

Orinda

THE SAMOAN MIGRANT PROJECT

Preliminary Report

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Introduction

A descriptive study of Samoan migrants in Hawaii was carried out by a team of researchers from The Pennsylvania State University on Oahu from March through June, 1975. This team was under the overall supervision of Dr. Paul T. Baker of The Pennsylvania State University and Dr. Joel M. Hanna of the University of Hawaii Medical School. Staff members of The Pennsylvania State University aided in the development of the research program. The research team consisted of postdoctoral and predoctoral students from The Pennsylvania State University and the University of Hawaii.

The primary objective of the study was to explore some aspects of the health and well-being of Samoan children and adults. The project was focused on body weight gain, blood pressure, physical fitness, and fertility. It was intended as only a pilot study for an expanded project but some results of the study may be of interest to Samoans and the health care programs concerned with Samoan health and well-being. The medical aspects may be of particular interest because there is evidence of an increase in the frequency of obesity, hypertension and heart disease among other groups of Polynesians who have migrated from a traditional to a more highly industrialized society (Prior, 1971; Prior et al., 1974). The environmental factors causing this decline in health are still not known. This brief report is intended to inform interested parties of our early results from the study. Because the study was a pilot one with relatively small samples most conclusions should be considered as subject to modification as more information is collected.

The primary method of data collection was household surveying in four communities on Oahu. Volunteers participated in body measurements

(anthropometry), blood pressure determinations, skin color reflectometry, and saliva collection. Children under 18 years of age participated in a dental examination assessing the number and eruption time of teeth. Questionnaires on migration and socioeconomic variables were completed by adults 18 years of age or older. Women completed a questionnaire on fertility and helped generate a genealogy for the family. A level of living survey assessing the physical environment of the home was completed by a team member for each household. Over 600 people participated in the household surveys (Table 1).

Table 1. Location of Samoans Studied on Oahu

Location	Families	Individuals
Laie	45	230
Nanakuli	18	80
Wahiawa	14	70
Honolulu	<u>48</u>	<u>220</u>
	125	600

In addition, 35 adult men participated in a physical fitness study at the University of Hawaii Medical School. This study assessed the responses of the heart and lungs to a progressive stress test on a treadmill. Also measurements were made of blood components (lipids) that have been implicated in diseases of the blood vessels and heart.

