI Births equal deaths
1970 mortality
no migration

Population (in thousands)

Year
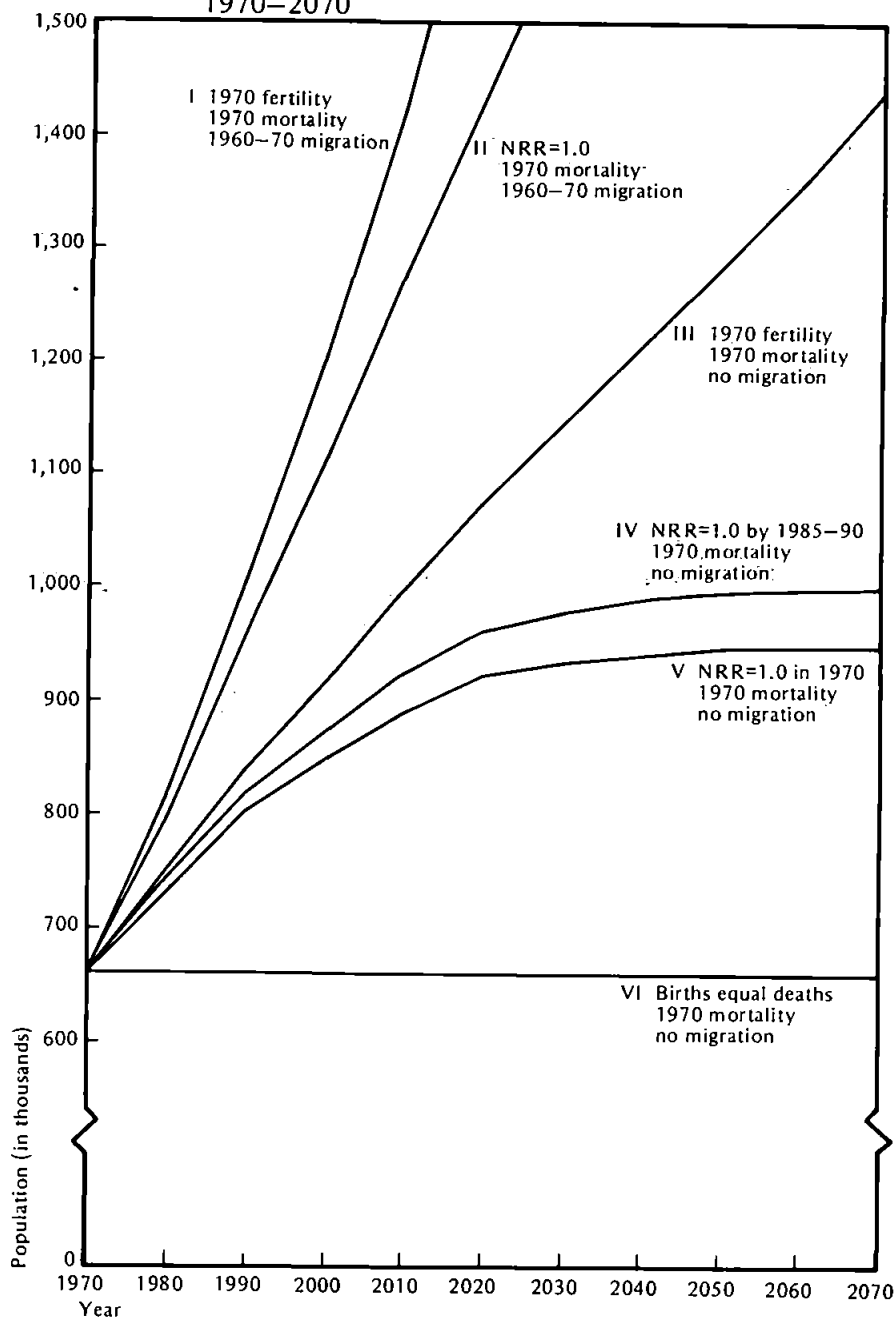
TABLE 45 Projections of the civilian population (in thousands) by broad age group: Hawaii, 1970–2070

