EAST-WEST CENTER

Pacific Transitions: Population and Change in Island Societies

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SUMMARY Despite some well-publicized pessimism about the future of the Pacific islands recently, the population and societal transitions now underway can provide grounds for optimism. The high death rates that followed European contact and almost wiped out several island populations have continued to drop sharply. More recently, birth rates have also been dropping, easing fears of population pressures. Transitions in employment and mobility are also reshaping island societies. Fewer islanders are working in agriculture and more are in higher paid urban jobs, especially in the service industries. Even though many people are migrating from village to urban areas, from outer islands to main islands, or even to other countries for work, they often send money back to help their home communities. Greater educational opportunities are also available to islanders. While some decry the loss of traditional institutions and see Pacific islanders as the victims of exploitation or dependency, others view them as taking maximum advantage of the wide variety of opportunities now available to them.

Pacific Islands and Their Societies

Some Pacific changes resemble the "demographic transition"—lower death rates followed by lower birth rates

The Pacific islands include a range from low coral atolls with few resources to large islands with significant populations that are relatively well endowed with natural resources. Beginning about 40,000 years ago, Papuan-speaking peoples moved into Melanesia, followed about 7,000 years ago by Austronesian-speaking peoples who moved through Melanesia and on into Micronesia and Polynesia. The Pacific population is now marked by diversity and isolation; even those in the same country are often isolated by the vast distances between islands or, on larger islands, by rugged terrain and dense forests. As of 1990 about six million people lived in the Pacific islands, 3.7 million in Papua New Guinea and and about 800,000 in Fiji, with the remaining 1.5 million spread among the other islands.

Traditionally, the societies and peoples of the Pacific have been divided into three major cultural areas: Melanesia, Micronesia, and Polynesia. Melanesia is most populous and largest in land and natural resources; Micronesian and Polynesian islands are by comparison small, scattered, and generally have few natural resources.

- Melanesia consists of Papua New Guinea, the Solomon Islands, Vanuatu, New Caledonia, and Fiji (Melanesian but with Polynesian cultural influences). With about 1,200 languages, Melanesia is marked by diverse and culturally fragmented societies (although in recent years a Melanesian identity has developed) with a generally egalitarian social structure.
- Micronesia, marked by somewhat diverse but hierarchical societies, consists of Kiribati, the Federated States of Micronesia, Palau, Guam, the Marshall Islands, Nauru, and the Commonwealth of the Northern Marianas. All except Kiribati and Nauru have been under U.S. jurisdiction, Guam as a territory and the others as a UN trusteeship, with heavy dependence on external aid.
- Polynesia, more culturally homogenous than the other areas but also traditionally marked by hierarchical societies, consists of the Cook Islands, French Polynesia, Niue, Western and American Samoa, Tokelau, Tonga, Tuvalu, and Wallis and Futuna. People on the larger island groups such as Western Samoa and Tonga have adequate land and marine resources, but those on resource-poor atolls are heavily dependent on external aid.

The Pacific, like much of the rest of what is now the Third World, was colonized by Western powers, mostly by France and England, although Spain, Germany, and the Netherlands also had an early role and the United States, Australia, and New Zealand a later one. Today the islands are divided into 21 political entities: nine independent nations; five self-governing in free association with former colonial rulers; and seven continuing as dependencies of France (New Caledonia, French Polynesia, Wallis and Futuna), the United States (Guam, American Samoa), and New Zealand (Tokelau). The former colonial connections are still reflected in patterns of commerce, transportation, communication, foreign aid, and higher educational opportunities.

The penetration of Pacific island cultures by Europeans has fundamentally altered island societies. This history has negative and positive aspects—devastating epidemics and loss of traditional lifestyles on the one hand but introduction of health-improving and later reproductive-controlling technology on the other. Some of the changes are similar to the "demographic transition" seen elsewhere around the world over the last few centuries, with modernization resulting in a fall in mortality and, a decade or two later, fertility toward the low levels typical of developed countries. This view applies largely to the Pacific but does not explain the degree to which these two trends will vary among parts of nations, or even islands, and among different cultures, classes, and occupational groups.

Changes in Rates and Causes of Death

When Pacific peoples moved out into their islands, they left behind them most of the diseases that scourged populations elsewhere and their mortality levels were probably moderate to low. Contact with

the West brought devastating epidemics such as smallpox, measles, influenza, and dysentery, as well as diseases that became endemic such as tuberculosis, which almost exterminated some island societies. Modern medical advances (such as antibiotics) and public health measures (such as improved sanitation) are restoring low mortality and allowing more to survive the dangerous early childhood years. Life expectancies have ranged from less than 40 years for countries before the transition to more than 70 years where the change is nearly complete. The trend is toward continued and often rapid improvement, although unhealthy environmental conditions that could be easily rectified persist, and mass campaigns against specific diseases such as malaria are still necessary in some areas. Wider application of health care, which buys lowered mortality, has been limited by cost. Those countries with the lowest mortality tend to be those with close fiscal association with a metropolitan (former colonial) power, while countries that have had to fend for themselves tend to have higher mortality.

In conjunction with the mortality transition seen in most island societies has been a transition in morbidity, or kinds of illness. High-mortality populations tend to have more deaths from environmental diseases such as tuberculosis, malaria, and diarrhea that especially affect the young. As mortality drops, more and more people survive long enough to die of so-called degenerative or chronic noncommunicable diseases such as heart and circulatory diseases and cancer. In the later stages of the transition, other causes associated with changing lifestyles—violent death, motor vehicle accidents (an unwanted consequence of paved roads), substance abuse, and obesity—may become important. Nauru, with its unusually high per capita wealth (based on sales of phosphates) is proving to be an unusually dramatic example of this. Such problems have more to do with excesses bought with money than with money as such (though perhaps they are aggravated by a lack of a tradition of urban culture), and their solution has more to do with education in healthful living than with restoring a village lifestyle. Most Pacific islands are likely for the foreseeable future to have some persisting communicable and hygiene-related diseases but they will be brought down to tolerable levels for most of the population. They are likely to experience infant mortality levels several times as high as those possible in well-developed health systems, and diseases requiring costly and complex methods of diagnosis and treatment will continue to be neglected, especially among the elderly.

Traditional Pacific cultures could probably control the size of their populations

Changes in Childbearing

Classic demographic transition theory expects high fertility in traditional societies to compensate for punishing levels of mortality. But assuming this was the case in the Pacific is questionable since mortality levels there were not especially high. Instead, the small area and constricted resources of atolls is likely to have encouraged control of family size. Studies of Tikopia and later Nukuoro and Eaurapik in the Federated States of Micronesia indicate that low mortality and controlled fertility were the rule up to the first decades of this century. It seems more likely that Pacific islanders have had a long history of controlling their population size through such methods as premarital and postpartum (after childbirth) sex taboos, prolonged lactation, abortion, and infanticide.

Control over fertility weakened with the decline of traditional social systems following contact and colonization. To combat the resulting high fertility, governments instituted family planning programs. Some areas—Guam, French Polynesia, New Caledonia, and Tuvalu—have experienced a strong fertility transition and now have levels similar to Western nations. Even the high-fertility groups—Marshall Islands, Solomon Islands, Federated States of Micronesia, Vanuatu, and Papua New Guinea—all show some recent decline in fertility, which suggests that their peak has been reached and passed.

Conventional demographic wisdom identifies increasing levels of education, participation in paid employment, increasing affluence, and greater urbanization as the major catalysts for fertility transition. Former East-West Center researcher

Agricultural production is falling largely because people have found better ways to use their time and energy

Margaret Chung, however, found that among woman on the Fijian island of Kadavu the crucial factor was not education but the opening up of alternative opportunities, especially the possibility of living elsewhere than in the rural village. Family planning programs played a role in some cases such as Fiji and Tuvalu, while in others the rising standard of living seems to have had most effect. Some areas—New Caledonia, Northern Marianas, Guam, and French Polynesia—have gone far in fertility decline with little or no formal program; instead women with good access to education, jobs, and mobility, consulting with doctors and pharmacists of their own volition, have managed the transition. Even in Tuvalu and Fiji, the sites of the earliest programs, the rate of women accepting family planning services has never exceeded 40 percent of those eligible.

As more children survived, the population of many island groups became distorted with up to half the population under age 15, and this is still the case for countries such as the Marshall and Solomon Islands and Federated States of Micronesia. Other countries such as Tonga and New Caledonia have seen a drop in the proportion of youngest children, but the bulge of teenagers and young adults is still moving through the demographic profile like a goat swallowed by a snake, placing heavy strains on education and land systems, job markets, and the social fabric.

Changes in Employment and Education

The almost totally rural, agriculture-based populations of traditional societies are becoming a rarity in the Pacific, and the proportion of people involved in agriculture in most nations is dropping (although there are exceptions). In Melanesia, only 13 percent of the value of exports is derived from crops, and even Fiji, where much agriculture is commercial and technologically sophisticated, saw agriculture's proportion of the economy fall 10 points over two decades to 44 percent in 1986. During the early 1980s, John O'Meara found that on Savai'i in Western Samoa the villagers' return on making copra was so low that only children were sent out to gather nuts. The primary reasons for low production of this and other crops were not that villagers were unwilling or inefficient, oppressed by their social system and rapacious chiefs, or lacked the incentive of individual land ownership, but simply that they had found more attractive things to do with their time and energy. It seems clear that the only types of agricultural development worth planning, much less funding, are those that have some prospect of generating returns comparable to those available from urban paid employment. Not all agricultural activities are doomed; some enterprises have succeeded, including cacao in Western Samoa in the 1950s, coffee in the New Guinea highlands in the 1960s, and the recent boom in Tongan squash. Sugar has served Fiji well over the years and even the case of coconut is not entirely negative, since the palms produce for 70 or 80 years whether they are harvested or not, and production can rise rapidly once conditions are favorable. And there clearly remains a role for subsistence agriculture to grow the staples of island diets, on health and dietary grounds alone or for profit, as evidenced by thriving export trades of these staples from island producers to the metropolitan populations.

Some Pacific islands, especially in Western Melanesia, have other resources of value; Papua New Guinea, for example, is becoming one of the world's top gold producers, and the area also has petroleum, natural gas, copper, nickel, manganese, and other minerals. Other areas such as Vanuatu, Fiji, the Solomon Islands, and Papua New Guinea have tropical rain forests that provide products of value. But the dramatic job increases so far have not been in the mining or manufacturing sectors but in services, trade, and industries such as transportation and construction. Resources in Polynesia are less tangible—climate, scenery, and culture that will allow carefully managed resort and ecotourism development—but may be of increasing value in a shrinking world. Tourism jobs may not seem appropriate pinnacles of ambition for proud people, but many Pacific islanders seem to prefer them to making copra, and some rise far higher than menial service levels. The communications revolution,

besides helping Pacific islands overcome their traditional isolation and internal fragmentation, may benefit them with an influx of "knowledge workers" able to live where they want and work by computer and telecommunication.

Parallel with this employment transition is another that feeds into it—an education transition. In most Pacific island communities, it is no longer acceptable for young people to be illiterate or not to have attended school in some form. School attendance, however, is not compulsory in most island communities, and, particularly among the independent nations, significant proportions of school-age children are still not attending—up to or more than 65 percent in Papua New Guinea and the Solomon Islands and increasing, with only half of adults literate. Even in relatively well developed Fiji, where adult literacy is over 80 percent and most children attend at least some primary school, one-third of all school-age children are not attending school at any given time. Attendance is free and compulsory in the American territories of Guam and American Samoa and in the Micronesian states. Attendance is also virtually universal in the Polynesian areas of the Cook Islands, French Polynesia, Wallis and Futuna, Niue, Tokelau, and Tonga, and high in Western Samoa, as well as in New Caledonia and in Micronesia. Again, those countries with higher incomes are able to provide universal education free or at low cost. Possibilities for higher education either at home or abroad have also increased dramatically in the past two decades. But too many young people, particularly in Melanesia, will enter the next century unschooled and illiterate.

Some island groups have more of their people living overseas than at home

The spread of education and the move to paid employment have produced social changes, as these jobs required more people than the traditional elite could provide and they began to be filled by those who could survive the educational systems. The traditional two-tier social structure in which a small elite presides over the mass of people is giving way to a three-tier structure with a middle class composed mainly of people in paid employment. In the area of private enterprise, Pacific islanders have not so far prospered, with problems of amassing capital, learning alien techniques, and isolating an essentially private activity from an essentially public family milieu. In most island societies this has proven easier for immigrant groups, such as the Indians in Fiji. But with their example and the experience of relatives overseas, there is every reason to expect more and more Pacific islanders to seek and succeed in business opportunities.

Changes in Mobility

The move out of agriculture has expanded service industries in some areas, but where this has not been possible many have migrated to places with jobs. This has been largely the case for Polynesia and increasingly of Micronesia, although less so in Melanesia. Migration has been especially characteristic of Polynesia, giving rise to large Polynesian communities in Pacific rim cities such as Auckland, Los Angeles, and Honolulu. Niue is the extreme example of outward migration, but the Cook Islands, Tokelau, Western Samoa, and Tonga are also affected in this way. As Te'o Fairbairn recently noted, more than 100,000 Samoans and 40,000 Tongans live overseas, and more Niueans, Tokelauans, and Cook Islanders live abroad than on their home islands.

Pacific islanders have not only migrated among Pacific countries, but their own countries have received other significant migrant groups. Europeans are concentrated particularly in New Caledonia and Guam but can be found in every island country, dating back to the colonial era or on short-term employment in government or business, and most recently for international technical assistance agencies. Most controversial has been the Indian population of Fiji, estimated at 350,000 in 1992. Significant numbers of Chinese have settled in French Polynesia (9 percent of the population), Guam, and Papua New Guinea, and Koreans have gone to Guam and American Samoa recently, while there has also been an influx of Filipinos to Guam, Palau, the Northern Marianas, and Papua New Guinea. Small pockets of Vietnamese remain in New Caledonia and Vanuatu (and Javanese in the former) dating from the colonial era. Japanese migration,

extensive between the world wars, is again occurring to Micronesia, although usually for short periods.