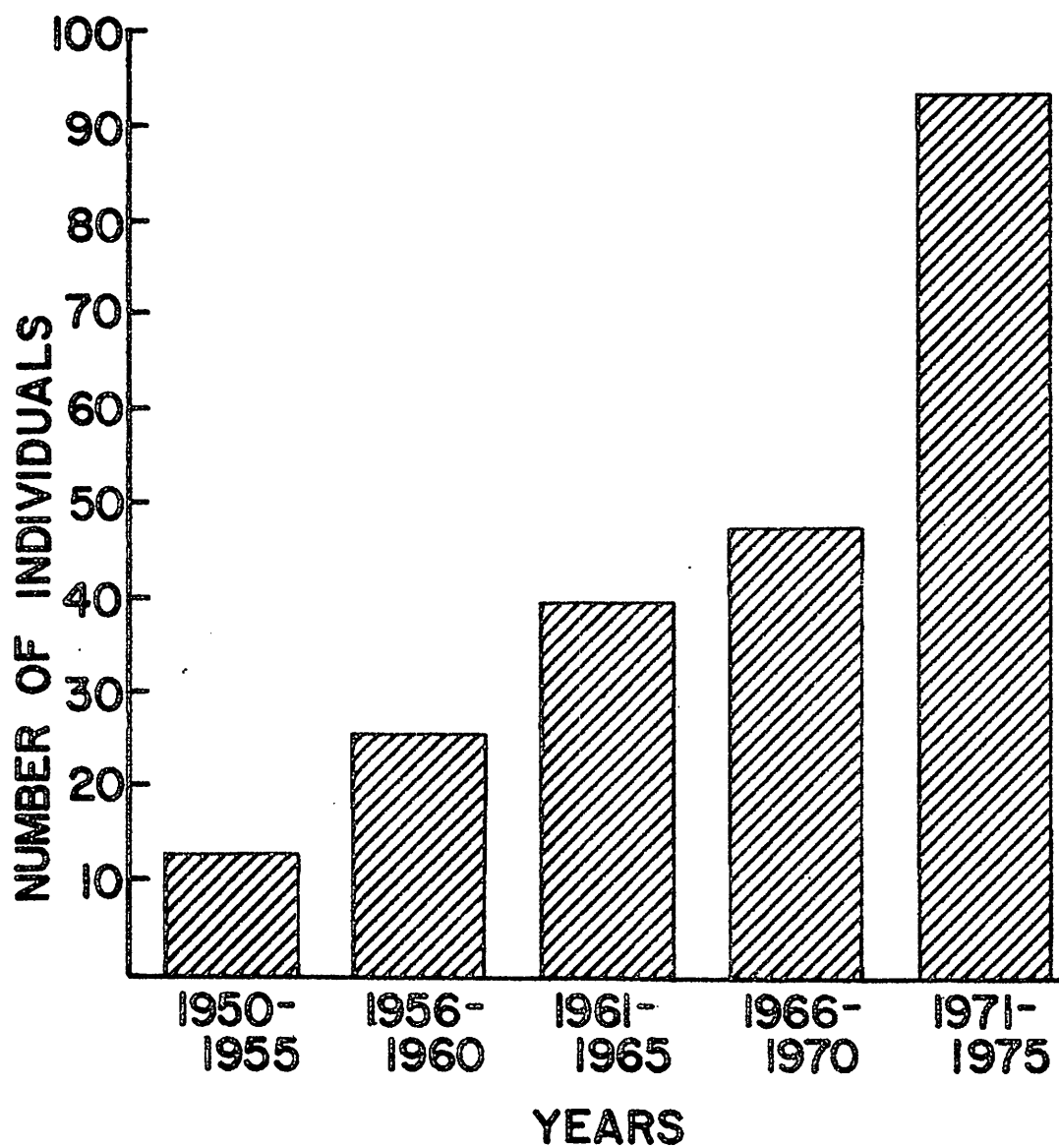
Migration and Living Patterns

Migration to Hawaii was begun in the early 1950's in response to the military experience of many Samoans and the presence of a military base on Tutuila. Since the early 1960's there has been a steady increase in the number of immigrants from Western and American Samoa to Hawaii, New Zealand, and the United States mainland. This trend can be seen in Hawaii in Figure 1. In the mid-seventies, it is estimated that over 20 percent of Samoans live outside the Samoan Islands. The reasons for migration are often economic. On small islands with limited resources the exploitation of these resources as a cash commodity coupled with a rapid increase in population size readily depletes the resources and undermines the economic stability of the island. The economic condition may be considered a major push aspect in migration. As for the pull aspects of Hawaii, the most frequently reported reasons for migration were: (1) better education for children and self (35 percent); (2) better jobs (19 percent); and (3) to be with a relative who had migrated earlier (11 percent). Seventeen percent of the people in our study were in Hawaii visiting relatives or vacationing. Visiting is often a prelude to eventual migration.

Most people migrated alone (37 percent). Many women migrated with their children (20 percent), although a significant number of children migrated with relatives other than their parents. In Hawaii, 32 percent of the families had one or more "adopted" children.

The oldest Samoan community on Oahu is Laie. Many migrants had been there since the middle of the 1950's. Almost 60 percent of the adult migrants had been in Laie over five years. In comparison, only 43.3 percent of the migrants in Honolulu had been there five years or

Figure 1



Time of migration to Hawaii for adults
by five year intervals 1950-1975.

longer. The average length of residence of the adult Samoan migrants was: Laie (9.1 years), Nanakuli (5.9 years), Wahiawa (7.9 years), and Honolulu (6.8 years).

Samoans compared to other Polynesian migrant groups such as the Tokelau and Maori migrants in New Zealand were generally older when they migrated. Men and women had an average age at migration of 34.5 years and 31.0 years, respectively. On the average migrants residing in Honolulu were the youngest and in Nanakuli the oldest.

The majority of Samoan migrants interviewed were originally from American Samoa (70 percent). Thirty percent were from Western Samoa. Almost half of the Western Samoan migrants have settled in Laie. The migrants came from 36 communities in American Samoa and 30 communities in Western Samoa.

The Samoans in our study had a high level of education. In our study we found approximately one-third of the adults had some high school education, and 30 percent had completed high school. Many had some post-high school education. Eighty-five percent of the adult Samoans participating in the study were bilingual in English and Samoan.

In spite of a good education and relative fluency in English, employment opportunities appear to have been limited for the Samoan migrants. Less than 75 percent of the adult men interviewed were employed in full- or part-time occupations. About 30 percent of all adult women were employed. Of course, our samples were small and employment in the total Samoan population in Hawaii may differ substantially from these figures.

Physical Measurements

As part of the physical assessment in the household survey a number of physical measurements (anthropometric measurements) were made for children and adults. These measurements included height, weight, triceps skinfold, girths, diameters, and segmental limb lengths. The first three measurements have been analyzed and show the Samoan population is substantially different from the U.S. standards.

Samoan adults (20-60 years) are slightly shorter and much heavier than U.S. standards for men and women in the same age range (Figure 2).

The skinfold measurements are an indicator of the amount of body fat (adipose tissue). Based on the U.S. standards (Seltzer and Mayer, 1965), the average triceps skinfold indicates that Samoan men are not only heavy but are quite fat compared to average Americans. The average skinfold measurement for Samoan women in all age classes (20-60 years) shows that they exceed U.S. norms by an even greater percentage than the men. Other investigators (Bassett et al., 1969; Prior, 1971) have found that many Polynesian peoples have high weights and amounts of fat compared to most other populations. The frequency of fat individuals increases in the migrant groups. The health implications of being fat are many. High levels of body fat have been associated with increased frequencies of diabetes, high blood pressure, and heart diseases.

Samoan children in Hawaii appear to grow faster than most U.S. children. Thus at a given age they are on the average taller and weigh more than either U.S. children in a nationwide survey or children in Apia (Figure 3).

Boys, but not girls, born in Hawaii may be growing more rapidly than boys born in Samoa. The number of years spent in Hawaii (that is, the