Age group	1970	1980	1990	2000	2010	2030	2050	2070
Under 15								
Projection I	197.91	216.40	271.38	301.35	351.12	471.54	637.29	855.13
Projection II	197.91	195.69	233.88	249.37	269.92	328.07	396.98	476.52
Projection III	197.91	196.21	224.75	228.15	241.88	270.00	303.19	338.11
Projection IV	197.91	192.94	204.18	195.86	199.05	197.81	198.70	198.65
Projection V	197.91	177.55	193.70	188.73	185.75	187.56	188.54	187.94
Projection VI	197.91	106.87	87.67	108.27	121.01	152.14	136.86	115.43
15–59								
Projection I	393.89	498.69	592.98	738.46	861.40	1,143.32	1,525.52	2,055.78
Projection II	393.89	498.69	583.04	703.47	789.81	927.98	1,116.19	1,350.08
Projection III	393.89	456.29	487.64	553.79	600.21	665.33	738.21	826.65
Projection IV	393.89	456.29	487.64	543.68	569.58	573.71	569.17	569.94
Projection V	393.89	456.29	478.85	525.05	548.45	538.09	537.97	540.42
Projection VI	393.89	456.29	445.14	418.73	385.15	300.78	392.21	407.30
60 and over								
Projection I	66.94	98.07	136.04	156.35	212.05	335.64	472.20	631.39
Projection II	66.94	98.07	136.04	156.35	212.05	335.64	423.54	510.15
Projection III	66.94	95.62	126.00	131.82	152.66	205.89	241.88	268.75
Projection IV	66.94	95.62	126.00	131.82	152.66	205.89	226.45	229.24
Projection V	66.94	95.62	126.00	131.82	152.66	205.89	216.57	216.40
Projection VI	66.94	95.62	126.00	131.82	152.66	205.89	129.72	136.05
All age groups								
Projection I	658.75	813.16	1,000.39	1,196.16	1,424.57	1,950.50	2,635.02	3,542.29
Projection II	658.75	792.45	952.96	1,109.19	1,271.78	1,591.69	1,936.70	2,336.75
Projection III	658.75	748.12	838.39	913.75	994.74	1,141.22	1,283.28	1,433.51
Projection IV	658.75	744.85	817.83	871.35	921.29	977.41	994.32	997.83
Projection V	658.75	729.46	798.54	845.59	886.86	931.54	943.08	944.77
Projection VI	658.75	658.78[a]	658.81[a]	658.82[a]	658.82[a]	658.81[a]	658.79[a]	658.78[a]

a   The Projection VI program did not reproduce the 1970 total population exactly, but the differences are negligible.

TABLE 46 Projections of percentage distribution for the civilian population by broad age group: Hawaii, 1970—2070

Age group	1970	1980	1990	2000	2010	2030	2050	2070
Under 15								
Projection I	30.04	26.61	27.13	25.19	24.65	24.18	24.19	24.14
Projection II	30.04	24.69	24.54	22.48	21.22	20.61	20.50	20.39
Projection III	30.04	26.23	26.81	24.97	24.32	23.66	23.63	23.59
Projection IV	30.04	25.90	24.97	22.48	21.61	20.24	19.98	19.91
Projection V	30.04	24.34	24.26	22.32	20.95	20.13	19.99	19.89
Projection VI	30.04	16.22	13.31	16.43	18.37	23.09	20.77	17.52
15—59								
Projection I	59.79	61.33	59.27	61.74	60.47	58.62	57.89	58.04
Projection II	59.79	62.93	61.18	63.42	62.10	58.30	57.63	57.78
Projection III	59.79	60.99	58.16	60.61	60.34	58.30	57.53	57.67
Projection IV	59.79	61.26	59.63	62.39	61.82	58.70	57.24	57.12
Projection V	59.79	62.55	59.97	62.09	61.84	57.76	57.04	57.20
Projection VI	59.79	69.26	67.57	63.56	58.46	45.65	59.54	61.83
60 and over								
Projection I	10.16	12.06	13.60	13.70	24.58	17.21	17.92	17.82
Projection II	10.16	12.38	14.28	14.10	21.08	21.09	21.87	21.83
Projection III	10.16	12.78	15.03	14.43	24.14	18.04	18.85	18.75
Projection IV	10.16	12.84	15.41	15.13	20.86	21.07	22.77	22.97
Projection V	10.16	13.11	15.78	15.59	20.70	22.10	22.96	22.91
Projection VI	10.16	14.52	19.13	20.01	20.33	31.25	19.69	20.65
All age groups, all projections	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