While it might seem a tenuous practice for islanders to migrate elsewhere and send money back to keep the home islands viable, it is surely no more uncertain than the wildly fluctuating export commodity prices upon which the islands have previously depended. The "transnational corporations of kin" that have developed allow extended families to exploit the resources of a variety of environments. The rural village does not inevitably suffer; its perpetuation and the comfort of the inhabitants may be the major objective. Some have alleged that remittance money does not benefit the sending community because little is invested in commercial or agricultural development, but ignores the fact that money is heavily used to finance education for younger kin and for improved housing. Once these priorities are served, families may be more enterprising with their investments. Future Pacific households may resemble those former East-West Center researcher Yvonne Underhill found on Manihiki Atoll in the northern Cook Islands, where some members stay on the atoll to use and further develop local resources (mainly the oyster shell and pearl industry) while others range over the "household region"—stretching from neighboring atolls, other Cook or French Polynesian islands, to New Zealand or even Australia and the United States—for education, jobs, and technological resources.

The "Pacific" brand of urbanization allows people to keep a foothold in both town and country

Changes in Urbanization

The urban center seems to have been the most successful of the institutions introduced by foreigners in terms of both proliferation and growth. In the beginning, Pacific towns were places to visit or work on a short-term basis, but certainly not a place to live permanently. Instead, they were inhabited by foreigners—Europeans, Chinese, Indians, people of mixed race or from other island groups—or people who were different in some way, a small educated elite, speakers of the colonial language, the mission-sponsored, those who provided a bridge between the indigenous and the alien. Over recent decades, the town has developed into an authentic alternative to the village settlement, and urban growth is now mainly derived from an influx of indigenous people and from natural growth of the existing population. Urban living brings the advantages of water and power services, education, and medical care, and quick access to goods, services, amusement, and other people; on the other hand, paid employment must be found for at least some family members, and there are sometimes squatter settlements and lawless, unemployed "rascals," as well as pollution.

Some Pacific island towns have been affected in recent years by slow growth or actual decline as their populations have migrated to a metropolitan country. Internal redistribution is also having an effect in some countries, with the "deserted village" becoming a feature of the more inaccessible parts of the Pacific. Often the movements are of a peculiarly "Pacific" kind, designed to retain a foothold in both places and have the best of both worlds. Another type of urbanization has come to some of the more affluent islands, marked less by people living in a definable town than by the virtual absence of a rural population; Nauru is the outstanding example, but Guam and Saipan have developed along similar lines.

Views of the Pacific

All Pacific islands are well into the mortality transition and some have completed the change. The fertility decline, while not as advanced, is now well established and is likely to intensify rather than diminish since the forces that temporarily promoted large family size are in retreat. Transitions in education, employment, and migration (in particular to urban areas and overseas) are being embraced with considerable enthusiasm; only the cost involved prevents these transitions from moving forward even faster than they already have. Some researchers, advisers, and indeed many reflective and articulate Pacific islanders (including many island leaders) regret these transitions (except mortality and morbidity) and feel Pacific island development may be moving too fast and in the wrong direction. They worry about the decline in agricultural production, rural depopulation, and the abandonment of marginal locations, as well as the decay of traditional

institutions and the frantic pace of change. Some echo the view of the first entranced European visitors in seeing the Pacific of the past as a latter-day Eden, although it is not clear whether this view springs from traditional appraisals or from media and tourist publicity.

Some feel Pacific island development is moving too fast and in the wrong direction

There are several different ways of looking at these changes. Some islanders and foreign observers, saddened by the traumatized condition of traditional subsistence systems, are receptive to viewing the state of the Pacific in light of "dependency theory." This view, most associated with John Connell, describes an exploitive world system in which metropolitan countries benefit from unequal terms of trade and exchange with their former colonies, which suffer from persistent underdevelopment and economic stagnation. The metropolitan countries also are blamed for the cultural erosion, monetization, and increasing "individualism" of island culture, including trade that induces technology transfer, capital investment, and development aid; media that carry messages subversive of traditional culture; and nonindigenous educational systems. Another view is provided by I. G. Bertram and R. F. Watters, who describe a system of migration, remittances, aid, and bureaucracy (for which they have coined the acronym MIRAB) centered on the idea that aid, although called "development," is in fact "welfare state colonialism." Aid money, although ostensibly given to finance economic development and self-sufficiency, finances a disproportionately large public sector (which becomes the main source of employment and a conduit for income redistribution) and the migration/remittance system. The MIRAB model implies that this is all that can be expected, given poor development prospects, and that donor governments and agencies should give up on self-sustaining development, which is unlikely to succeed but in the attempt might cause social and political instability. Islanders are understandably not pleased with being cast as international welfare cases; donor governments are no happier to hear that their obligations are likely to continue for the foreseeable future. A third and even more pessimistic recent view is *Pacific 2010: Challenging the Future* (Cole 1993) published by the Australian National University's National Centre for Development Studies. This study, concentrating on the fertility and mortality transitions, suggests a "demographic doomsday" as island growth rates careen down unknown trajectories and socioeconomically explosive pathways.

The dependency theory of exploitation and the MIRAB theory of "welfare state" colonialism have their points but present an incomplete picture. Rather than being overrun by Western culture and the money economy, Pacific islanders often adapt new ideas and technology to their own culture. A Samoan, for example, may still make a presentation gift of a pig and a fine mat, but is also likely to include a $20 bill. It is true that, with prices for agricultural (and sometimes mineral) exports so insecure, annual appropriations by metropolitan governments become habitual and immigration flows gain momentum no matter how unpopular they are among the receiving domestic population. But since the islands, except those with minerals and forests, do not on the whole have enough resources for self-sufficiency (barring the unlikely return to pre-contact technology and lifestyles), migration may help preserve life on the home islands through remittances rather than leave it behind. And far from helpless dependents, islanders have proven adept at exploiting niche markets, from Kiribati's maritime school to train ship crews to the steady supply of professional sports players going to teams in the United States and now New Zealand and Australia.

Conclusion

It is possible to view the contemporary situation in the Pacific islands more charitably than either the dependency theorists or the MIRAB advocates have done— to say that the people have reappraised the resources available to them and restructured their economies to take advantage of them. Colonial oppression has given way to the possibility of the liberation of individual Pacific islanders by the opportunities offered by the labor markets, educational institutions, and social welfare systems of

their former overlords. In the process of reappraisal some components of the traditional systems have been downgraded or even abandoned, but most have not. The picture that emerges is not of island peoples submerged in a baffling sea of change, forced to abandon long-treasured traditional forms by external and malevolent forces manipulating them into continued dependency; nor of people dumped by forces out of their control into a continuing "welfare-state colonialism"; nor uprooted from idyllic villages and forced to seek subsistence on the periphery of the inhospitable cities of their ex-colonial rulers. The picture is rather of people at different stages of a deliberate reappraisal of their options, which they see as having been dramatically widened, and with new enterprise and determination striking out in new and stimulating directions. Some ambivalence over the rate and direction of change is natural, but Pacific cultures show every sign of being able to evolve a blend of their traditional forms and those required to survive and prosper in the modern world.

Pacific cultures appear able to blend traditional and modern ways

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Demographic and social change in the island nations of the Pacific

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The report is an updated and expanded version of a lecture that Professor Ahlburg presented as part of the Distinguished Lecturer Series commemorating the Program on Population's Twenty-Fifth Summer Seminar on Population, held in Honolulu and Taipei during June–July 1994.

Most Pacific Island nations have small populations. Several of those populations are growing rapidly as a result of high fertility rates, young age structures, and low or declining mortality rates. International migration relieves population pressures caused by rapid population growth in some Polynesian and Micronesian countries. Nevertheless, rapid population growth may be hampering the region's development efforts. Although urbanization levels are generally low, in several countries population growth has led to high levels of population density, which may be placing stress on the land and other resources. Pacific nations spend more of their national budgets on education and health care than do developing countries in general, but their educational outcomes are poorer and in some cases their health outcomes are also below those of the average developing country.

Projected declines in fertility, mortality, and migration will slow the region's rates of population growth over the next 35 years. Nevertheless, all countries of the Pacific will experience substantial population increases, and growth rates will remain high in several Melanesian and Micronesian countries. Accommodating the additional numbers of people will pose major challenges to their governments and societies.

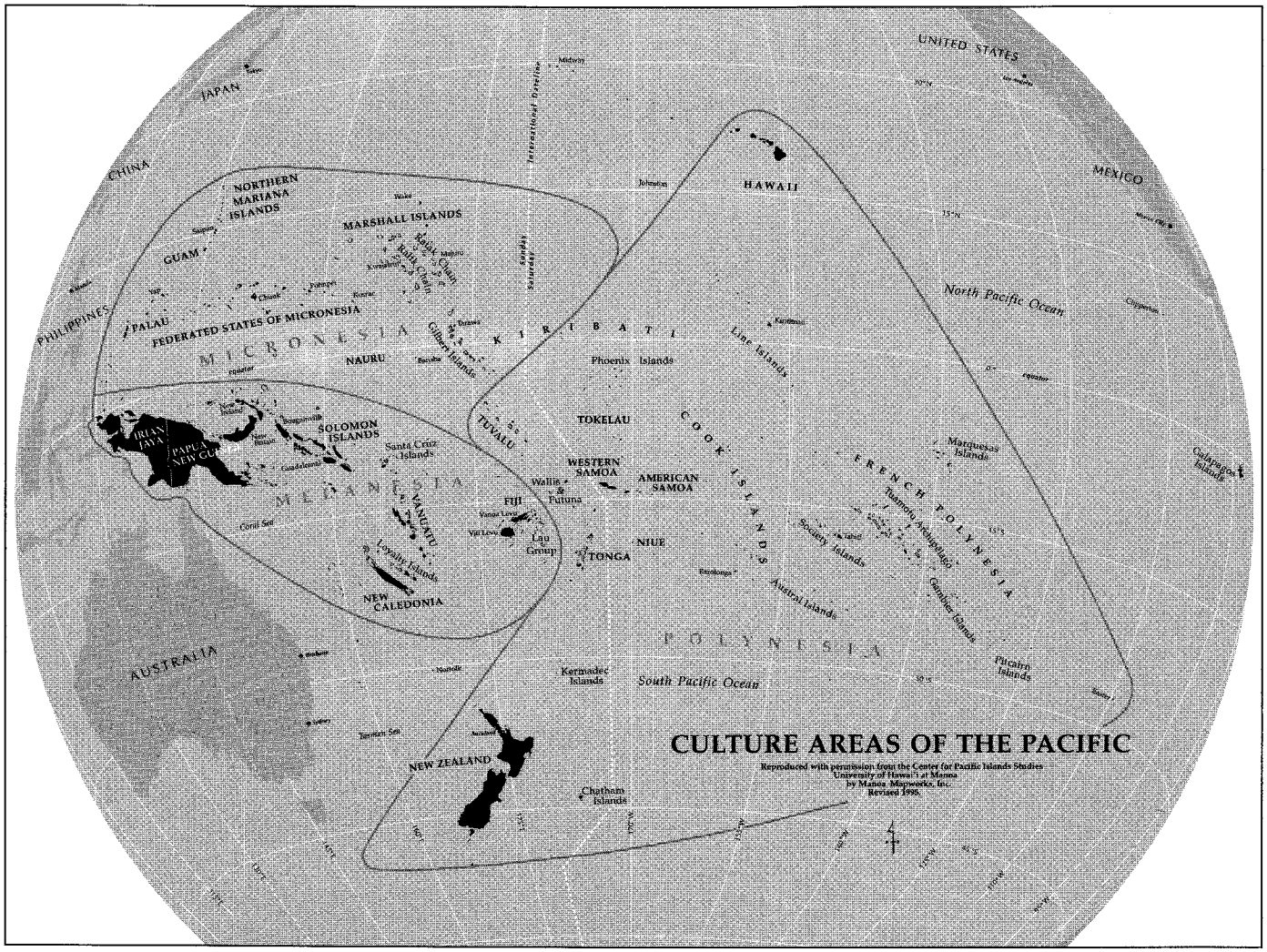
The island nations of the Pacific are undergoing population growth and other demographic changes that are affecting the region's societies, economies, and natural environment. Some of the effects of population growth can be positive—for example, creating a larger home market for Pacific Island producers and giving a nation a more prominent voice in regional and international affairs. Many observers, however, now believe that rapid population growth in the Pacific is causing or exacerbating a variety of social and economic problems. Among those problems are high unemployment and delinquency, environmental degradation caused by urban growth and the expansion of agriculture and natural-resource extraction, and strains within families. Throughout much of Polynesia, population growth is thought to be responsible for a significant degree of overseas migration and a decline in the observance of traditional family obligations.

CHARACTERISTICS OF SMALL ISLAND NATIONS

Small island nations tend to have lower fertility and mortality rates and higher rates of internal and external migration than do most developing countries. These demographic differences may be traced to their distinctive social and economic characteristics (Caldwell, Harrison, and Quiggin 1980). Small island nations generally have higher levels of gross national product and foreign aid per capita than do most developing nations. The Pacific Islands in particular are more urbanized and more Western in language, institutions, and religion as a result of their historic ties to Australia, New Zealand, the United States, and countries in Europe.