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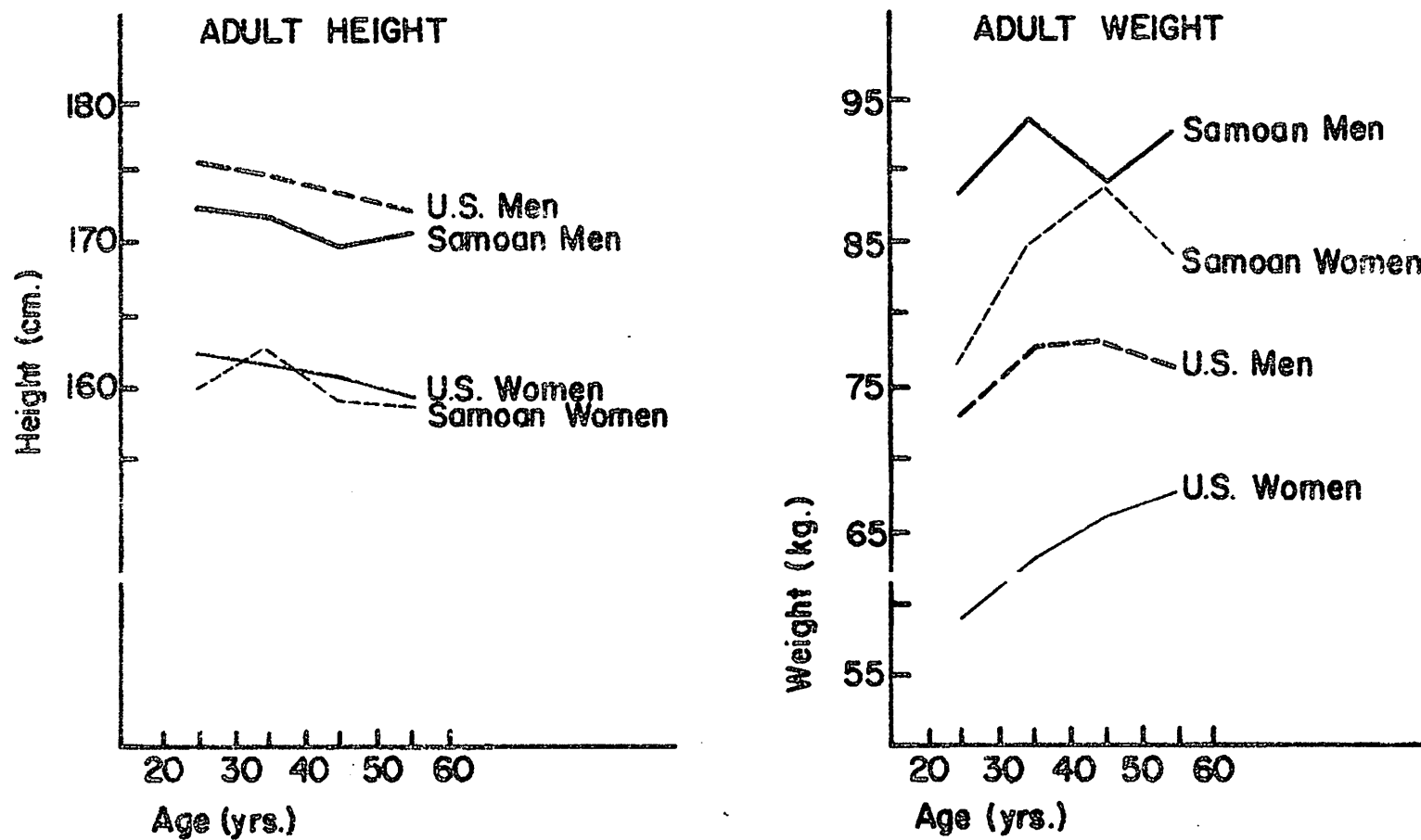
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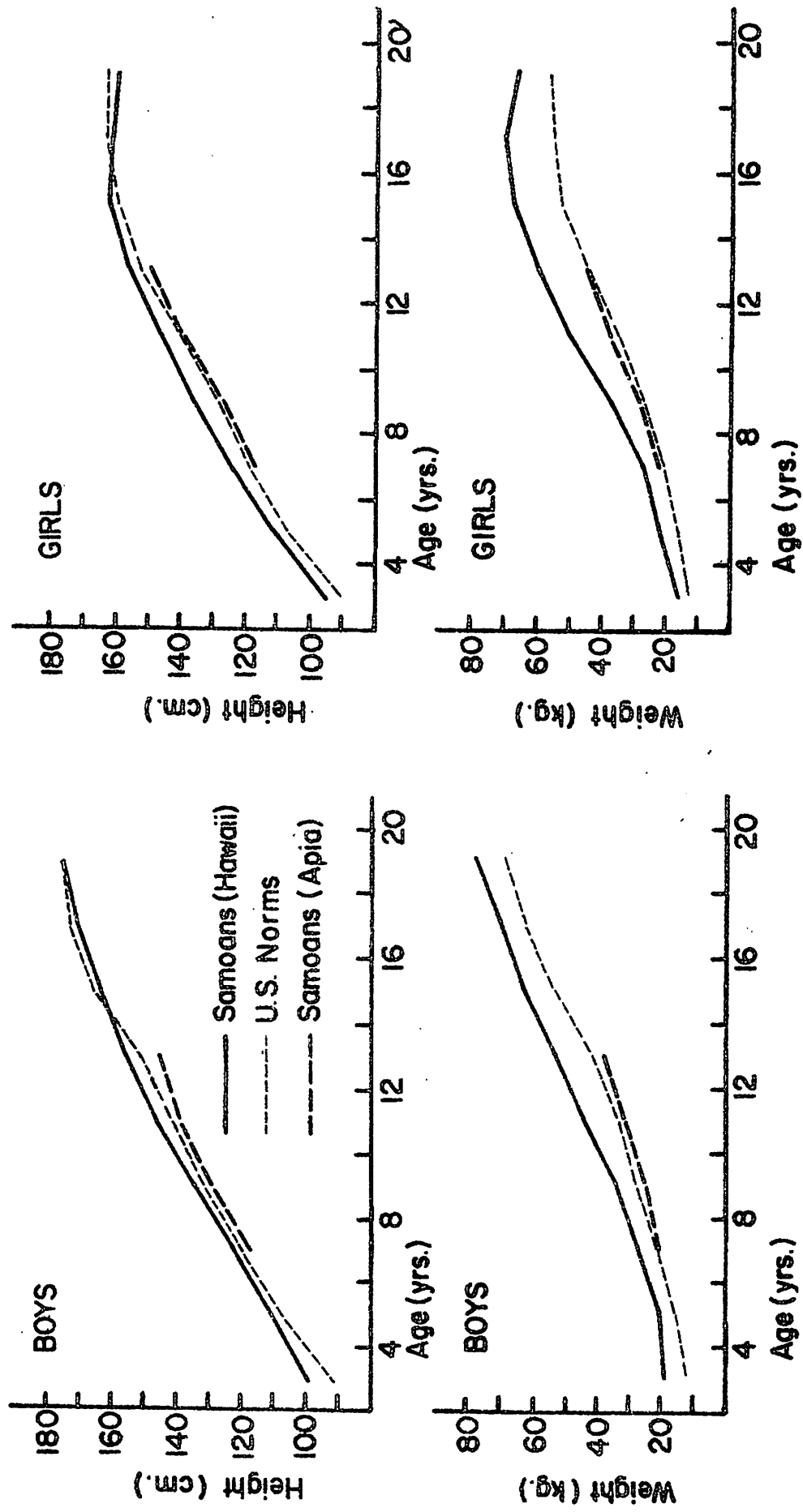
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Figure 2



Comparison of patterns of height and weight for Samoan men and women living in Hawaii versus U.S. men and women.

Figure 3



Comparison of growth patterns of height and weight for Samoan boys and girls living in Hawaii and Apia versus U.S. boys and girls.

time since migration) did not significantly affect growth. The triceps skinfold measurements, a measure of the body fat, clearly indicate that Samoan children in Hawaii are fatter than mainland U.S. or Apia children (Figure 4).