TABLE 47 Projections of the civilian population as percentage of the 1970 population, by broad age group: Hawaii, 1970–2070

Age group	1970	1980	1990	2000	2010	2030	2050	2070
Under 15								
Projection I	100.00	109.34	137.12	152.26	177.41	238.26	322.00	432.07
Projection II	100.00	98.88	118.17	126.00	136.38	165.76	200.58	240.77
Projection III	100.00	99.14	113.56	115.27	122.21	136.42	153.19	170.84
Projection IV	100.00	97.48	103.17	98.96	100.57	99.95	100.40	100.37
Projection V	100.00	89.71	97.87	95.36	93.86	94.77	95.26	94.96
Projection VI	100.00	54.00	44.30	54.71	61.14	76.87	69.15	58.32
15–59								
Projection I	100.00	126.60	150.54	187.48	218.69	290.26	387.29	521.91
Projection II	100.00	126.60	148.02	178.60	200.51	235.59	283.37	342.75
Projection III	100.00	115.84	123.80	140.59	152.38	168.91	187.41	209.87
Projection IV	100.00	115.84	123.80	138.03	144.60	145.65	144.50	144.69
Projection V	100.00	115.84	121.57	133.30	139.24	136.61	136.58	137.20
Projection VI	100.00	115.84	113.01	106.31	97.78	76.36	99.57	103.40
60 and over								
Projection I	100.00	146.50	203.21	233.56	316.76	501.38	705.37	943.16
Projection II	100.00	146.50	203.21	233.56	316.76	501.38	632.67	762.06
Projection III	100.00	142.84	188.22	196.91	228.04	307.56	361.32	401.46
Projection IV	100.00	142.84	188.22	196.91	228.04	307.56	338.27	342.43
Projection V	100.00	142.84	188.22	196.91	228.04	307.56	323.50	323.26
Projection VI	100.00	142.84	188.22	196.91	228.04	307.56	193.77	203.23
All age groups								
Projection I	100.00	123.44	151.86	181.58	216.25	296.09	400.00	537.73
Projection II	100.00	120.30	144.66	168.38	193.06	241.62	294.00	354.72
Projection III	100.00	113.57	127.27	138.71	151.00	173.24	194.80	217.61
Projection IV	100.00	113.07	124.15	132.27	139.85	148.37	150.94	151.47
Projection V	100.00	110.73	121.22	128.36	134.63	141.41	143.16	143.42
Projection VI	100.00	100.00	100.01[a]	100.01[a]	100.01[a]	100.01[a]	100.01[a]	100.00

a The Projection VI program did not reproduce the 1970 total population exactly, but the differences are negligible.

while Projection III keeps fertility constant but removes all migration. The effect of fertility on the total growth rate of Projection I is equal to about 37 percent of that growth rate, whereas the effect of migration is equal to about 63 percent. Net in-migration, under the given assumptions, is clearly much more important to future growth than is natural increase. As of 1 July 1973, the total population of the state was estimated as 832,000, which is in almost exact agreement with the mid-1973 figure as interpolated from Projection I (State of Hawaii, Department of Planning and Economic Development, *Statistical Report*, no. 92, 1973).

Under Projection II the population would reach one million by about 1993, whereas under Projection III this would not occur until about 2010. Projection II implies a doubling about every 75 years; Projection III implies a doubling every 126 years. Projection III implies a shift in the age distribution somewhere between the shifts caused by Projections I and II.