In 1990 the average gross national product per capita for the Pacific nations shown in Table 1, excluding American Samoa and Nauru, was about US $1,500, far exceeding the average of about US $320 for all developing nations. In addition, per capita aid to Pacific nation recipients is much higher than to developing countries as a group. In 1988 it averaged US $225, as compared with less than US $10 for all developing countries (World Bank 1993b, vol. 1, p. 2). Several Pacific countries and territories shown in Table 1 have special ties to developed countries that account for their high incomes per capita.

Another difference between small island states and developing countries in general lies in their occupational structures. Developing countries tend to have about 60 percent of their labor force in agriculture. Of the nine Pacific nations for which I have agricultural labor force statistics, only three—Papua New Guinea, Western Samoa, and Vanuatu—have as large or a larger share of their population in agriculture (World Bank 1993b, ix, table 4.3).



POPULATION SIZE

Most Pacific Island nations have populations of fewer than one-half million. Of the 21 Pacific nations and territories listed in Table 1, only Fiji and Papua New Guinea have more than one-half million inhabitants. Some observers believe that small population size, together with geographic isolation and a poor resource endowment, limits the development prospects of Pacific nations.

For at least some of the nations, these concerns appear to be misplaced. With the exception of certain small atoll economies, the islands of the Pacific are well endowed with natural resources, and technological developments have decreased their isolation. Papua New Guinea has extensive minerals and forests; Fiji and the Solomon Islands are also rich in minerals, forests, and agricultural lands; and virtually all Pacific Islands have abundant fisheries. Rapid technological developments in air transport and communications have sharply reduced the islands' isolation. Satellite telecom-

Table 1. Geographic, demographic, and economic indicators: Pacific Island countries, recent years

Subregion and country	Land area (km^2)	Sea area (1,000 km^2)	Population (1,000), 1992	Population density (persons/km^2), 1992	Total GDP (US mil $), 1991	GNP per capita (US $), 1991	GNP annual per capita growth, 1980–91	Annual inflation (%), 1980–91	Aid per capita (US $), 1982
Melanesia									
Fiji	18,272	1,300	757	41	1,499	1,930	–0.2	6.1	56
New Caledonia	19,000	1,740	178	9	u	3,530[a]	u	u	1,138
Palau	494	u	16[b]	32	u	3,289[c]	u	u	u
Papua New Guinea	462,243	u	4,100	9	3,734	830	–0.6	5.2	102
Solomon Islands	27,990	1,340	373[d]	14	211	690	3.5	12.4	126
Vanuatu	12,000	680	166	14	177	1,150	2.8[e]	5.0	221
Micronesia									
Federated States of Micronesia	701	2,500[f]	110[g]	157	194[h]	1,554[c,h]	0.8[i]	u	u
Guam	541	u	146	270	u	21,000[a]	u	u	u
Kiribati	810	3,600	76	106	38[h]	720	0.8[i]	5.4	258
Marshall Islands	181	1,942	52	287	76	1,610[h]	0.8[i]	u	u
Nauru	21	320	10	476	u	u	u	u	u
Northern Marianas	471	u	57[j]	121[j]	u	u	u	u	u
Polynesia									
American Samoa	200	u	53	265	u	21,000[a]	u	u	u
Cook Islands	240	1,800	19	79	u	3,416[c]	u	u	581
French Polynesia	3,300	5,000	210	64	u	3,530[a]	u	u	1,169
Niue	259	390	2[b]	8	u	3,051[c]	u	u	1,294
Tokelau	10	290	2[b]	200	u	u	u	u	1,188
Tonga	720	700	97[k]	135	127	1,280[h]	2.1[e]	u	177
Tuvalu	26	900	10	384	u	1,068[c]	u	u	827
Wallis and Futuna	255	u	14	55	u	u	u	u	u
Western Samoa	2,934	130[f]	163[l]	56	145	960	1.0[e]	11.6	u

Sources: Land area: Hughes, Ahlburg, and Lee (1986, table 1.1); SPC (1994a, 62); UNFPA (1992, table 1); World Bank (1993b, table 1a; 1995, table 1.2). Sea area: Hughes, Ahlburg, and Lee (1986, table 1.1); World Bank (1995, table 1.2). Population: Levin (1993), except where noted. Population density: author's calculations. Total GDP, 1991: World Bank (1993a, table 1.2; 1993b, table 3; 1995, chapter 7, various tables). GNP per capita, 1991: World Bank (1993b, tables 1 and 1a; 1995, tables 1.2 and 2.1). GNP annual per capita growth, 1980–91: World Bank (1993b, tables 1 and 1a); 1995: World Bank (1993b, tables 1.2 and 2.1). Annual inflation, 1980–91: World Bank (1993b, tables 1 and 1.a). Aid per capita: Hughes, Ahlburg, and Lee (1986, table 1.1).

Note: This and subsequent tables include the U.S. dependent territories of American Samoa and Guam.

u—data are unavailable.

a. Estimate from World Bank (1993b, table 1a).

b. Source: UNDP (1994, table 2).

c. Gross domestic product (GDP).

d. Alternative estimates are 346,000 (World Bank 1995, table 1.2) and 355,400 (UNDP 1994, table 2).

e. Real GDP growth, 1983–93.

f. Source: World Bank (1995, chapter 7).

g. Source: World Bank (1995, table 1.2). Alternative estimates are 104,000 (UNDP 1994, table 2) and 117,000 (Levin 1993).

h. 1993 GDP.

i. Real GDP, 1988/9–1992/3.

j. 1994 mid-year estimate, from SPC (1994a, 62).

k. Source: UNDP (1994, table 2). Alternative estimates are 97,400 (ADB 1993, 323), 104,000 (Levin 1993), and 93,000 (World Bank 1995, table 1.2).

l. Source: UNDP (1994, table 2). Alternative estimate is 200,000 (Levin 1993).

municications make distance cost-neutral. It has therefore become feasible to integrate small remote island nations into regional economies at costs affordable to the islands (Hughes, Ahlburg, and Lee 1986, 108). The Pacific economies face a more favorable trading environment than many other developing countries because they have ready access to markets in most industrialized countries.

FERTILITY AND FAMILY PLANNING

In contrast with most island nations, several Pacific countries have extremely high fertility, although in others fertility is more moderate (Table 2). In the Solomons and the Marshall Islands, women bear an average of six or seven children. These fertility rates are among the highest in the world. In Western Samoa, the Federated States of Micronesia, Papua New Guinea, and Vanuatu, recent total fertility rates exceed four children per woman. (The total fertility rate represents the number of children a woman would have over her lifetime if current age-specific fertility rates were to continue.) In contrast, the average total fertility rate for all developing countries is 3.9, and in the developed world the average is 1.9 (UN, DESIPA 1993, table A12).

Over the past four decades, fertility rates have fallen substantially in Fiji and Guam and in Polynesia. A recent report on the Marshall Islands indicates a remarkable decrease in fertility: between 1988 and 1993 the crude birth rate fell 33 percent, largely as a result of the introduction of the contraceptive Norplant (Johnson 1994, 41). If the report is accurate, and fertility reduction is sustained, this development will have a significant effect on that country's future. Birth rates have not fallen much in other areas of the Pacific, such as Papua New Guinea, the Solomon Islands, and the Federated States of Micronesia. High or moderately high fertility combined with low mortality and a substantial proportion of women in the childbearing age span produces rapid population growth.

One reason why fertility rates are high in the Pacific Islands is that contraceptive use is lower there than in many other developing countries and very low compared with that in countries having similar levels of income per capita (Kane and Lucas 1985; World Bank 1993a, 1993b). In several low-income developing countries, 30–60 percent of married women of childbearing age use contraceptives, and many middle-income developing countries have contraceptive use rates of 40–70 percent. Comprehensive data on contraceptive use in the Pacific are difficult to find, and estimates for a country can vary considerably. Reliable statistics on contraceptive use are clearly needed.

From available data (which can vary considerably among sources), it appears that levels of contraceptive use in Polynesian countries range from less than 10 percent to around 30 percent of women in the reproductive age span. In Tonga the level is 23 percent. Contra-

PACIFIC ISLANDS AND THEIR SOCIETIES

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The Pacific islands include a range from low coral atolls with few resources to large islands with significant populations that are relatively well endowed with natural resources. Beginning about 40,000 years ago, Papuan-speaking peoples moved into Melanesia, followed about 7,000 years ago by Austronesian-speaking peoples who moved through Melanesia and on into Micronesia and Polynesia. The Pacific population is now marked by diversity and isolation; even those in the same country are often isolated by the vast distances between islands or, on larger islands, by rugged terrain and dense forests. As of 1990 about six million people lived in the Pacific islands, 3.7 million in Papua New Guinea and about 800,000 in Fiji, with the remaining 1.5 million spread among the other islands.

Traditionally, the societies and peoples of the Pacific have been divided into three major cultural areas: Melanesia, Micronesia, and Polynesia. [See map on page 2.] Melanesia is most populous and largest in land and natural resources; Micronesian and Polynesian islands are by comparison small, scattered, and generally have few natural resources.

- Melanesia consists of Papua New Guinea, the Solomon Islands, Vanuatu, New Caledonia, and Fiji (Melanesian but with Polynesian cultural influences). With about 1,200 languages, Melanesia is marked by diverse and culturally fragmented societies (although in recent years a Melanesian identity has developed) with a generally egalitarian social structure.
- Micronesia, marked by somewhat diverse but hierarchical societies, consists of Kiribati, the Federated States of Micronesia, Palau, Guam, the Marshall Islands, Nauru, and the Commonwealth of the Northern Marianas. All except Kiribati and Nauru have been under U.S. jurisdiction, Guam as a territory and the others as a UN trusteeship, with heavy dependence on external aid.
- Polynesia, more culturally homogeneous than the other areas but also traditionally marked by hierarchical societies, consists of the Cook Islands, French Polynesia, Niue, Western and American Samoa, Tokelau, Tonga, Tuvalu, and Wallis and Futuna. People on the larger island groups such as Western Samoa and Tonga have adequate land and marine resources, but those on resource-poor atolls are heavily dependent on external aid.

ceptive use is especially low in many Micronesian countries, the exceptions being Kiribati (27–38 percent) and the Marshall Islands (31 percent), although the latter figure is in dispute. Among Melanesian countries, use rates are also quite low: 10–25 percent in the Solomon Islands and Papua New Guinea and possibly a slightly higher proportion in Vanuatu (Kane and Lucas 1985, 3). Recent estimates from the World Bank (1993a, various tables) suggest much lower levels: around 3–4 percent for Vanuatu and the Solomons.

In 1990, 27 percent of Fijian women were reported to be using contraception (World Bank 1993a, 55). Use among ethnic Fijian women is considerably less than that of Indo-Fijians and is consistent with their higher total fertility: 4.1 children per woman in 1986, compared with 2.8 among Indo-Fijians. By contrast, during the mid-1970s almost 60 percent of Fijian women were reported to be using contraception. Family planning programs in several other Pacific countries have become weaker in recent years, and this may be one explanation of why fertility has remained high throughout much of the region.

MORTALITY AND CAUSES OF DEATH

Life expectancies at birth have risen over the past quarter-century throughout the region (Table 3). In 11 of the 13 Pacific nations for which data are available, life expectancies in 1992 exceeded the average life expectancy of 61 years for all developing nations in 1985–90, the only exceptions being Kiribati and Papua New Guinea. Several Pacific nations have achieved life expectancies approaching the developed-country average of 74 years (UNDP 1993, table A15).

The infant mortality rate, defined as the number of infants under 12 months of age who die per 1,000 live births, is a good indicator of mortality decline and the corresponding gain in life expectancy at birth. In 1992 most countries in the Pacific region had infant mortality rates below 50, and several countries—notably French Polynesia and New Caledonia—had rates at the low levels typical of economically advanced countries. In contrast, Papua New Guinea (at 67) and Kiribati (at 99) are notable for their high rates. For low-income developing countries in general, the average rate is about 70 infant deaths per 1,000 births, and for middle-income developing countries it is about 50 (World Bank 1991, table 28). Since 1970, most Pacific nations have experienced decreases in the infant mortality rate of between 30 and 70 percent. In the developing world in general, the rate has fallen by 45 percent since 1965.

A recent study investigated the main causes of death in the Pacific nations (Taylor, Lewis, and Levy 1989). Infectious diseases are responsible for more than 20 percent of deaths in the malarious Melanesian countries of Papua New Guinea, Solomon Islands, and Vanuatu and in Kiribati and the Federated States of Micronesia. In contrast, those diseases

Table 2. Total fertility rates: selected Pacific Island countries, 1950–55 to 1993

Subregion and country	1950–55	1956–60	1960–65	1966–70	1970–75	1976–80	1980–85	1985–90	1993
Melanesia	6.3	6.4	6.2	6.0	5.8	5.6	5.3	5.0	u
Fiji	6.6	6.8	6.0	5.0	4.2	4.0	3.8	3.2	3.2
Papua New Guinea	6.2	6.3	6.3	6.2	6.1	5.8	5.6	5.2	5.4
Solomon Islands	6.4	6.4	6.4	6.5	7.2	7.1	6.4	5.8	5.8
Vanuatu	u	u	u	u	u	u	u	u	5.3–6.5
Micronesia	5.9	6.3	6.2	5.9	5.5	5.3	5.0	4.7	u
Fed. States of Micronesia	u	u	u	u	u	u	u	u	5.6
Guam	5.5	5.8	6.0	4.7	4.1	3.5	3.1	2.8	3.3
Kiribati	u	u	u	u	u	u	u	4.3–4.9	u
Marshall Islands	u	u	u	u	u	u	u	u	7.2
Polynesia	7.4	7.5	7.3	6.8	6.3	5.8	5.2	4.5	u
American Samoa	u	u	u	u	u	u	4.5	u	u
French Polynesia	6.0	6.4	6.5	6.2	5.2	4.2	3.8	3.6	3.2
Tonga	u	u	u	u	u	u	u	4.1–4.9	u
Western Samoa	u	u	u	u	u	u	u	u	4.8

Sources: 1950–55 to 1985–90: UN, DESIPA (1993, table A12). 1993: SPC (1994b, various tables); World Bank (1994a, table 1.1).