In summary, Samoan children are taller and weigh more than other groups of children that have been studied. Samoan adults are slightly shorter, but weigh more than the reported U.S. figures (NCHS, 1966). Both Samoan adults and children are fatter than the U.S. standards based on the triceps skinfold measurement.

Blood Pressure

As part of the physical assessment in the household survey, resting blood pressure determinations were made on adults and children. Adult blood pressure for age and sex are near or below U.S. standards. There was a relatively low frequency of high blood pressure disease (hypertension) for either the systolic pressure (when the heart muscle is actively pumping) or the diastolic pressure (when the heart muscle is relaxed) (Figure 5). The diastolic pressure was slightly elevated over U.S. standards but within the normal range. Lower blood pressures were found in older (50-70 years) individuals in contrast to the higher blood pressures generally observed with aging. Males had higher blood pressures than females.

Samoan children in Hawaii show a different picture (Figure 6). There is a clear increase in both systolic and diastolic blood pressures with increasing age. Although these blood pressures are within the normal range, the rapid increase among adolescents may indicate a trend toward high blood pressure in adulthood. While we cannot be certain

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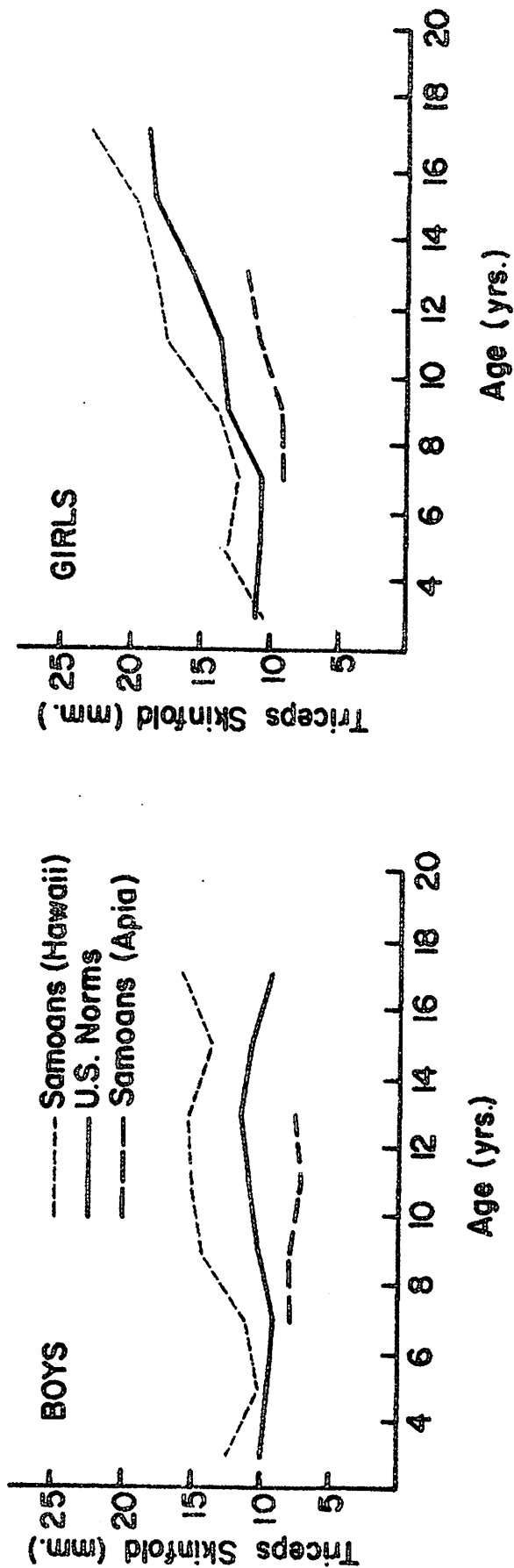
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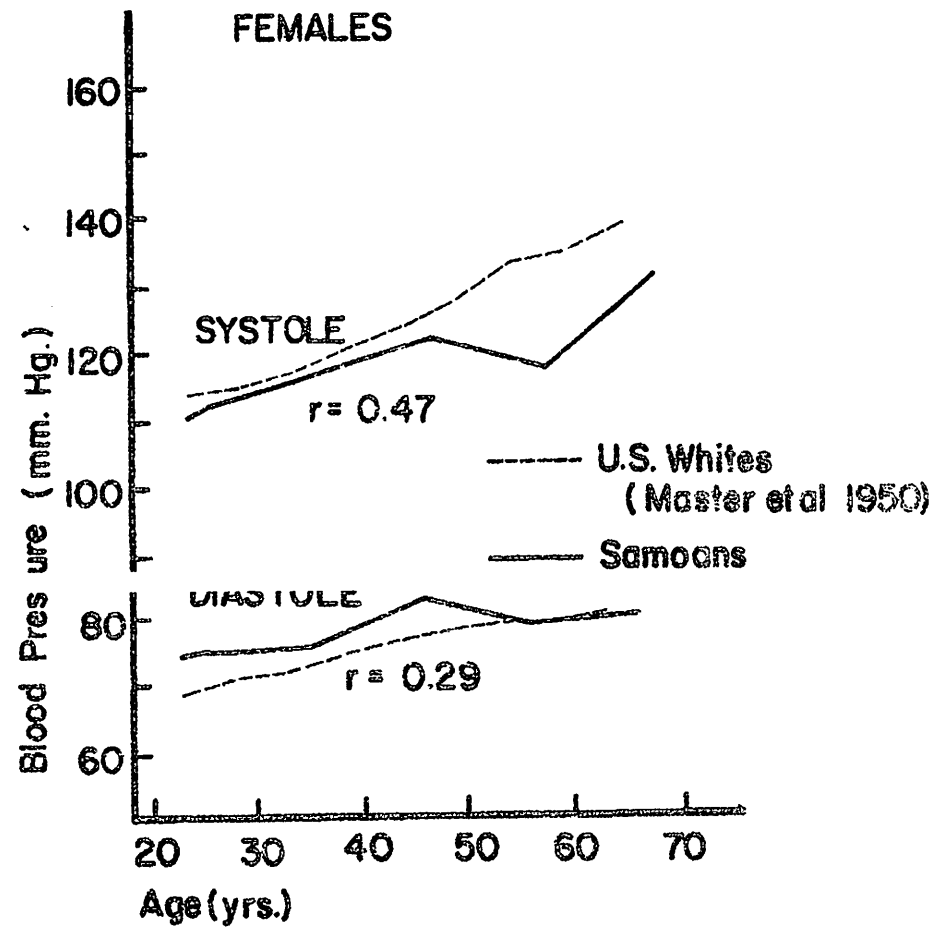
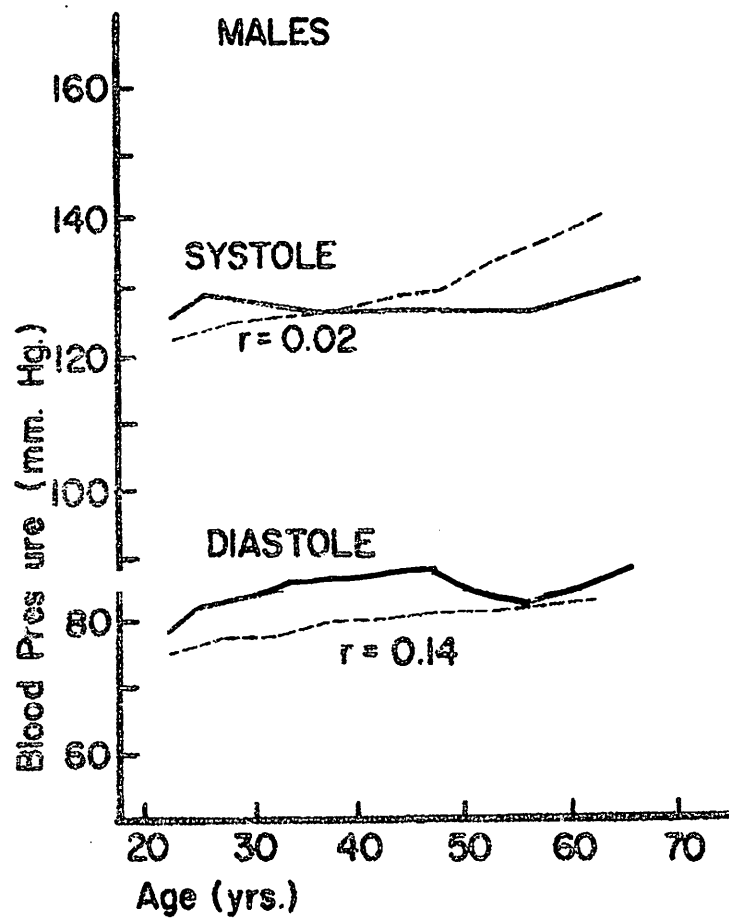
1. The first of the two main groups is the "old" group, which is the group of people who have been in the country for a long time. This group is the most numerous and is the most integrated into the society. They are the people who have been born in the country and who have grown up with the culture and the language of the country. They are the people who have been in the country for a long time and who have been part of the society for a long time. They are the people who have been in the country for a long time and who have been part of the society for a long time. They are the people who have been in the country for a long time and who have been part of the society for a long time.