If, in the absence of migration, fertility were reduced from its 1970 level to the replacement level produced by an NRR of 1.0, growth would of course be slower than if current fertility levels were continued, and this growth would eventually come to a complete stop. Because of the peculiarities of the initial 1970 age distribution, however, even with instantaneous change to replacement level, implying 2.13 children per woman, population growth would still be substantial. Under such conditions (Projection V), growth would continue for the next 80 years or so but at decreasing rates. By the middle of the twenty-first century, when population growth settled down to a zero rate, the total size of the population would be some 43 percent larger than it was in 1970.

These changes would also be accompanied by marked changes in the age structure. The absolute size of the population under age 15, for instance, would remain below the 1970 level throughout the period, whereas the population over 60 would increase more than threefold. The population in the labor-force ages during the century would increase by roughly one-third its 1970 size.

If the reduction of fertility from its 1970 level to a replacement level were to come about more gradually, the demographic implications would not be greatly different. Projection IV illustrates one such possibility, assuming achievement of replacement-level fertility by 1985–90. The population under this assumption would also stabilize roughly by 2050 at a total size some 51 percent higher than in 1970, i.e., at a total of slightly under one million.

The requirements of an immediate achievement of a zero growth rate (with no migration and continued 1969–71 mortality) are worked out in Projection VI. By definition, under this alternative the total population would remain constant, but its age composition would undergo violent changes. For instance, instantaneous zero population growth would require the number of those under 15 years of age to decrease by 54 percent in just 10 years, continue falling to 44 percent of its 1970 size by 1990, and fluctuate markedly for several centuries thereafter. Similar fluctuations, although with a different amplitude and different time pattern, would also occur among those in the labor-force ages and among those over 60 as well. An analysis showing more refined age groupings would reveal even more violent fluctuations.

The peculiarities of a zero-growth-now pattern are further highlighted if the underlying fertility requirements are made explicit. To achieve zero growth, fertility would have to fall immediately to merely one-third of the replacement level, implying a total fertility of 0.84 children per woman. This extreme decline would have to be followed by a rapid recovery to a total fertility of more than three and one-half times that high. Fluctuations with a slowly dampening amplitude would continue for well over two centuries.

At least four major conclusions appear to emerge from a study of these projections.

First, a total elimination of net in-migration in Hawaii would have a far larger impact on reducing population growth than even an instantaneous reduction of fertility to replacement levels. By inference, and barring a major reversal of recent trends, the primary factor determining Hawaii's future growth is likely to be migration rather than fertility.

Second, even if fertility were instantaneously reduced to replacement levels, and even in the total absence of migration, the population would continue to grow until about the middle of the next century, leveling off at about 945,000, some 43 percent larger than in 1970. In other words, continued growth in the decades ahead appears inevitable under any realistic assumptions as to the future course of fertility.

Third, at a more moderate pace of fertility reduction, notably the achievement of replacement levels by the late 1980s, the ultimate population would be only about 50,000 larger than that brought about by an immediate decline. Therefore, the support that demographic arguments could provide for a policy aimed at artificially accelerating the existing downward trend of fertility appears to be rather tenuous.

Fourth, simple demographic arguments suffice to establish the

proposition that immediate and, by inference, very rapid stabilization of population size is both an unobtainable and an undesirable objective. The disadvantages of the requisite violent adjustments of the age structure and of fertility levels would far outweigh any conceivable advantage that could be achieved by an immediate or early attainment of zero population growth.

CONCLUSION

Hawaii's demographic situation has been characterized over the past three-quarters of a century by significant changes—in population size, composition, distribution, and the components and rate of growth. Between 1900 and 1970 the population of the state grew from about 150,000 to almost 800,000 at an average annual growth rate of 2.3 percent. Most of the growth occurred on the island of Oahu (the County of Honolulu), where the average annual growth rate was 3.4 percent. By 1970, 82 percent of the state's residents lived on Oahu. It is difficult to predict future distributional trends. If proposed schemes to attract people to the Neighbor Islands are successful, the distribution might shift away from Oahu to some extent. On the other hand, if market forces are allowed uncontrolled play, it may be that Oahu will continue to grow faster than the other islands and to attract increasing numbers of people from within the state as well as from without.