Note: Data may vary considerably by source. Ranges are given where discrepancies are large.
u—data are unavailable.

account for fewer than 5 percent of deaths in American Samoa, Cook Islands, Guam, Tokelau, and the Northern Marianas. Respiratory disease is another leading cause of death in Melanesia and in Niue and Tokelau. Fiji, most of Polynesia, and eastern Micronesia have high rates of death from cardiovascular disease, which accounted for more than 25 percent of all deaths in the late 1980s. Cancer causes more than 15 percent of deaths in Guam, Palau, American Samoa, French Polynesia, Cook Islands, and Tonga. External causes such as accidents and poisoning are a major cause of death in New Caledonia, American Samoa, Nauru, the Federated States of Micronesia, Palau, and the Northern Marianas. Suicide is a serious problem among teenagers in Polynesia and Micronesia.

Mortality data worldwide indicate that as life expectancy rises, death from infection falls and death from cardiovascular disease and other diseases associated with late middle age rises. Papua New Guinea, Solomon Islands, Vanuatu, Kiribati, and the Federated States of Micronesia—some of the Pacific countries with the lowest life expectancies—exhibit a traditional pattern in which infectious diseases predominate as a cause of death. As these countries develop and their life expectancies rise, they are likely to begin exhibiting a "modern" cause-of-death pattern such as that found in Guam, Cook Islands, American Samoa, Niue, Palau, and Northern Marianas. The other Pacific countries are at various points along the transition from the traditional pattern to the modernized pattern. Not surprisingly, one study of the Pacific region has found that life expectancy is greater where income and aid per capita are higher and where the average level of education and the provision of health services, as measured by the number of doctors per capita, are also higher (Taylor, Lewis, and Sladden 1991).

A major cause of illness among infants and children is gastrointestinal disease, particularly diarrhea. This group of diseases is clearly linked to impure

Table 3. Life expectancy, infant mortality, and mortality under age 5: selected Pacific Island countries,1970 and recent years

Subregion and country	Life expectancy at birth		Infant mortality (deaths per 1,000 births)		Mortality under age 5 (deaths per 1,000 live births), circa 1990
	1970	circa 1991	1970	circa 1991	
Melanesia					
Fiji	62	63	50	26	31–41
New Caledonia	64	73	41	17	21
Papua New Guinea	46	50	125	54–67	71–80
Solomon Islands	54	61	52	30	65
Vanuatu	50–60	55–63	100	30–45	58–91
Micronesia					
Fed. States of Micronesia	u	63	u	36–51	44–72
Kiribati	52	53–60	87	60–99	80
Marshall Islands	u	u	u	43	u
Polynesia					
Cook Islands	65	71	37	28	32
French Polynesia	61	70	47	15–22	26
Niue	62	66	33	12	12
Tokelau	u	62–68	u	30–45	30
Tonga	58	69	60	22–41	31
Tuvalu	59	67	u	34–43	56
Western Samoa	62	65	36	21–33	35–59
All developing countries				74[a]	104

Sources: Life expectancy and infant mortality in 1970: Hughes, Ahlburg, and Lee (1986, table 1.2) as cited from Government of Australia, *Report of the Committee to Review Australian Overseas Aid Programme* (Canberra: Australian Government Publishing Service, 1984); South Pacific Commission, *1980 Statistical Summary* (Noumea, 1982); World Bank, *The World Bank Atlas*, 1985 (Washington, D.C., 1985). Life expectancy circa 1991: Larson (1995, table A-3); UNDP (1994, table A1); World Bank (1993b, tables 1 and 1a); SPC (1994a, various tables). Infant mortality circa 1991: Larson (1995, table A2); SPC (1994a, various tables); UNDP (1994, table 4); World Bank (1994b, various tables). Mortality under age 5: Larson (1995, table A2); UNDP (1993, table 11); World Bank (1994b, various tables).

Note: Data may vary considerably by source. Ranges are given where discrepancies are large.
u—data are unavailable.
a. 1990 data.

drinking water and inadequate sanitation. Problems in these areas tend to be greatest in Melanesia and are more severe in rural than in urban areas. Investment by households in roof runoffs and proper water storage, by communities in village drinking water and latrines, and by governments in water reservoirs and sewerage works will be required to reduce illness and death from these causes.

Child survival appears to be directly related to the provision of maternal and child health services in the Pacific region (Table 4). With the exception of Papua New Guinea, the vast majority of births are attended by health personnel, and the incidence of low birth-weight babies is below the average for developing countries. Levels of early child immunization in 1981 were higher in Fiji, Western Samoa, the Solomons, and Papua New Guinea than the average for all developing nations. Since then, however, improvement in several of the Pacific nations has lagged behind gains made by developing countries as a group.

Table 4. Measures of child health: selected Pacific Island countries, recent years

Measure	Fiji	Papua New Guinea	Solomon Islands	Vanuatu	Tonga	Western Samoa	All developing countries
Births attended by health personnel (%), 1983–89	98	20	80	86	95	50–95	55
Low birth-weight babies (%), 1980–88	14	25	9	u	u	3	18
One-year-olds immunized (%)							
1981	65	49	39	u	u	99	24
1988–90	87	74	58	55	90	90	70
Mothers breastfeeding at one year (%)	u	u	u	66	u	40	73
Children malnourished (%), 1980–90							
Underweight (< age 5)	u	35	u	20	u	u	35
Wasting (12–23 months)	u	u	15	u	u	u	13
Stunting (24–59 months)	u	u	34	19	u	u	40

Sources: Larson (1995, tables 7 and 8); UNDP (1992, table 11).

Note: Data may vary considerably by source. Ranges are given where discrepancies are large.

POPULATION GROWTH

Mainly as a result of natural increase (larger numbers of births than of deaths), Pacific Island nations tend to have moderate to high rates of population growth. As shown in Table 5, during the late 1980s, 10 of 18 countries had annual population growth rates higher than the average annual rate of 2.0 percent for all developing countries during that decade (World Bank 1991, table 26). A 2 percent growth rate will double a population's size in about 36 years, and a 3 percent growth rate will double it in about 24 years. If the 1986–90 growth rates shown in Table 5 were to continue, six of the Pacific nations would double their populations in about 20 years or less.

In some of the countries, however, high rates of natural increase are offset by significant out-migration. For ex-

Table 5. Annual rates of population change (in percentages): selected Pacific Island countries, 1960–65 to 1986–90

Subregion and country	1960–65	1966–70	1970–75	1976–80	1980–85	1986–90
Melanesia						
Fiji	3.3	2.3	2.0	1.9	2.0	0.8
New Caledonia	3.2	4.3	3.4	1.1	2.0	1.6
Papua New Guinea	2.2	2.4	2.4	2.5	2.3	2.3
Solomon Islands	3.0	3.1	3.4	3.5	3.5	3.4
Vanuatu	2.5	2.9	3.0	3.0	2.7	2.5
Micronesia						
Fed. States of Micronesia	2.7	2.9	3.2	2.3	2.7	3.4
Guam	2.4	2.4	2.2	2.2	2.5	2.1
Kiribati	1.4	2.2	1.8	1.4	2.1	2.0
Marshall Islands	2.7	2.9	3.2	2.8	4.0	3.6
Northern Mariana Islands	2.7	2.9	3.2	2.3	2.9	16.1
Polynesia						
American Samoa	3.0	3.0	1.6	1.8	3.8	3.7
Cook Islands	1.2	1.7	–1.6	–1.4	–0.4	–0.4
French Polynesia	3.2	3.6	3.2	3.0	2.8	2.6
Niue	1.2	–0.3	–4.1	–3.7	–4.7	–5.2
Tonga	3.0	1.9	1.5	0.8	0.5	0.5
Tuvalu	1.2	0.8	1.5	4.1	4.1	4.0
Wallis and Futuna Islands	1.0	1.0	1.0	3.9	2.9	1.3
Western Samoa	2.9	2.3	1.1	0.6	0.2	0.1

Source: UN, DESIPA (1993, table A2).

DENNIS A. AHLBURG

Fertility rates in several Pacific Island countries are among the highest in the world—six or seven children per woman.

ample, the low or negative population growth in the Cook Islands, Niue, Tonga, Western Samoa, and Fiji during the late 1980s was due to heavy out-migration rather than to low rates of natural increase. In other countries, rapid population growth has occurred primarily as a consequence of significant in-migration to a small population base. A startling example is the Northern Mariana Islands, where the population grew by more than 16 percent during the late 1980s. Rapid growth, whether due to natural increase or to in-migration, has produced attendant social and economic pressures throughout the region.

Table 5 indicates that population growth slowed in half of the Pacific countries during the period from the early 1960s to the late 1980s but accelerated in most of the others. Because population growth has been heavily influenced by international migration in recent decades, it is instructive to examine migration patterns in the region.

INTERNATIONAL MIGRATION

Migration data for the Pacific are sketchy because many countries have no reliable way of estimating inflows and outflows. Much of the available information on actual numbers of migrants represents an educated guess. Nevertheless, some general patterns and trends are clearly discernible.

International migration in the Pacific is largely a Polynesian and Micronesian phenomenon. The major sending countries are in Polynesia and include Tonga, Wallis and Futuna, the Cook Islands, and Western Samoa (Table 6). Each of these countries loses between 5 and 10 persons per 1,000 residents each year. During the 1980s the volume of out-migration became so great in Tonga and Western Samoa that their population size remained constant despite high rates of natural increase. Most of the migrants from Tonga and Western Samoa have been going to New Zealand, the United States, and Australia. Fiji has experienced significant out-migration since two coups d'etat in 1987, losing principally skilled workers and professionals. Out-migration is thus viewed by some as a demographic and social safety valve.

Whereas Polynesia is the major sending subregion of the Pacific, Micronesia is the major receiving subregion. The Polynesian islands of American Samoa and Guam are also net receivers. Micronesia and American Samoa have become a destination not only for other Pacific Islanders, but also for Filipinos and Koreans (Franco 1993, 162). American Samoa is a major destination for migrants from Western Samoa and, to a lesser extent, Tonga, Tokelau, and Niue.

In Micronesia, migration explains the 250 percent increase in the population

Table 6. Estimated net numbers of migrants per 1,000: selected Pacific Island countries, 1993

Subregion and country	1993
Melanesia	
Fiji	–8.6
New Caledonia	0.6
Papua New Guinea	0
Solomon Islands	0
Vanuatu	0
Micronesia	
Fed. States of Micronesia	11.6
Guam	3.0
Kiribati	0.6
Marshall Islands	0
Nauru	0.4
Northern Mariana Islands	0
Palau	2.1
Polynesia	
American Samoa	6.0
Cook Islands	–5.3
French Polynesia	0
Tonga	–10.4
Tuvalu	0
Wallis and Futuna	–9.5
Western Samoa	–3.1

Source: Personal correspondence from Michael J. Levin, U.S. Bureau of the Census.

of the Northern Mariana Islands since 1980. In that year, 67 percent of the Marianas' population of nearly 18,000 were native-born. By 1993 the population was three and a half times as large, but by then only 36 percent of the population was native-born. Of the foreign residents recorded in that year, 20 thousand were Filipino workers (Eastly 1994, 15). Foreign-born residents accounted for slightly more than half of Guam's population in 1990; one in five was Filipino (Ahlburg and Na 1995, 3).

Saipan has long been a destination for migrants from other states in Micronesia. Since 1986, when the Federated States of Micronesia and the United States signed the Compact of Free Association, Guam has attracted between 3,000 and 5,000 migrants from the Federated States, most of them men in their 20s and 30s (Rubinstein 1993, 259). As a result of the agreement, great numbers of migrants from Micronesia are expected to move to Hawaii and the mainland United States.

The predominant direction of migration flows in the Federated States of Micronesia is unclear. According to unpublished data from the U.S. Bureau of the Census (Michael J. Levin, personal correspondence), net migration has been increasing there; but Bos et al. (1992, 338) estimate a loss of about six residents per 1,000 residents per year. Levin (1992) notes that the net rate of migration in the Federated States of Micronesia is highly unstable and has probably switched from positive to negative.

The primary motive for migration in the Pacific, as elsewhere, is economic improvement for migrants and their families. The primacy of economic incentives in the decision to migrate has led to a belief that migrants are young, primarily male workers who go overseas, possibly acquire skills or education, and then return home—in other words, that migration is circular. Even though this pattern may describe Pacific migration of an earlier time, it no longer appears to do so. Migration now seems to be permanent, and permanent return is unlikely.[1]

Family migration from the Pacific to the United States and Australia is now more common than the migration of single men (Connell 1980; Connell and McCall 1990; Ahlburg and Levin 1990). Among Polynesian migrants to the United States and American Samoa whom I studied with Michael Levin, the sexes were reasonably well balanced in number, and a majority of the migrants had married (Ahlburg and Levin 1990). Within 10 years of arriving in the United States, 60 percent of Tongans and 75 percent of Western Samoans had taken out United States citizenship, indicating their intention to remain. Micronesian migration to Saipan fits this newer pattern. Migration to Guam, which used to be dominated by young, single males, has changed in recent years: today, Micronesians in Guam have reestablished family structures that look very much like those back home (Rubinstein 1993).

Some Pacific Islands have high rates of out-migration—mainly to Micronesia, New Zealand, the United States and its Pacific territories, and Australia.