Figure 4



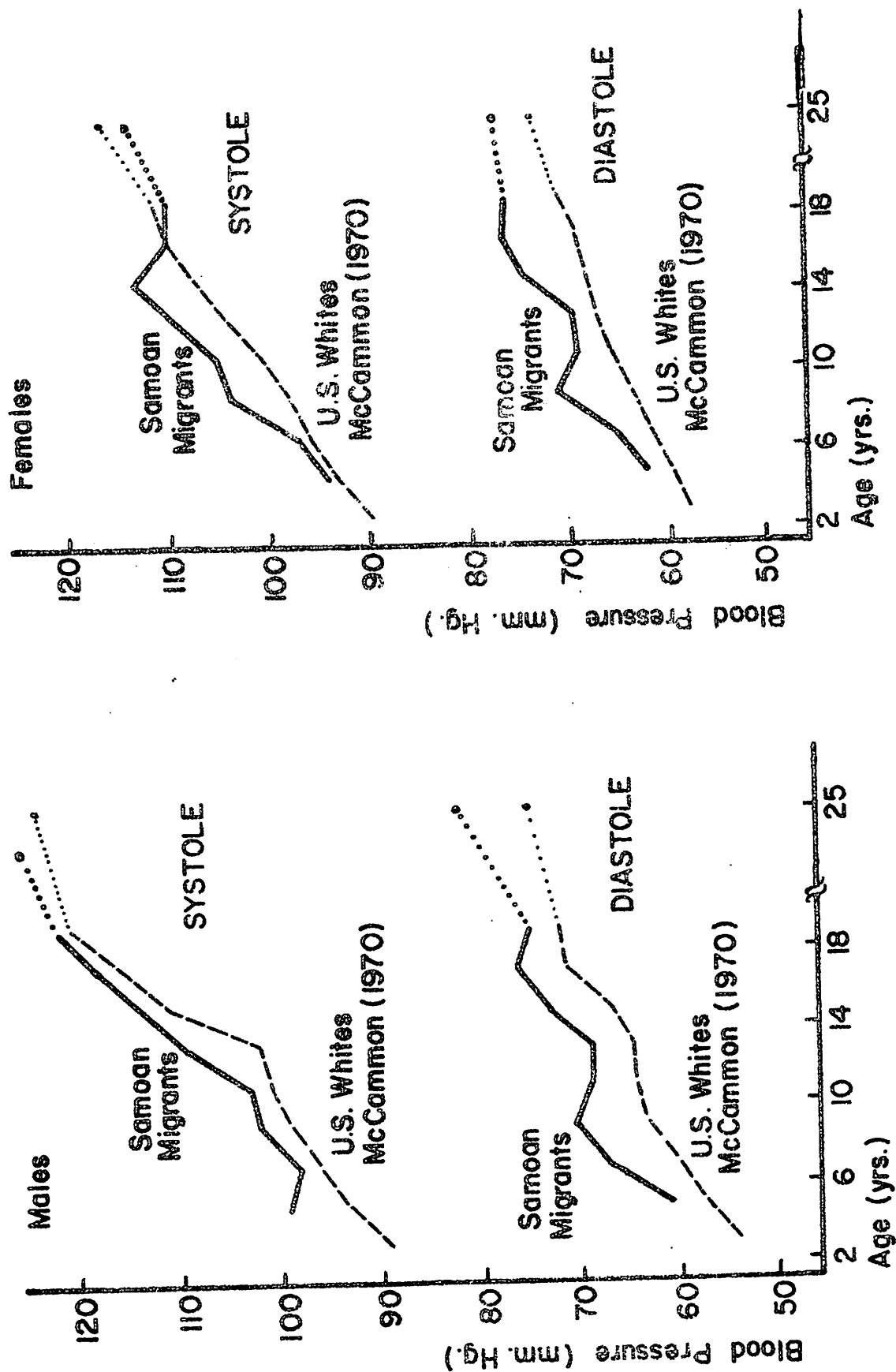
Comparison of growth patterns of triceps skinfold for Samoan boys and girls living in Hawaii and Apia versus U.S. boys and girls.