Irregularities in the age and sex structure have been due mainly to sex- and age-selective migration, especially during the early years of the century, and to the large numbers of young men stationed at military bases in the state. In recent years the age and sex structure of the population, especially the civilian population, has assumed more normal features.

All ethnic groups except Hawaiians have experienced continuous growth over the period, though the rates of growth have varied depending on such factors as immigration, intermarriage, and fertility. Changing definitions of ethnicity have clouded the picture, but in general the growth rate has been most rapid among the Filipinos and the Caucasians, slowest among the Koreans and Chinese. According to census definitions, by 1970 Caucasians formed the largest ethnic group (39 percent of the population), followed by the Japanese (28 percent), Filipinos (12 percent), Hawaiians and part-Hawaiians (9 percent), and Chinese (7 percent). Large-scale immigration has ceased to play as important a role in determining Hawaii's ethnic composition as in the past; differential fertility and continued in-migration from the U.S. mainland are likely to be the main sources of changes in the future.

Of the three determinants of demographic growth, fertility has been especially volatile. From initially high levels during the early years of the century, fertility declined to reach a low during the Depression, rose again during the 1950s, peaked around 1960, and declined to new lows in the early 1970s. Marital distribution favoring high fertility was largely responsible for the 1960 peak, but the subsequent fertility decline resulted from a decrease both in the proportion married and in marital fertility. Over the entire period fertility has been highest among Hawaiians and part-Hawaiians, followed in turn by Filipinos, Japanese, Chinese, and Caucasians. Whether the recent downward trend for most groups continues or not will depend to a great extent on economic, social, and political conditions.

Mortality has shown no such irregularity. It has fallen steadily, although at a decreased rate now that the more easily conquered causes of death have been brought under control. Even without new medical advances, however, a rising standard of living and higher educational levels would seem to presage a slow but steady improvement in mortality.

The future course of migration is, if anything, even less predictable than that of fertility. At the moment net in-migration seems to be on the rise, but the many legal, economic, and social stimuli—and barriers— to migration remain themselves incapable of easy analysis. For example, if the cost of living in Hawaii continues to rise, in-migration might slacken. But if it rises elsewhere too, so that the differential cost remains constant or even declines, in-migration may continue at present rates or may even rise.

In summary, the primary characteristic of Hawaiian demography over the period surveyed has been rapid growth, and there does not seem to be any sign of a major slowdown. Our projections show that even the most conservative assumptions about future fertility and migration—that is, replacement fertility and no net in-migration—would result in continued growth in Hawaii for almost a century. If recent trends continue, the primary component of future growth is likely to be migration rather than fertility. The actual size and composition of an eventually stabilized population is not predictable with any certainty, but a substantial increase in numbers of inhabitants during the decades ahead appears inevitable.

BIBLIOGRAPHY

Adams, Romanzo
1969   *Interracial Marriage in Hawaii.* Montclair, New Jersey: Patterson
        Smith.

Babbie, Earl
1972   *The Maximillion Report.* Honolulu: Citizens for Hawaii.

Barclay, George
1958.   *Techniques of Population Analysis.* New York: John Wiley and
        Sons.

Bogue, Donald
1970   *Demographic Techniques of Fertility Analysis.* Chicago: Commu-
        nity and Family Study Center.

Cho, Lee-Jay, and Robert D. Retherford
1973   Comparative analysis of recent fertility trends in East Asia. In
        International Union for the Scientific Study of Population (IUSSP),
        International Conference Proceedings, vol. 2, pp. 163–181. Liège.

Coale, Ansley
1967   Factors associated with the development of low fertility: an
        historic summary. In United Nations, *World Population Conference,
        1965,* vol. 2, pp. 205–209. New York.

Coale, Ansley, and Paul Demeny
1966   *Regional Model Life Tables and Stable Populations.* Princeton, New
        Jersey: Princeton University Press.