In a 1994 study of American Samoa's 1980 and 1990 censuses, I found that in 1990 a smaller percentage of the population consisted of migrants who had returned from living in the United States and also that in 1990 proportionately fewer return migrants were economically successful as compared with nonmigrants. This finding is consistent with a pattern of reduced return migration. My own observations in American Samoa (Ahlburg 1994), as well as research on Asian migration to the Middle East (Russell 1986), challenge the assumption that migrants who acquire skills overseas return home and apply them productively there. Anecdotal evidence suggests that this assumption may be false elsewhere in the Pacific as well.

Sustained out-migration soon means that a significant proportion of a country's population resides overseas. I have estimated that some 39,000 Tongans and 76,000 Western Samoans were living overseas in 1989 (Ahlburg 1991, 16). These numbers represent 40 percent and 48 percent, respectively, of the two countries' home populations in that year.

Permanent migration can benefit the home country as long as migrants send home a large flow of remittances. I have estimated that in 1989 the average Tongan migrant remitted $850 and the average Western Samoan remitted $500 from the United States (Ahlburg 1991, 20). Brown and Connell (1993b, 69) have put the average annual value of cash and goods remitted per migrant at US $991 for Tongans and US $706 for Western Samoans. Other researchers have estimated remittances (in US dollar equivalents) at $36 for Niueans, $525 for Kiribatis, and about $200 for Cook Islanders (see Ahlburg 1991, 24).

These remittances have great importance for the home countries. According to my calculations, remittances sent to Tonga and Western Samoa in 1989 equaled 45 percent and 40 percent, re-

1. Chapman (1991, 289) argues that this dichotomous characterization of migration as circular or permanent is not productive. He asserts that "each is an integral part of a broader, regional system of mobility." See Hayes (1991) for further discussion of approaches to understanding migration in the Pacific.

spectively, of the countries' gross domestic product. The amounts remitted were more than three times as large as Tongan and Western Samoan export earnings and allowed residents to enjoy a higher standard of living than would have been possible in the absence of such support. In both countries a more equal distribution of income has resulted from the inflow of remittances (Ahlburg 1995, 1996; Brown and Connell 1993a).

The conventional view is that remittances are used predominantly for consumption and thus have little effect on savings or investment (Yusuf and Peters 1985; Ahlburg 1991) However, on the basis of recent survey data from Tongans and Western Samoans living in Brisbane, Australia, Brown (1994, 351) argues that a sizable proportion of migrants remit mainly for investment purposes and that such migrants tend to remit and save more than other migrants. He asserts, in addition, that most remittance-dependent households save or invest domestically a substantial amount of the remittances they receive (p. 356). Brown and Connell (1993b) report that in-kind remittances and long-distance business activities involving out-migrants have led to the growth of an active informal retail sector in Tonga. Clearly, further investigation of this important issue is needed.

Remittances can have adverse economic effects on the recipient country that are often overlooked because of the respite they give from rapid population growth and the flow of cash they bring. Large remittance flows can lead to an increase in the value of the exchange rate and a rise in wages, both of which decrease the competitiveness of exports and import-replacement industries. These effects can distort or stall a country's economic development. The same effects can result from foreign aid. Whether out-migration and the attendant flow of remittances are a viable development option for some Pacific nations over the long term is a matter of debate (Ahlburg 1991; North 1994).

One thing is clear, however. With their high rates of out-migration, sending countries of the Pacific have not been forced to curb their high fertility rates. It is also likely that traditional customs have not changed as much as they would have done if large-scale migration of the educated and skilled young had not occurred.

URBANIZATION

Urbanization, a worldwide phenomenon, occurs not only as a result of natural increase but also as people in search of better opportunities move to urban centers within their own or their adopted countries. For the low-income countries of the developing world, 36 percent of the population is urban (World Bank 1991, table 31). Among the 19 Pacific Island nations for which data are available, most have urbanization levels well below that average, Fiji being the notable exception (Table 7). Rates of urban growth have recently been the highest in the Solomon Islands, the Marshall Islands, Papua New Guinea, and Tonga.

Urbanization is often used as a measure of the potential environmental damage that a growing population's increasingly urban concentration can cause. Population density, a measure of population pressures throughout a country, suggests that human populations can have environmental impact on rural as well as urban areas. Although many Pacific countries do not have particularly high degrees of urbanization, several have very high levels of population density. The average population density for all developing countries is 80 persons per square kilometer. As we have seen in Table 1, population density is well above that average in Nauru, Tuvalu, the Marshall Islands, American Samoa, Guam, Tokelau, the Federated States of Micronesia, Tonga, and Kiribati.

Increased urbanization and population density need not necessarily result in environmental degradation. They can

Table 7. Urbanization and urban growth: selected Pacific Island countries, recent years

Subregion and country	Urban population (% of total), 1993	Urban population growth per year (%), 1985–90
Melanesia		
Fiji	40	1.2
Papua New Guinea	16	4.3
Solomon Islands	15	6.6
Vanuatu	28	2.8
Micronesia		
Kiribati	35	3.4
Marshall Islands	30	5.8
Polynesia		
Cook Islands	25	–0.4
Tonga	21	4.3
Western Samoa	23	0.8
All developing countries	63	5.0[a]

Sources: ADB (1993, table 4); UNDP (1993, table 10; 1994, table A3).

a. During 1980–91 (World Bank 1993b, table 31). Figure is for low-income countries, excluding China and India.

even benefit a country's economy and social infrastructure by providing a market large enough to encourage local manufacture of goods or sufficient demand for the provision of better communication systems, schools, and health facilities. A government's land-use and pricing policies can influence the effects of population concentration on the environment just as they can lead to a rise in urbanization and population growth in the first place (Connell and Lea 1993).

One study of urbanization in developing countries has found that population growth in itself is not the leading cause of the growth of cities (Kelley and Williamson 1984). More important causes are government policies that subsidize urban living costs and reduce the return to agriculture, largely by controlling the price of food. This appears to be the case in the Pacific, where labor and other markets are even more distorted in favor of urban areas than in most developing countries (Hughes, Ahlburg, and Lee 1986, 94). Urbanization in the Pacific is also closely linked to high per capita aid flows that further distort the balance between urban and rural prices. These effects on urban growth are the indirect result of government policies that were designed for other purposes.

Another factor that contributes to urban growth is the gap between urban and rural areas in the provision of such public services as health-care facilities, safe drinking water, and sanitation—services in which urban areas have a clear advantage (Table 8). The difference is small in Western Samoa but quite large in the Melanesian countries. As for safe drinking water, the inequality is considerably greater in Papua New Guinea than in the average developing country. For sanitation, the gap is much greater in Vanuatu than in the developing world at large.

Some Pacific cities are growing rapidly, and this growth, attributed mainly to in-migration, has been blamed for a deterioration in safety and the quality of life. Port Moresby, the capital of Papua New Guinea, is often cited as an example of migration-induced urban blight. Connell and Curtain (1982) argue, however, that there is no causal relationship between recent migration and urban crime levels in Papua New Guinea. King (1993) has found that urban growth in Papua New Guinea slowed during the 1980s and that, in contrast with the previous decade, most of that growth was due to natural increase, rather than migration. Analyzing urban growth in Melanesia, Connell and Lea (1993, 25) have reached a similar conclusion: natural increase in urban areas may now be as important a contributor to urban growth as migration. This is clearly so in Fiji and may be the case in Papua New Guinea as well (p. 55).[2]

A comparison of the capital cities of Suva and Port Moresby indicates that Suva, in its concentration of population, dominates Fiji to a greater extent than Port Moresby dominates Papua New Guinea. This difference may reflect the diverse development strategies pursued in the two countries. Decentralization has been an important policy in Papua New Guinea but not in Fiji. Nevertheless, with the growing dominance of Port Moresby as Papua New Guinea's major city, it is likely that the government's decentralization policy has only retarded, not stopped, the increasing concentration of the country's urban population. Similar trends may be expected elsewhere in the Pacific, perhaps accompanied by social problems similar to those in Port Moresby and Suva.

Table 8. Rural-urban differences in social indicators: selected Pacific Island countries, 1960, 1990, and 2000 (projected)

Indicator	Fiji	Papua New Guinea	Solomon Islands	Vanuatu	Kiribati	Tonga	Western Samoa	All developing countries
Urban population (%)								
1960	30	3	u	u	u	u	u	22
1990	39	16	9	21	35	21	21	37
2000	43	20	u	u	u	u	u	45
Rural population with access to services (%), 1988–90								
Health	u	96	u	75	u	u	100	u
Water	69	20	58	64	54[a]	71[a]	77	60
Sanitation	65	56	u	33	u	u	91	40
Urban population with access to services (%), 1988–90								
Health	u	100	80[a]	100	85[a]	100[a]	100	90
Water	96	94	82	100	65[a]	100[a]	100	85
Sanitation	91	54	73	82	53[a]	72[a]	95	76
Urban population annual growth rate (%)								
1960–90	3.2	8.6	u	u	u	u	u	4.0
1990–2000	2.3	4.8	u	u	u	u	u	4.0

Sources: Urban population (%): UNDP (1991, table 20); Table 7 of this report (Kiribati and Tonga). Rural and urban access to services: UNDP (1993, table 10); Larson (1995, table A6). Urban population growth rate: UNDP (1991, table 20).

u—data are unavailable.

a. Estimate for whole nation from Larson (1995).

2. Connell and Lea's study provides an excellent discussion of the problems attending the growth of cities in Fiji, Papua New Guinea, Vanuatu, and the Solomon Islands.

Projections of urban population to 2000 indicate that the rate of urban growth is slowing in both Fiji and Papua New Guinea (Table 8). Nevertheless, the urban growth rate in Papua New Guinea will remain high and well above the average for all developing countries. In particular, urban growth is extremely high in Port Moresby, which in 1990 already had a population of 190,000 (King 1993, 69). If the current rate continues, within 15 years the city's population will double.

POPULATION GROWTH AND DEVELOPMENT

Various studies have concluded that many Pacific countries have the potential for solid economic growth on a sustainable basis. For example, a recent study by the World Bank (1991, vi) suggests that the economies of Fiji, Kiribati, the Solomon Islands, Tonga, Vanuatu, and Western Samoa could grow indefinitely at 2.5 percent annually. During the 1980s, however, many Pacific nations did not perform this well. The six economies studied by the World Bank grew at an average rate of only 0.6 percent per annum, in sharp contrast to 5 and 7 percent per annum, respectively, in comparable island nations of the Caribbean Sea and Indian Ocean. Economists have attributed the modest economic performance of the Pacific nations to several factors, including human-resource bottlenecks and high rates of population growth.

The two factors are related: rapid population growth can inhibit a nation's ability to improve the education, skills, and health of its people. Indeed, this appears to have happened in at least some Pacific nations during the 1980s. But how, precisely, does rapid population growth inhibit economic growth?

Some economists argue that rapid population growth slows economic growth both by reducing aggregate savings and investment and by diverting investment from industry and infrastructure to less productive "welfare" expenditures such as health and education. Others point out that investments in health and education, particularly the education of girls, have high rates of return—that is, they boost the development process rather than retarding it. Nevertheless, both groups agree that rapid population growth strains a nation's resources and, if too rapid, may cause its living standard to fall. (For discussions of this topic, see Cassen 1994; Ahlburg, Kelley, and Mason 1996.)

As we have seen, several nations in the Pacific have extremely high rates of population growth that may be hampering their development efforts. Even in countries where out-migration prevents high rates of natural increase from resulting in rapid population growth, there may still be significant pressure on resources. Many migrants are in their 20s when they migrate. While growing up, they receive public health and education resources; but they leave just when they become productive.

In a study of 17 Pacific nations' population trends and economies during the 1970s, I did not find a simple statistically significant relationship between population growth and economic growth (Ahlburg 1988). Similarly, a comparison of Pacific nations' population growth rates with their economic growth rates during the 1980s reveals no consistent pattern of association. Some countries had population growth rates above average and economic growth rates below average; examples are Papua New Guinea and the Solomon Islands. Other countries with population growth rates below average also had economic growth rates below average; Fiji and Tonga represent this group.

Many factors besides population growth can affect economic growth. For example, foreign aid in its many forms can overcome the negative impact of population growth on an economy or even encourage rapid population growth. The Marshall Islands, Guam, French Polynesia, American Samoa, and the Federated States of Micronesia have rates of population growth exceeding the average for developing countries; but because of their special associations with France or the United States, they have per capita incomes comparable to the World Bank's average for high-income countries, which was about US $21,000 in 1991 (World Bank 1993b, table 1).

I have found evidence, however, that those Pacific nations with the highest rates of population growth have higher levels of infant mortality, poorer health-care service delivery (as measured by the number of residents per doctor and per hospital bed), and lower levels of education—that is, larger proportions of people with no formal education—than do countries with lower population growth rates (Ahlburg 1988, 53). Infant mortality, health-care services, and education are important indicators of a country's quality of life and level of social development. They also have important implications for long-run economic development. Although I have found no evidence that rapid population growth in the Pacific has a strong negative impact on overall economic growth in the short run, I have found it to be associated with lower levels of education and health care and higher levels of infant mortality, any one of which may reduce a nation's potential for future economic growth.

Some Pacific nations have special relationships with developed countries (mostly with France, New Zealand, and the United States) that allow them to accommodate rapid population growth while enjoying high levels of income, and others have high natural rates of

population growth but only low actual rates of population growth due to outmigration. Nevertheless, most Pacific nations need to be concerned about rapid population growth. Developed countries may not continue indefinitely to welcome migrants from the Pacific, and therefore nations with high birth rates need to consider population policies that encourage smaller families. In addition, population policies that are integrated with development planning that fosters human-resource improvements—in particular, education and health care—are more likely to be successful than ones that have no links to an overall development plan.