Figure 5



Blood pressures of adult Samoan migrants to Hawaii compared to published U.S. white standards.

Figure 6



Blood pressures of Samoan children in Hawaii compared to published U.S. white standards.

from our present data, children in Honolulu may have higher blood pressures than more rural children and children born in Hawaii may have higher blood pressures than children born in Samoa.

The causes of high blood pressure are not known. Scientists (Stamler et al., 1967) have suggested that diet, perceived psychological stress, genetic background and physical fitness may play roles in the production of hypertension. Many of these factors may have a significant impact on children or teenagers. Because Samoans are living life styles ranging from traditional (Western Samoa) to highly westernized (Hawaii), they are a very good population of people to study to try to define the causes of hypertension.

Polynesians as a group appear to be prone to hypertension. Recent reports have shown that hypertension and related heart diseases are becoming more prevalent in Hawaii and in American Samoa (Hawaii Department of Health, 1976; Department of Medical Services, American Samoa, 1976). Studies of Hawaiians have shown that a high frequency of adults are hypertensive. For example, Stokes et al. (1966) found that 76 percent of pure Hawaiian males (35-65 years) had elevated blood pressure ($> 140/90$).

Fertility

Women 18 years of age or older completed a form concerning reproductive history. A total of 131 women participated. Seventy percent were married, 20 percent single, and 10 percent divorced or widowed. Eighty-one percent of married females have been married only once.

Table 2 summarizes the statistics on fertility for all women in the sample. These figures indicate that Samoan women successfully complete a very high number of pregnancies (5.08 live births) as compared to the average reproductive success of all U.S. women (2.4 live births).

Table 2. Fertility Characteristics of Samoans in Hawaii

	N	Means	Standard Deviation	Range
Age at first pregnancy	98	20.01	3.91	12.00-33.00
Age at menarche	129	14.19	1.67	10.00-18.00
No. of pregnancies	108	5.69	4.04	1.00-18.00
No. of live births	106	5.08	3.38	1.00-14.00
No. of miscarriages	39	1.97	1.74	1.00-10.00
No. adopted	40	1.63	0.95	1.00- 5.00
No. live children	104	4.66	3.11	1.00-13.00
No. births premigration	76	5.04	3.32	1.00-12.00
No. births Hawaii	59	2.34	1.58	1.00- 6.00

The reported use of contraceptives was low, approximately 20 percent. The favored method of contraception is the pill or oral contraceptive. Over 75 percent of the women in the sample stated that they had no gynecological problems. The problems most frequently stated were nonspecific in nature (14.3 percent).

Age trends indicate that there are changes occurring in both reproductive behavior and attitudes toward reproduction. It is clear

that there has been a steady decline in the age of menarche from a mean of 14.2 years for women 50 and over to a mean of 13.5 years for women age 15-20 years. There has also been a decrease in the age of the first pregnancy for these same age groups, the difference is about one and one-half years. Ideas concerning the actual number of children desired has decreased from 8.3 children for women 45-50 years to 3.5 children for women 15-20. The number of children considered ideal has also decreased from a high of 9.3 (women over 50) to a low figure of 4.4 (women 25-30).

Additional population statistics (Park, 1972) indicate that Samoan populations in American and Western Samoa and in Hawaii are increasing rapidly. Data from the current study suggest that the Samoan population in Hawaii will continue to increase because of both migration and natural population increase. However, the well-known effects of modern living styles on desired family size is affecting young Samoan women.

Tooth Eruption

Children a few months old to 18 years of age were given dental examinations to assess the number of baby teeth (deciduous teeth) and adult teeth (permanent teeth) that were present at a specific age. The age of tooth eruption is an indication of the course of growth, development and maturation of children. Because of the small number of very young and older children, the investigators concentrated on the eruption of the adult teeth in children age 6-13.

The results indicate that the adult teeth of Samoan children both in Apia, Western Samoa and on Oahu, Hawaii erupt earlier than the adult teeth of mid-western American and German children. Oahu children have significantly more teeth than Western Samoan children at

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ages 7-12 for boys and 9-12 for girls. Samoan children born and living in Hawaii have more erupted teeth per age than children born and living in Samoa. In general boys who have lived in Hawaii longer, have an earlier tooth eruption age. This is true of girls only until the age of nine. In comparing the four communities in Hawaii, children in the urban area of Honolulu have a slightly advanced eruption time. The tooth eruption pattern and the anthropometric data indicate that Samoan children in Hawaii are more advanced in their growth patterns than U.S. white children of comparable ages.

Saliva

Whole saliva was collected from 200 individuals of both sexes age 5-75 in the communities of Laie, Nanakuli and Wahiawa. The investigators were interested in looking at the digestive enzymes in the saliva. Amylase is the digestive enzyme in the mouth which breaks down starch in starchy foods such as taro, potato, noodles, cake and doughnuts. The electrophoretic results indicate that there is a single α -amylase enzyme. The ability to digest starch (i.e., the α -amylase activity level) is normal in the Samoan sample. The total protein content of the saliva is also within the normal range. No significant differences were found between men and women or between children (less than 18 years of age) and adults. There were some small differences in the amylase electrophoretic patterns, activity levels and total protein content among the communities studied. For example, one community had the highest salivary amylase activity levels, while another had the highest total protein content. These differences may be related to genetic differences since the proportion of individuals from Western

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 3, 1862. It is a long and detailed letter, covering many topics, including the state of the Union, the progress of the war, and the administration of the government. It is a very important document, as it provides a clear and concise summary of the President's views and policies at that time.