Demeny, Paul; Robert Gardner; and Eleanor Nordyke
1971   Five projections for the civilian population of Hawaii: a note on
        alternative demographic futures. Paper prepared for the Institute
        on Stabilizing Hawaii's Population, Kauai, Hawaii State Association
        of Counties, 8–10 December 1971.

Diamond, Milton; James A. Palmore; Roy G. Smith; and Patricia G. Steinhoff
1973   Abortion in Hawaii. *Family Planning Perspectives* 5(1):54–60.

Glick, Clarence E.
1970   Interracial marriage and admixture in Hawaii. *Social Biology*
        17(4)278–291.

Gotanda, Masae, comp.

1972 *Statistical Sources in Hawaii.* Honolulu: State of Hawaii, Department of Education.

Hajnal, John

1955 Age at marriage and proportions marrying. *Population Studies* 7(1):111–136.

Hawaii, State of. Department of Health

1948– *Annual Statistical Reports.* Honolulu.

Hawaii, State of. Department of Health and Department of Planning and Economic Development

1973 Population mobility in Hawaii during 1971. *Population Report,* no. 1. Honolulu.

Hawaii, State of. Department of Planning and Economic Development

1963– *Statistical Reports.* Honolulu.

1967 Population projections. *State of Hawaii General Plan Revision Program,* part 4. Honolulu.

1967– *State Data Book.* Annual. Honolulu.

Hawaii, State of. Temporary Commission on Population Stabilization

1972 *Report.* Honolulu.

Hawaii, Territory of. Board of Health

1900–58 *Annual Reports.* Honolulu.

Hawaii, Territory of. Department of Health. Bureau of Health Statistics

1957 *Abridged Life Tables by Sex, Territory of Hawaii, 1939–1941 and 1949–1951.* Honolulu.

Honolulu, City and County of. Department of Planning

1971 *Planning for Oahu: Employment and Population: Trends and Projections.* Honolulu.

Honolulu, City and County of. Honolulu Redevelopment Agency

1972 *Redevelopment and Housing Research.* Honolulu.

Hood, David R., and Bella Z. Bell

1973 *In-migration as a Component of Hawaii Population Growth: Its Legal Implications.* Report no. 2. Honolulu: Legislative Reference Bureau.

Kaku, Kanae

    1971   Identification of medical problem areas in Hawaii. Regional Medical Program, Honolulu (unpublished).

Keyfitz, Nathan, and Wilhelm Flieger

    1968   *World Population.* Chicago: University of Chicago Press.

    1971   *Population.* San Francisco: W.H. Freeman.

Lind, Andrew W.

    1967   *Hawaii's People.* Honolulu: University of Hawaii Press.

Nordyke, Eleanor

    1972   In-migration: the primary factor of Hawaii's population growth. East-West Population Institute, Honolulu (unpublished).

    1973   In-migration versus fertility as factors in Hawaii's population growth. *Hawaii Medical Journal* 32(4):207–212.

Palmore, James A.

    1972   *Measuring Fertility and Natural Increase: A Self-Teaching Guide to Elementary Measures.* Paper no. 16, revised edition. Honolulu: East-West Population Institute.

    1973   *Measuring Mortality: A Self-Teaching Guide to Elementary Measures.* Paper no. 15, revised edition. Honolulu: East-West Population Institute.

Park, Chai Bin, and Y. Scott Matsumoto

    1971   Hawaii life-table values by causes of death: 1959–1961. *Hawaii Medical Journal* 30(3):184–190.

Ravenholt, R.T.; James W. Brackett; and John Chao

    1972   World fertility trends during the 1960s. Paper presented at the annual meeting of the Population Association of America, Toronto.

Retherford, Robert

    1956   Research note on components of change in marital status on Oahu, 1940–1960. *Social Forces* 34(3):238–240.

    1970   Analysis of trends in sex-mortality differentials in developed countries. Unpublished Ph.D. dissertation, Department of Sociology, University of California, Berkeley.

Schmitt, Robert C.