EDUCATION

Education is the cornerstone of human-resource development. The returns to investment in education, particularly the education of girls, are higher than the returns to almost any other investment—provided, of course, that the education is appropriate to the recipients' needs (Psacharopoulos 1982). The percentage of a national budget spent on education does not necessarily indicate whether the investment in education has been effective (Jones 1992). Countries can spend large amounts of money on education and still fail to develop their young people into a valuable human resource.

Although comparable data are difficult to obtain, it appears that for some Pacific countries, the quality of education is not equal to the resources spent on it. As Table 9 indicates, four Pacific countries—Fiji, Tonga, Vanuatu, and Kiribati—spend a greater share of their budgets on education than the average for all developing countries; nevertheless, they have less adult literacy, fewer average years of schooling completed, lower primary teacher-pupil ratios, lower levels of primary and secondary school enrollment, or higher primary drop-out rates than the developing world as a whole. In a number of countries, such as the Solomon Islands and Kiribati, a majority of primary school teachers are untrained or only partially trained.

Table 9 also reveals a positive aspect of educational performance in the Pacific. In all the countries listed in the table except Papua New Guinea, the educational advantage of males over females is smaller than in developing countries on average. For all developing countries, literacy is 43 percent higher for males than for females (70 percent versus 49 percent). In the Pacific the male advantage in literacy is 88 percent in Papua New Guinea but only 38 percent in Solomon Islands, 19 percent in Vanuatu, 13 percent in Fiji, 1 percent in Kiribati, and zero in Tonga. Within the developing world the mean number of years of schooling is 1.9 years greater for males than for females. Except in Papua New Guinea, gender differences in years of schooling are smaller in the Pacific countries, ranging from 0.4 years in Tonga and the Solomon Islands to 1.2 years in Vanuatu. Nevertheless, governments in the region should give more attention to educating girls, not just because education improves their life chances but also because it is associated with lower fertility levels.

School enrollment and standards of education tend to be higher in urban than in the rural areas, and urban schools attract the best teachers. Rural enrollments in some Pacific countries are still as low as 25 percent for boys in the early years of primary school, and zero for girls.

Secondary enrollment in Pacific countries is also low in relation to the average for developing nations. The highest levels of enrollment have been achieved, together with reasonably high standards of education, in Western Samoa, Tonga, and Fiji. Many of the most educated students from these countries emigrate to Australia, New Zealand, the United States, or Canada.

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Critics of Pacific Island education stress the need for training in science, technology, and manual skills and trades. Much of the formal education in the region emphasizes traditional academic subjects of little relevance to Pacific Islanders' lives.

Within the region's education community there is a debate about the form that education should take. Pacific Island education tends to be formal, and school curricula emphasize traditional academic subjects such as English literature. Critics have argued that more emphasis should be placed on mathematics and science because those subjects are more suited to an increasingly scientific and technological world. These observers also recommend greater emphasis on training for manual skills and trades. Policymakers should consider the content of school curricula in discussions of development strategies and attempt to reach broad consensus.

In short, education deserves increased priority, given its importance to Pacific nations' development. As we have seen, more funds for education do not neces-

sarily result in better outcomes. Education systems need to be made more efficient, teacher training improved, and curricula made more relevant to the countries' human resource needs. (See also Gannicott 1989.)

HEALTH AND NUTRITION

Investments in health, like those in education, can have a high rate of social and economic return. Few data are available on access to health services in Pacific nations, but access appears to be less of a problem in the Pacific than in many other developing areas.

Existing data on the number of persons per doctor, per nurse, and per hospital bed indicate that the provision of medical services is generally much better in the Pacific than in the developing world as a whole (Table 10). Fiji, Tonga, and Kiribati have about twice as many doctors per capita as the average for developing countries, and all the Pacific nations for which data are available have more nurses per capita as well. However, compared with their Pacific neighbors and the developing world at large, the Solomon Islands, Papua New Guinea, and Vanuatu have a low ratio of doctors to population. Several studies of mortality in the Pacific link a low doctor/population ratio to higher mortality rates (Ahlburg 1988; Taylor, Lewis, and Sladden 1991).

The relatively good provision of health services in the Pacific should come as no surprise. Many Pacific nations spend two to three times as much of their budgets on health care as do other developing nations. This investment re-

Table 9. Education measures: selected Pacific Island countries, recent years

Measure	Fiji	Papua New Guinea	Solomon Islands	Vanuatu	Kiribati	Tonga	Western Samoa	All developing countries
Adult literacy rate (%)								
1970	75	32	51	u	95	100	98	u
1985, ages 15+								
Total	80	47	54	53	93	99	90	60
Men	85	60	62	57	93	99	u	70
Women	75	32	45	48	92	99	u	49
Mean years of schooling (ages 25+), 1980								
Total	4.9	0.9	1.0	3.7	6.1	7.1	5.0	3.5
Men	5.4	1.2	1.2	4.3	6.5	7.3	5.5	4.4
Women	4.4	0.6	0.8	3.1	5.7	6.9	4.5	2.5
Primary pupil/teacher ratio, 1986–88	30	32	21	24	u	u	27	35
Enrollment ratios, 1986–88								
Primary	100	73	48	6[a]	84	98	68[a]	90
Secondary	56	13	11	8	32	84	70	90
Primary dropout rate, 1986–88	50	33	51	u	u	u	u	44
Public expenditure on education (as % of total public expenditure), 1987–88	20	u	12	25	15	17	u	15
Public expenditure on primary education (as % of all levels), 1987–88	51	u	u	61		u	61	42

Sources: Adult literacy, 1970: Hughes, Ahlburg, and Lee (1986, table 1.2); 1985: UNDP (1991, table 5); Larson (1995, table A5). Mean years of schooling: UNDP (1991, table 5); Larson (1995, table A5). Primary pupil/teacher ratio: UNDP (1991, table 14). Enrollment ratios: UNDP (1991, table 14); Larson (1995, table A5). Primary dropout rate: UNDP (1991, table 15). Public expenditure on education and public expenditure on primary education: UNDP (1991, table 15).

u—data are unavailable.

a. Estimates by Hughes, Ahlburg, and Lee (1986).

sults in generally lower mortality levels than in other developing countries, but there are notable exceptions. According to my own calculations, Papua New Guinea spends twice the proportion of its national budget on health as do developing countries in general, yet its life expectancy is 13 percent lower, and its maternal mortality rate is more than three times the average rate for all developing countries. The reasons for this disparity are not immediately apparent.

The one aspect of health-care delivery in which Pacific countries appear to lag far behind developing countries at large is the provision of family planning services. As mentioned earlier and shown in Table 10, contraceptive prevalence in the Pacific is generally low, on the order of 10–30 percent of women in the reproductive age span, as compared with 49 percent for all developing countries. Opinions vary on whether the low contraceptive use among Pacific islanders is due to limited access to contraceptives or to a low demand for family planning. Research is needed on the relative importance of contraceptive demand and supply.

Contraceptive prevalence is an important health and development indicator, for several reasons. Contraception gives couples the ability to achieve their desired family size. By enabling them to space births, it also has positive effects on the health of children and their mothers, thereby saving lives and scarce public and private resources. A high rate of contraceptive prevalence not only lowers mortality and morbidity, but also tends to slow the rate of population growth.

Malnutrition among Pacific Island children is a cause for concern. In Vanuatu, 20 percent of children under 5 years of age are malnourished; in Papua New Guinea the figure is 35 percent (Larson 1995, 17). Wasting and stunting are a significant problem among older children in the Solomon Islands and Vanuatu. (Wasting is defined as significantly low weight in relation to height and is evidence of acute undernutrition during the period immediately preceding measurement. It is often associated with fluctuations in food supply or recent illness, such as diarrhea. Stunting is defined as significantly low height in relation to a child's age and is associated with inadequate nourishment over an

Table 10. Health services and reproductive health measures: selected Pacific Island countries, recent years

Measure	Fiji	Papua New Guinea	Solomon Islands	Vanuatu	Kiribati	Tonga	Western Samoa	All developing countries
Population with access to health services, 1987–90	99	96	80	80	85	100	100	72
Contraceptive prevalence, late 1980s	27–32	10–20	10–25	3–25	27–38	23–39	20	49
Maternal mortality (per 100,000 births), 1988	68–150	700–1,000	549	92–138	127	70–80	46	420
Population per doctor, 1984–89	2,030	6,070	7,420	5,000	1,967	1,667	3,570	5,080
Population per nurse, 1984–89	490	880	679	450	u	557	410	1,870
Population per hospital bed, 1980–85	364	299[a]	179	162	208	284	229	u
Public health expenditure (as % of GNP), circa 1990	2	3	4	2	6	4	4	4

Sources: Access to health sources: UNDP (1993, table 12); Larson (1995, table A6). Contraceptive prevalence: Kane and Lucas (1985, 3); Larson (1995, table A7); UNDP (1993, table 23); World Bank (1994a, various tables). Maternal mortality: ADB (1993, table 2); Larson (1995, table A2); UNDP (1993, table 12); World Bank (1994b, various tables). Population per doctor and population per nurse: UNDP (1993, table 12). Population per hospital bed: World Bank (1994b). Public health expenditure: Larson (1995, table A4); UNDP (1993, table 12).

Note: Data may vary considerably by source. Ranges are given where discrepancies are large.
u—data are unavailable.
a. 1987–92 estimate.

extended period of time.) Although data are lacking for other countries of the region, it is likely that child malnutrition exists elsewhere as well.

Information on breastfeeding practices in the Pacific is also scarce. In the nations for which data are available, the prevalence of breastfeeding is below the average for all developing countries. Low levels of breastfeeding have been linked elsewhere to higher levels of malnutrition and fertility. For these reasons, the United Nations Children's Fund (Larson 1995, 15) recommends that mothers breastfeed their infants for one year and supplement the infants' diet with other foods after six months.

Malnutrition among children is not only an important human concern. It is also an important economic concern because the children of today will become the workers of tomorrow. By preventing individuals from reaching their full physical and intellectual potential, malnutrition threatens a nation's development prospects.

Apart from the child malnutrition just noted, malnutrition has not been a serious problem in most Pacific nations. Of the seven countries for which data are reported in Table 11, all except the Solomon Islands recently had an average daily calorie supply per capita greater than the recommended daily requirement.

During the 1980s, domestic food production rose by an average of 15 percent in the developing world. In contrast, all of the Pacific nations for which data are available, with the exception of Papua New Guinea, had decreases in domestic food production during that period (Table 11). This does not necessarily mean that food *consumption* declined. It is possible that as production fell, so did food exports, permitting more of the locally produced foods to be consumed locally; or it might mean that food imports increased to compensate for the decline in production. In either case, the decline in domestic food production is troubling because it likely led to increased dependence on foreign aid and remittances (Fairbairn-Dunlop 1994).

PROJECTED POPULATION TRENDS

Population growth in the Pacific Island nations over the next quarter-century has major implications for education, job creation, health services, and the proportion of the population that is elderly. To meet the needs of the future population, policymakers need some idea of its future size and age structure, and well-prepared population projections are preferable to uninformed guesses.

Because projections are based on assumptions about future fertility, mortality, and migration, they are only as accurate as the assumptions on which they are based. It is extremely difficult to predict human behavior, particularly over a 20- or 30-year period. Despite the inaccuracies of projections, they are an important planning tool, in part because they allow policymakers to work through the implications of various assumptions about future fertility, mortality, and migration.

A variation on this approach is that of Callick (1993), who on the basis of 20-year projections of current demographic trends paints a "doomsday" scenario of the region's future. His point, which has often been missed, is that if current policies and trends continue, this scenario—or something like it—is a possible outcome. Callick intended his article to stir discussion and prompt corrective action.[3] That is the purpose of the projections that follow.

A further cautionary note is needed. The population projections presented here do not take into account the demographic impact of the human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS). As of early or mid-February 1995, 645 cases of HIV/AIDS had been reported in 14 Pacific Island nations (SPEHIS 1995, table A-1). The reported number of cases of this sexually transmitted disease (STD) underestimates the total prevalence of HIV/AIDS. Although we currently have

Table 11. Nutrition and food production: selected Pacific Island countries, recent years

Subregion and country	Daily calorie supply (as % of requirements), 1986–90	Food-production index, 1986–90 (1979–81 = 100)
Melanesia		
Fiji	108	80
Papua New Guinea	114	103
Solomon Islands	84	82
Vanuatu	100	77
Polynesia		
Western Samoa	103	99
All developing countries	107	115

Sources: UNDP (1991, 1993, table 13).

3. Another useful projection exercise in the same collection as Callick's is that by Gannicott (1993). For a more optimistic view of the Pacific region's future, see Pirie (1994).

no firm knowledge of the likely impact of the HIV/AIDS pandemic in the Pacific, sexual practices in the Pacific suggest that the virus is likely to become a serious problem in a number of countries.

Several aspects of the disease have important demographic, social, and economic implications for the Pacific nations. First, HIV/AIDS affects men and women in their prime economic and reproductive years. Statistics from Pacific countries collected by the South Pacific Commission and the STD/AIDS Unit of the Papua New Guinea Department of Health indicate that in all but one of the countries, HIV is concentrated in the 20–29 year age group and AIDS in the 30–39 age group. The exception is Papua New Guinea, where both HIV and AIDS are concentrated in the 20–29 year age group (Duncan 1995, 149). Second, worldwide the infection ratio is 1 male to every 1.2 females. Females also contract the disease at an earlier age on average and therefore lose more years of expected life than do males (Becker 1990, 1610). Research suggests that a significant epidemic in Pacific Island nations (that is, with 5 to 10 percent of their populations infected) would lower the population growth rate by one-half to one percentage point per year (Ahlburg, Larson, and Brown 1995b, 7). The health-care costs of a person with HIV or AIDS are more than 10 times the average expenditure on health care per capita and several times the national income per capita (Ahlburg, Larson, and Brown 1995b, 18). A significant epidemic may decrease economic growth and negatively affect human development (Ahlburg and Larson 1995; Duncan 1995).