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 3, 1862. The letter is addressed to the Senate and the House of Representatives, and is signed by Abraham Lincoln. The letter discusses the state of the Union and the progress of the war against the Confederacy. It also mentions the President's efforts to maintain the Union and his commitment to the principles of liberty and justice for all.

2. The second part of the document is a report from the Secretary of the War Department, dated January 10, 1862. The report is addressed to the President and the Congress, and is signed by Edwin M. Stanton. The report provides a detailed account of the military operations of the Union Army during the previous year. It includes information about the number of troops, the equipment, and the results of the battles. The report also discusses the challenges faced by the Union Army and the measures taken to overcome them.

3. The third part of the document is a report from the Secretary of the Navy Department, dated January 15, 1862. The report is addressed to the President and the Congress, and is signed by Gideon Welles. The report provides a detailed account of the naval operations of the Union Navy during the previous year. It includes information about the number of ships, the equipment, and the results of the battles. The report also discusses the challenges faced by the Union Navy and the measures taken to overcome them.

4. The fourth part of the document is a report from the Secretary of the Treasury Department, dated January 20, 1862. The report is addressed to the President and the Congress, and is signed by Salmon P. Chase. The report provides a detailed account of the financial operations of the Union Government during the previous year. It includes information about the revenue, the expenditures, and the state of the public debt. The report also discusses the challenges faced by the Union Government and the measures taken to overcome them.

5. The fifth part of the document is a report from the Secretary of the Interior Department, dated January 25, 1862. The report is addressed to the President and the Congress, and is signed by Caleb B. Smith. The report provides a detailed account of the land and mineral operations of the Union Government during the previous year. It includes information about the land sales, the mineral operations, and the state of the public lands. The report also discusses the challenges faced by the Union Government and the measures taken to overcome them.

6. The sixth part of the document is a report from the Secretary of the War Department, dated February 1, 1862. The report is addressed to the President and the Congress, and is signed by Edwin M. Stanton. The report provides a detailed account of the military operations of the Union Army during the previous year. It includes information about the number of troops, the equipment, and the results of the battles. The report also discusses the challenges faced by the Union Army and the measures taken to overcome them.

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and American Samoa varies in these communities. Differences also may be related to changes in the diet.

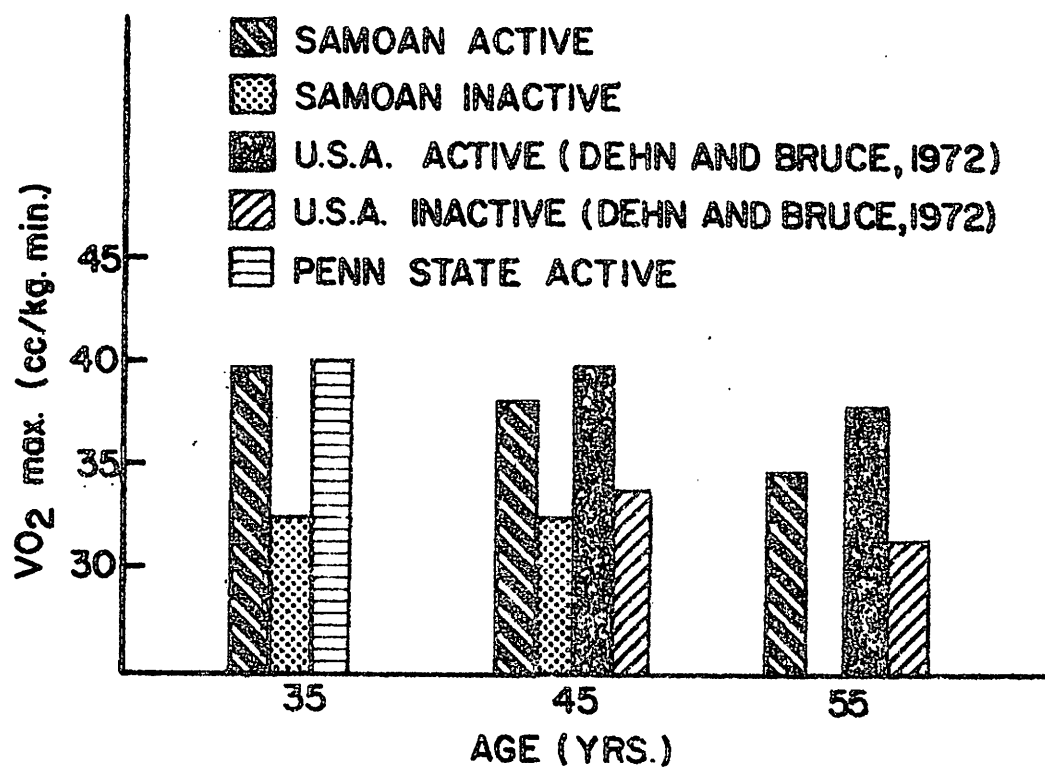
Physical Fitness Study

Thirty-five men age 30 to 58 participated in a stress test at the University of Hawaii Medical School. Each man received a complete physical examination prior to the testing. The stress test indicated that Samoan men had a low efficiency of heart and lung performance under stress produced by walking on a treadmill. Comparing these results to men of comparable age and daily activity levels (Dehn and Bruce, 1972; unpublished data on Penn State male students) work capacities as measured by oxygen use (VO_2 max) are reduced for Samoans (Figure 7).

The blood analysis indicated that the sample of Samoan men had normal hematocrit and hemoglobin levels. No one was anemic. The fasting levels of blood lipids indicated that Samoan men have high levels of both serum cholesterol and triglycerides when compared to U.S. population standards. However, when compared to the lipid levels of other Polynesian groups living in industrialized societies, the Samoan lipid levels were not as high. Residents in traditional societies have lower lipid levels (Figure 8). Inactive men had higher cholesterol levels than men who were more physically active. Activity levels were based on a self-report questionnaire. High levels of blood lipids, inactivity and obesity have been designated as high risk factors in high blood pressure (hypertension), blood vessel diseases (atherosclerosis) and coronary heart disease.