    1966   Age differences in marriage in Hawaii. *Journal of Marriage and the Family* 28(1):57–61.

1968   *Demographic Statistics of Hawaii, 1778–1965.* Honolulu: University of Hawaii Press.

1971   Memorandum to the Temporary Commission on Population Stabilization: revised estimates of the components of population change in Hawaii, 1960–1970. State of Hawaii, Department of Planning and Economic Development, Honolulu (mimeographed).

1973   The changing definitions of race in Hawaii. *Population Report,* no. 1. Honolulu: State of Hawaii, Department of Planning and Economic Development.

Taeuber, Irene

1962   Hawaii. *Population Index* 28(2):97–125.

United Nations. Department of Economic and Social Affairs

1948–   *Demographic Yearbook.* Annual. New York.

United States. Bureau of the Census

1913   *Thirteenth Census of the United States, 1910. Abstract of the Census with Supplement for Hawaii.* Washington, D.C.: Government Printing Office.

1922a   *Fourteenth Census of the United States, 1920.* Vol. 3, *Composition and Characteristics of the Population by States.* Washington, D.C.: Government Printing Office.

1922b   *United States Abridged Life Tables, 1919–1920.* Washington, D.C.: Government Printing Office.

1932a   *Fifteenth Census of the United States, 1930. Outlying Territories and Possessions.* Washington, D.C.: Government Printing Office.

1932b   *Mortality Statistics, 1929.* Washington, D.C.: Government Printing Office.

1933   *Mortality Statistics, 1930.* Washington, D.C.: Government Printing Office.

1934   *Mortality Statistics, 1931.* Washington, D.C.: Government Printing Office.

1943   *Sixteenth Census of the United States, 1940. Population. Second Series. Characteristics of the Population. Hawaii.* Washington, D.C.: Government Printing Office.

1953   *Census of Population: 1950.* Vol. 2, *Characteristics of the Population.* Part 52, *Hawaii.* Washington, D.C.: Government Printing Office.

1961   *Census of Population: 1960. General Characteristics, Hawaii. Final Report PC(1)–13B.* Washington, D.C.: Government Printing Office.

1962   *Census of Population: 1960. Detailed Characteristics, Hawaii. Final Report PC(1)–13D.* Washington, D.C.: Government Printing Office.

1963   *Census of Population: 1960. Subject Reports. Non-White Population by Race.* Washington, D.C.: Government Printing Office.

1971a   *Census of Population, 1970. General Population Characteristics. Advance Report PC(V2)–1. United States.* Washington, D.C.: Government Printing Office.

1971b   *Census of Population, 1970. General Population Characteristics. Final Report PC(1)–B13. Hawaii.* Washington, D.C.: Government Printing Office.

1971c   *Census of Population, 1970. General Social and Economic Characteristics. PC(1)–C13. Hawaii.* Washington, D.C.: Government Printing Office.

1971d   *Census of Population, 1970. Number of Inhabitants. Final Report PC(1)–A13. Hawaii.* Washington, D.C.: Government Printing Office.

1972a   *Census of Population, 1970. Detailed Characteristics. Final Report PC(1)–D13. Hawaii.* Washington, D.C.: Government Printing Office.

1972b   *Census of Population, 1970. Subject Reports. Migration Between State Economic Areas PC(2)–2E.* Washington, D.C.: Government Printing Office.

1973   *Census of Population, 1970. Subject Reports. State of Birth PC(2)–2A.* Washington, D.C.: Government Printing Office.

United States. Census Office

1901   *Twelfth Census of the United States, 1900. Population, Part I.* Washington, D.C.: Government Printing Office.

1902   *Twelfth Census of the United States, 1900. Population, Part II.* Washington, D.C.: Government Printing Office.

United States. Department of Health, Education and Welfare

1937–   *Vital Statistics of the United States.* Annual. Washington, D.C.: Government Printing Office.

United States. National Center for Health Statistics

n.d.   Life table values, 1959–1961, Hawaii. Unpublished vital statistics. Washington, D.C.

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