Given the best available estimates of current fertility, mortality, and migration, how much larger are the Pacific populations likely to become? What are the expected increases in each major age group—the young, the working-age population, and the elderly? These questions can be rephrased as questions about required social infrastructure: How many schools will be needed? How many jobs will have to be created? What proportion of the larger population will require support from those working? How many more doctors, nurses, and hospital beds will be needed?

PROJECTED POPULATION GROWTH

Population projections prepared by the U.S. Bureau of the Census for 19 Pacific countries are reported in Table 12, and the implied rates of growth are shown in Table 13. The projections assume that fertility will decline in all the countries between 1993 and 2030. The fertility declines are assumed to be largest for the high-fertility Melanesian countries, where the total fertility rate in most cases is projected to fall to slightly more than two births per woman. Life expectancy is assumed to increase significantly in many countries. The assumed gains will be greatest in the high-mortality Melanesian countries and in several Polynesian and Micronesian countries. Migration rates are assumed to remain unchanged or else to decline slowly.

The United Nations (UN, DESIPA, 1993) and the World Bank (Bos et al. 1992) have also prepared projections of future population size and growth rates for the Pacific. Where the projections differ most, the degree of uncertainty is greatest.

The populations of all Pacific nations are projected to grow over the next 35 years. The increases range from a low of about 20 percent for Nauru and the Federated States of Micronesia to dramatic growth for Papua New Guinea (98 percent), the Northern Marianas (106 percent), Solomon Islands (144 percent), and Marshall Islands (287 percent). By 2030, Papua New Guinea's population is projected to exceed 8 million, Fiji's to exceed 1 million, and the Solomon Islands' to approach 1 million. For all countries of the region, however, *rates* of growth are projected to decline—in some cases to zero.

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As a result of projected declines in fertility and increased life expectancy, the proportions of elderly Pacific Islanders, especially those 70 and older, will rise dramatically over the next several decades.

International migration is also projected to decline, in many cases to net levels of zero—that is, the number of in-migrants balancing the number of out-migrants (Table 14). Migration is more difficult to forecast than fertility or mortality because it is determined to a greater extent by social and political events, particularly by governments' policies, which can change suddenly. Recent developments suggest that opportunities are likely to diminish for Pacific islanders to migrate to metropole countries with which their countries have former colonial ties.

WORKING-AGE POPULATIONS

Table 15 converts the projected population increases for men and women in four broad age groups into an index of change so that the implications for job creation can be seen easily. The number of persons in each age group in 1990 has been set at 100, and the projected number in that age group for each subsequent year has been calculated in relation to the number in 1990. In Fiji, for example, for every 100 males of ages 15–39 in 1990, 114 males are projected to be in that age group in 2000. The index for a particular age group and year also indicates the percentage of growth for the age group between 1990 and that year. As an example, the index of 114 Fijian males 15–39 years old in 2000 indicates that the number of males in that age group is projected to grow by 14 percent between 1990 and 2000 (114–100 = 14 percent). Table 15 reveals projected increases of between 37 and 147 percent in the region's working-age populations over the next 35 years.

If we assume that labor force participation rates will remain constant, then these rates of population growth in the working-age groups indicate how much the labor force is projected to grow in each Pacific country. If unemployment rates are also assumed to remain constant, then the projected population growth rates indicate the amount of growth in jobs that will be required over the next 35 years for workers of each sex and age group.

The projections indicate that job creation will be an enormous challenge for the nations of the Pacific. For many of them the number of new jobs needed over the next 35 years will more than double. The demand for new jobs will be greatest among workers who are in their middle and late working ages. In the Federated States of Micronesia, for example, there will be a fourfold increase in needed jobs for female workers of ages 40–54 and for male workers of ages 55–64.

THE DEPENDENCY BURDEN

In 1990 the Pacific nations had between 44 and 58 percent of their populations under age 20 (Table 16). Because of projected declines in fertility rates, the pro-

Table 12. Projected population size (in thousands): Pacific Island countries, 1993–2030

Subregion and country	1993	1995	2000	2010	2020	2030	1993–2030 % increase
Melanesia							
Fiji	757	773	823	933	1,037	1,133	50
Palau	16	17	18	20	21	22	38
Papua New Guinea	4,101	4,295	4,812	5,925	7,044	8,140	98
Solomon Islands	373	399	470	620	767	911	144
Vanuatu	166	174	193	230	266	298	80
Micronesia							
Fed. States of Micronesia	118	123	133	141	143	143	21
Guam	146	153	171	202	230	255	75
Kiribati	76	79	87	95	98	99	30
Marshall Islands	52	56	68	100	144	201	287
Nauru	10	10	11	11	12	12	20
New Caledonia	178	185	200	230	255	278	56
Northern Mariana Islands	49	51	57	71	86	101	106
Polynesia							
American Samoa	53	57	69	85	86	86	62
Cook Islands	19	19	20	22	24	24	26
French Polynesia	210	220	245	294	343	392	87
Tonga	104	106	110	119	128	137	32
Tuvalu	10	10	11	12	15	16	60
Wallis and Futuna	14	14	15	17	18	19	36
Western Samoa	200	209	235	288	341	392	96

Sources: Personal correspondence from Michael J. Levin, U.S. Bureau of the Census; calculations by the author.

Note: Projections for 1995 and subsequent years are based on 1993 estimates. Fertility, mortality, and migration assumptions underlying the projected population figures are available from the author. The United Nations (UN, DESIPA 1993, table A2) and Bos et al. (1992, various tables) have also projected the future size of Pacific Island populations to 2030, and their projections are somewhat different from those presented here.

portion of young people will fall throughout the region. By 2030, it is likely to be around 30 percent for most nations.

In contrast, the proportions of elderly will rise dramatically as a result of the lower fertility rates and projected declines in mortality (Table 17). In the more slowly growing populations of Fiji, French Polynesia, and Kiribati, the size of the 60 and older age group will roughly treble between 1990 and 2030. Among those 70 and older, the projected increases are especially dramatic: 167 percent in Tonga, 300 percent in New Caledonia, 383 percent in Papua New Guinea, and 414 percent in Fiji (calculated from data in Bos et al. 1992).

The proportions of young and old people in a nation indicate the size of the support load that the working-age population must carry. Demographers measure this support load by the dependency ratio—the number of persons under age 15 plus those over age 59 divided by the number of persons of working ages (15–59 years).

As Table 18 indicates, the Pacific nations have extremely high dependency ratios. In the Solomon Islands, for example, in 1990 there were 103 dependents for every 100 persons of working age. By 2030, there are projected to be only 53 dependents per 100 persons of working age. The high dependency ratios in the Solomons, Federated States of Micronesia, and Vanuatu place a heavy burden on those societies to support their young and old people. Although the numbers of young and old people will continue to grow, the Pacific nations' working-age populations will grow faster, so that their dependency ratios will decline. As long as productive employment can be created for the region's growing labor forces, the pressure of caring for the young and old should diminish. The critical challenge for Pacific nations and families is to generate the economic resources needed to

Table 13. Projected population growth per year (in percentages): Pacific Island countries, 1993–2030

Subregion and country	1993	1995	2000	2010	2020	2030
Melanesia						
Fiji	1.0	1.2	1.3	1.3	1.1	0.9
Palau	1.8	1.8	1.4	1.1	0.5	0.5
Papua New Guinea	2.3	2.3	2.2	2.3	1.9	1.6
Solomon Islands	3.5	3.4	3.1	3.2	2.4	1.9
Micronesia						
Fed. States of Micronesia	3.4	3.4	3.3	0.6	0.1	0.0
Guam	2.5	2.4	1.9	1.8	1.4	1.1
Kiribati	2.0	2.0	1.8	0.9	0.3	0.1
Marshall Islands	3.9	3.9	3.9	3.8	4.4	4.0
Nauru	1.4	2.0	0.0	0.0	0.9	0.0
New Caledonia	1.8	1.8	1.6	1.5	1.1	0.9
Northern Mariana Islands	3.0	2.4	2.4	2.4	2.1	1.7
Polynesia						
American Samoa	3.9	3.8	3.5	2.3	0.1	0.0
Cook Islands	1.2	1.1	1.0	1.0	0.9	0.0
French Polynesia	2.3	2.2	2.0	2.0	1.7	1.4
Tonga	0.8	0.9	0.8	0.8	0.8	0.7
Tuvalu	1.7	1.6	1.3	0.9	2.5	0.7
Vanuatu	2.4	2.2	2.0	1.9	1.6	1.2
Wallis and Futuna	1.2	1.1	1.5	1.3	0.6	0.6
Western Samoa	2.4	2.4	2.3	2.2	1.8	1.5

Source: Personal correspondence from Michael J. Levin, U.S. Bureau of the Census.

Note: Projections for 1995 and subsequent years are based on 1993 estimates. Fertility, mortality, and migration assumptions underlying the projected population figures are available from the author.

Table 14. Projected net number of migrants per 1,000: selected Pacific Island countries, 1995–2030

Subregion and country	1995	2000	2010	2020	2030
Melanesia					
Fiji	–6	–4	–2	–1	0
New Caledonia	*	0	0	0	0
Papua New Guinea	0	0	0	0	0
Solomon Islands	0	0	0	0	0
Vanuatu	0	0	0	0	0
Micronesia					
Fed. States of Micronesia	12	12	np	np	np
Guam	3	3	np	np	np
Kiribati	1	np	np	np	np
Marshall Islands	0	0	0	0	0
Polynesia					
American Samoa	6	6	np	np	np
Cook Islands	–5	np	np	np	np
French Polynesia	0	0	0	0	0

Source: Personal correspondence from Michael J. Levin, U.S. Bureau of the Census.

*Less than 0.5.

np—not projected.

Table 15. Indices of projected working-age population groups, by sex: selected Pacific Island countries, 1990–2030 (1990 = 100)

Subregion, country, and year	Both sexes	Men, by age group				Women, by age group			
		15–64	15–39	40–54	55–64	15–64	15–39	40–54	55–64
Melanesia									
Fiji									
1995	105	105	106	110	117	105	106	115	124
2000	109	109	114	127	128	109	111	133	153
2010	117	116	124	154	172	118	119	160	200
2020	127	126	122	183	233	128	119	179	282
2030	137	135	119	231	261	139	115	225	294
Papua New Guinea									
1995	113	113	113	109	108	114	113	108	110
2000	126	125	129	124	115	127	129	122	11
2010	152	149	160	171	155	153	157	154	164
2020	173	171	190	228	213	176	207	216	196
2030	196	192	206	293	254	200	226	290	311
Solomon Islands									
1995	118	117	126	120	114	118	125	120	117
2000	137	136	149	147	129	138	151	147	150
2010	175	173	200	220	157	177	205	213	183
2020	211	207	243	420	257	214	254	320	300
2030	244	239	280	453	414	248	291	440	450
Vanuatu									
1995	117	116	119	122	75	118	113	114	150
2000	136	133	139	133	100	138	127	157	200
2010	174	169	184	189	150	178	180	214	300
2020	212	186	229	277	225	218	227	314	450
2030	247	238	265	366	350	256	257	443	650
Micronesia									
Fed. States of Micronesia									
1995	114	113	118	120	100	114	110	150	100
2000	128	126	127	120	100	130	119	200	100
2010	160	158	164	220	150	162	162	250	250
2020	188	185	191	340	300	192	195	375	300
2030	216	211	209	420	500	220	214	500	450
Kiribati									
1995	110	111	113	125	100	109	114	125	100
2000	120	120	127	150	100	120	129	150	100
2010	139	140	133	150	100	137	150	175	200
2020	157	157	160	225	150	154	164	200	150
2030	174	177	167	300	177	174	179	275	250
New Caledonia									
1995	108	107	111	108	140	109	112	118	120
2000	115	113	120	123	140	118	124	127	140
2010	130	127	129	162	180	134	136	173	180
2020	144	138	129	200	220	149	133	236	220
2030	155	148	129	208	300	162	133	245	320
Polynesia									
French Polynesia									
1995	114	114	121	115	140	116	119	127	125
2000	129	128	133	131	160	130	131	145	175
2010	153	150	155	192	200	155	148	227	225
2020	173	169	164	285	260	176	157	327	325
2030	192	188	167	285	420	197	164	327	575

Table 15 *(continued)*

Tonga									
1995	106	106	104	80	67	108	100	100	133
2000	112	114	109	100	67	115	105	100	67
2010	125	126	122	180	100	127	124	167	133
2020	138	140	135	260	167	142	138	200	167
2030	156	156	139	280	300	158	138	233	267
Western Samoa									
1995	108	107	105	88	100	110	103	100	100
2000	117	116	118	113	100	119	112	100	100
2010	140	137	139	238	125	142	145	178	125
2020	162	157	155	325	200	167	170	256	175
2030	184	178	166	375	375	191	194	300	325

Source: Author's calculations, based on projections by Bos et al. (1992).

care for increasing numbers of people who are too young or too old to work.

SCHOOL ENROLLMENT

Table 19, which forecasts school enrollments for three age groups in six Pacific nations to 2030, is based on projected increases in the number of school-age children and two alternative assumptions about enrollment rates. The first assumption is that enrollment rates will remain constant at their 1995 levels. The second is that all children of ages 5–14 will attend school and 60 percent of those in the 15–19 age group will also attend school. For countries that have already achieved or exceeded this level of school enrollment, I assume that current rates will be maintained. In 1990, however, most Pacific countries did not have 100 percent of primary-age children enrolled in school, and in most the secondary enrollments were below 60 percent. The projections based on the second set of assumptions therefore reflect a stated objective of many Pacific governments: to improve their nations' educational levels by increasing school enrollments.