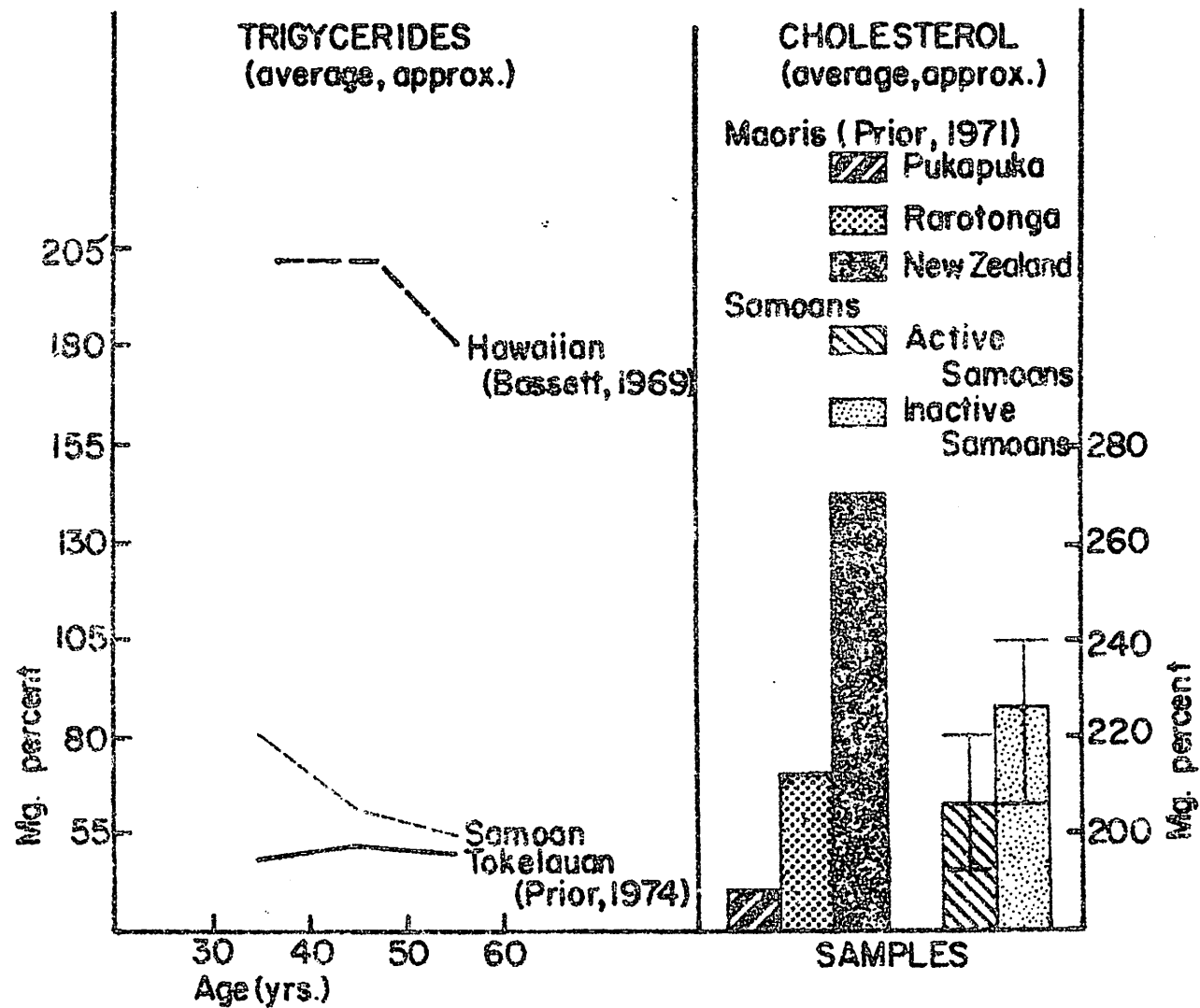
In American Samoa during 1971-1973, 19 percent of all deaths were due to heart disease and 13 percent of all deaths were due to stroke

Figure 7



Physical Fitness: Work Capacities (Oxygen Use)

Figure 8



Blood lipids in polynesian populations.

which is a hypertensive related disease. All other listed causes of death (eight categories) individually accounted for 3-9 percent of the deaths. Deaths due to disease of the heart and blood vessels (i.e., cardiovascular diseases) were possibly higher in Samoans (517 deaths/1000 population) than in the U.S. population (477/100,000). In certain age groups, Samoans run two times as great a risk of coronary heart disease as other U.S. groups (Department of Medical Services, American Samoa, 1976).

High uric acid levels associated with gout were found for Samoans. Gout is a painful disease often affecting the joints of the toes. It affects more men than women. These levels are high in many Polynesian groups. For example, Prior (1971) has found that on Rarotonga, 3.7 percent of the men have gout but that in New Zealand 13.3 percent of the migrants are affected.

In summary, it appears that the sample of Samoan men tested was slightly less well fit than their mainland American counterparts matched for age, but that Samoans are better fit than some other tested Polynesian groups such as Maoris and Hawaiians.

Prospectus: Future Research

The findings of the initial study of Samoan migrants in Hawaii has raised a number of questions, among them are: (1) what are the causes of the observed increased frequency of obesity in Samoans as living patterns and the environment become more westernized; and (2) what are the environmental and genetic factors, particularly during childhood, which are involved in the production of adult hypertension?

Work on these questions will begin this spring (April) in Hawaii and will continue in American Samoa and Western Samoa. Dr. Paul T. Baker, director of the project, anticipates that the study of the causes of high blood pressure will begin next winter. Communities of sedentary and migrant Samoans will be studied. Communities representing traditional and modernized living conditions will be selected for study.

The investigators hope that these additional studies will further elucidate the changing and emerging picture of the causal factors and status of Samoan growth and development, physical fitness and health. It is only through the tremendous spirit of cooperation and assistance of the members of the Samoan communities in Oahu that we have been able to complete the first study. These initial findings clearly point the way to further research concerning Samoan health and well-being. Again, we acknowledge the helpfulness of all participants.

For further information about past or proposed research, contact Dr. Paul T. Baker, Department of Anthropology, 511 Social Science Building, The Pennsylvania State University, University Park, PA. 16802.

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