As in Table 15, the projections are expressed as indices, in this case based on the numbers of children enrolled in 1990. A value less than 100 represents a decline since 1990 in the number of children needing to be educated. Such declines indicate reduced pressure on national education budgets and are a consequence of projected declines in fertility. In contrast, a value higher than 100 indicates an increase in the number of school places needed to keep enrollment at its 1990 level.

Except in Fiji and Tonga, population growth will mean increased demand for school places, particularly for students aged 15–19, even if 1990 enrollment rates are merely maintained, as in the first assumption. Given the countries' projected rates of population growth, raising enrollment rates to meet the goals implied by the second assumption would result in dramatic increases in the number of school places required. For most of the countries, two to four times as many places in primary schools would be needed. A 60 percent enrollment rate for students aged 15–19 would necessitate a fivefold increase in school accommodations for the Solomon Islands and a sixfold increase in Papua New Guinea.

Added to concerns about the quality

Table 16. Projected percentages of population under 20 years of age: selected Pacific Island countries, 1990–2030

Subregion and country	1990	1995	2000	2010	2020	2030
Melanesia						
Fiji	47	46	42	35	31	29
Papua New Guinea	52	52	51	47	40	35
Solomon Islands	58	55	53	49	42	35
Vanuatu	56	53	52	49	42	36
Micronesia						
Fed. States of Micronesia	56	53	49	45	38	32
Kiribati	49	49	49	41	36	33
New Caledonia	44	40	37	33	30	28
Polynesia						
French Polynesia	50	46	42	38	32	29
Tonga	51	50	47	41	35	30
Western Samoa	52	51	49	44	36	33

Source: Author's calculations, based on projections by Bos et al. (1992).

of education in many Pacific nations (Larson 1995, 19), these projections show that population growth will make it extremely difficult for the Pacific countries to meet the education goals set forth in their development plans. Government budgets are likely to remain tight. That means that individual families may have to pay a larger proportion of the costs of educating their children, increased educational efficiency must occur, or the quality of the education may decline.

MEDICAL SERVICES

Projected population growth in the six countries between 1990 and 2030 will also cause the demand for health services to rise sharply (Table 20). Merely to maintain the ratios of services to the population levels that existed in 1990, these countries will have to provide significantly more medical personnel and hospital beds each decade. For example, by 2030 Fiji is projected to need an additional 308 doctors, 1,360 nurses, and 2,267 hospital beds. If Papua New Guinea experiences the rate of population growth that has been projected, it will need two and a half times as many doctors in 2030 as it had in 1990 merely to maintain 1990-level services. If access to medical services is to improve, correspondingly larger numbers of doctors, nurses, and hospital beds will be needed. And correspondingly more money will be needed to fund those improvements in health services. With tight government budgets, families will have to pay an increased share of the cost of health care, increased efficiency must be realized, or the quality and quantity of care will decrease.

Table 17. Projected percentages of population 60 years of age and older: selected Pacific Island countries, 1990–2030

Subregion and country	1990	1995	2000	2010	2020	2030
Melanesia						
Fiji	5	6	7	9	13	16
Papua New Guinea	5	5	5	6	7	9
Solomon Islands	5	5	5	5	7	9
Vanuatu	5	5	5	5	7	9
Micronesia						
Fed. States of Micronesia	6	7	6	5	8	11
Kiribati	4	6	8	8	7	11
New Caledonia	8	9	9	11	13	17
Polynesia						
French Polynesia	6	7	7	9	11	16
Tonga	7	9	7	7	9	14
Western Samoa	7	7	6	6	7	11

Source: Author's calculations, based on projections by Bos et al. (1992).

Table 18. Projected dependency ratios: selected Pacific Island countries, 1990–2030

Subregion and country	1990	1995	2000	2010	2020	2030
Melanesia						
Fiji	74	68	60	54	58	60
Papua New Guinea	85	86	85	70	57	53
Solomon Islands	103	95	87	77	60	53
Vanuatu	96	88	88	75	62	58
Micronesia						
Fed. States of Micronesia	98	92	86	68	58	54
Kiribati	75	83	87	64	53	54
New Caledonia	68	65	60	55	57	62
Polynesia						
French Polynesia	78	68	68	60	52	61
Tonga	80	91	82	59	56	58
Western Samoa	85	87	82	65	52	55

Source: Bos et al. (1992, various pages).

CONCLUSION

The developing nations of the Pacific face formidable challenges over the next few decades, in part because their populations are young, fertility rates are high, and mortality rates are low and falling. These countries must find ways to provide education, jobs, and health services for their rapidly growing populations. As the elderly segments of their populations become larger, new services will be required to meet their needs. These developments will strain the resources of the region's governments and families.

Economic growth is the key to job creation and a pressing concern in the Pacific. Little uncertainty exists about the number of jobs that will be needed in the next 10 to 20 years because most of the people who will be needing jobs are already born. The pursuit of economic growth, in particular growth that creates jobs and decreases inequality, should therefore be a top priority of Pacific Island governments. Policies that interfere with job creation should be scrutinized carefully.

Given projected future population growth, the number of school places will have to rise significantly just to maintain student enrollments at current levels. Several governments have indicated a desire to increase enrollments. In some countries reform is needed of educational content and delivery. Moreover, although most Pacific nations do better than many developing nations at educating girls to the same level as boys, inequalities exist. Reducing the gender gap in education will enhance women's life chances and in all probability lead to lower fertility and improved child and maternal health.

A few Pacific nations may be able to attain these goals without spending a disproportionate share of their budgets on education, but many will not. If government budgets remain very tight, educators will be forced to find ways of delivering more education with fewer resources and families will probably have to pay a greater share of the cost of educating their children.

If fertility does not decline as rapidly as projected, the social and economic challenges facing the Pacific Island nations will be even greater than anticipated.

Continued population growth will place great strains on the Pacific nations' health resources. As with education, these societies will have to do more with less, and families will likely have to assume a greater share of health care costs. Meeting this challenge is vital to the development of the region's human resources.

The population projections presented in this report assume that Pacific Island fertility will decline from its currently high levels. If fertility does not decline as rapidly as projected, the rates of population growth and the challenges outlined here will be even greater than anticipated. It is not clear how Pacific nations will meet these demographic, economic, and social challenges. What *is* clear is that population policies and programs need to become an integral part of Pacific nations' development plans and not treated as isolated policy initiatives.

Table 19. Indices of projected school enrollments under two alternative assumptions: selected Pacific Island countries, 1990–2030 (1990 = 100)

Assumption, subregion, and country	Ages 5–9					Ages 10–14					Ages 15–19				
	1995	2000	2010	2020	2030	1995	2000	2010	2020	2030	1995	2000	2010	2020	2030
Assumption 1: Continuation of recent enrollment ratio[a]															
Melanesia															
Fiji	94	88	77	79	78	106	98	85	83	85	113	120	105	93	100
Papua New Guinea	115	130	133	128	124	114	132	158	150	141	105	120	157	161	156
Solomon Islands	102	131	148	144	128	104	107	150	150	148	122	130	168	192	186
Vanuatu	109	136	150	150	159	105	120	160	165	175	112	124	176	194	194
Polynesia															
Tonga	117	117	100	100	100	109	127	118	109	109	85	77	108	92	85
Western Samoa	120	130	125	125	125	100	115	130	120	120	95	95	130	120	125
Assumption 2: 100% enrollment for ages 5–14 and 60% enrollment for ages 15–19															
Melanesia															
Fiji	94	88	77	79	78	106	98	85	83	85	121	129	113	100	107
Papua New Guinea	157	178	182	175	170	156	181	216	205	193	485	554	725	743	720
Solomon Islands	213	273	308	300	288	217	223	313	313	308	385	411	531	606	587
Vanuatu	303	378	417	417	442	292	333	444	458	486	118	131	185	204	204
Polynesia															
Tonga	167	167	143	143	143	156	181	169	156	156	85	77	108	92	85
Western Samoa	176	191	184	184	184	147	169	191	176	176	95	95	130	120	125

Source: Author's calculations, based on data from UNDP (1993) and projections by Bos et al. (1992).

a. Recent enrollment ratios are presented in Table 9.

Table 20. Projected numbers of additional doctors, nurses, and hospital beds needed per decade: selected Pacific Island countries (1990 = base)

Subregion, country, and medical need	1990	2000	2010	2020	2030
Melanesia					
Fiji					
Doctors	338	31	59	92	126
Nurses	1,488	138	260	406	556
Hospital beds	2,480	230	433	677	927
Papua New Guinea					
Doctors	645	168	328	473	619
Nurses	4,449	1161	2,261	3,265	4,273
Hospital beds	18,822	4,913	9,567	13,812	18,077
Solomon Islands					
Doctors	43	16	32	47	61
Nurses	465	171	349	517	669
Hospital beds	1,672	614	1,254	1,857	2,402
Vanuatu					
Doctors	27	10	20	31	40
Nurses	339	121	251	379	498
Hospital beds	530	189	393	593	779
Polynesia					
Tonga					
Doctors	29	3	7	11	16
Nurses	254	31	64	97	144
Hospital beds	251	30	63	96	142
Western Samoa					
Doctors	46	8	18	29	39
Nurses	413	70	165	258	348
Hospital beds	717	122	287	448	604

Source: Author's calculations, based on data from UNDP (1993) and projections by Bos et al. (1992).

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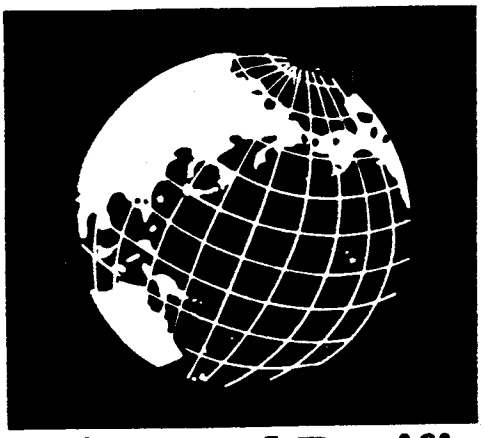

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Asian and Pacific CENSUS FORUM

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

by Geoffrey R. Hayes and Michael J. Levin

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

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

Mitroff, Mason, and Barabba 1983

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

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

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

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

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IN THIS ISSUE

HOW MANY SAMOANS? *(continued)*

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

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

Evaluation Methods

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

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

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

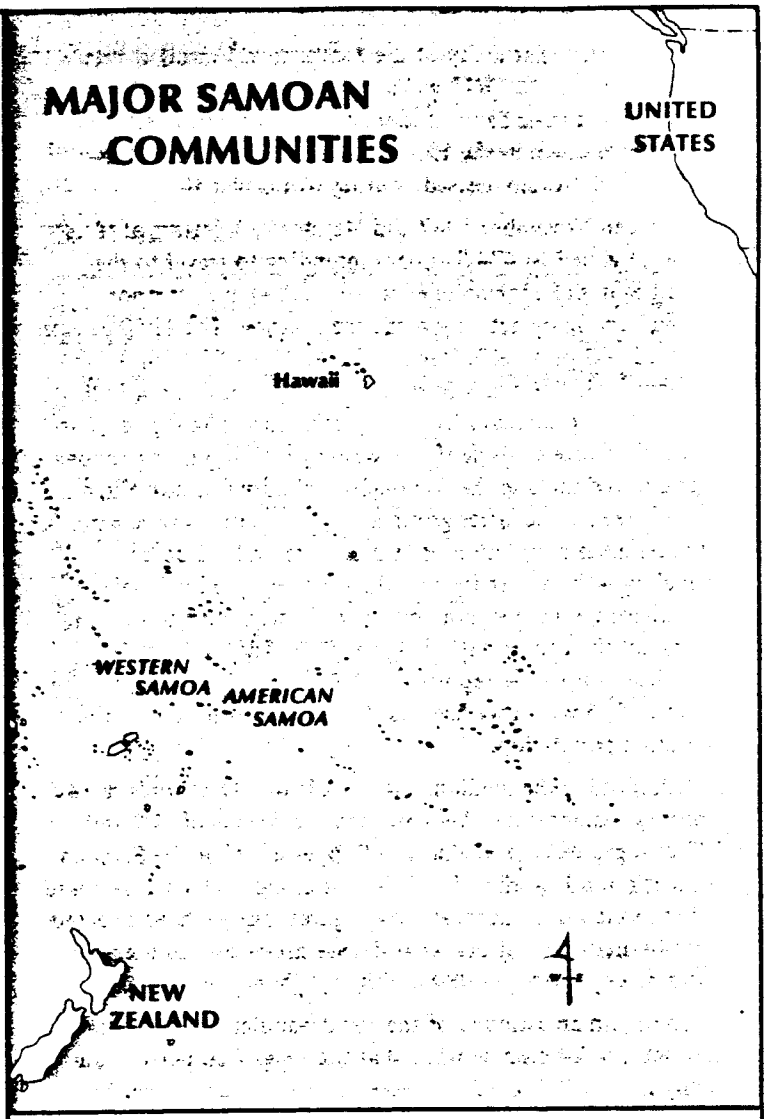
Given the difficulties associated with conventional demographic procedures, an unorthodox method was called for. In this paper we have applied a variant of the intercensal comparative method in combination with demographic analysis and statistical estimation to make a range of estimates of the Samoan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

The General Procedure

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

Establishing the Base Population

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



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

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

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

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

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

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

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

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

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

Reconciliation of Census, Natural Growth, and Migration Data

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

(continued on page 10)

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

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

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

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

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

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

HOW MANY SAMOANS? *(continued from page 4)*

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

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

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

Estimating the Expected Population

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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(continued on page 16)

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

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

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

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

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

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

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

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

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

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

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

HOW MANY SAMOANS? *(continued from page 14)*

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