

INTRODUCTION

The development of Guam since the end of World War II is unprecedented anywhere in world history. In a scant period of 30 years, Guam has achieved a century of progress in economic, political and cultural growth. In addition, Guam moved from a 17th century Spanish colonialism to a modern 20th century American society in less than 70 years. This miracle of progress, however, has not been without its unique problems, and these are problems for which there are no previous precedents. This has left the resolution of these problems almost entirely in the hands of the local people. A few of the more prominent problems include:

1. A social and cultural generation gap of three or four generations between the present day parents and their children.
2. Economic exploitation by "outsiders" who were already aware of the economic benefits that come from rapidly developing communities.
3. The sudden demand for expertise in complex government programs demanding competent management skills.
4. Training the entire population to develop new speech and thought patterns in a very few years. In recent history, the Guamanian people have had to make this adjustment five times (Chamorro to Spanish to English to Japanese to English).
5. Guam's environment, health problems and cultural practices are unique in American society. It often requires unorthodox procedures to align Guam's uniqueness with the many federal regulations

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established to govern conditions in a typical stateside community.

The last 35 years of Guam's history has been particularly turbulent, with none of it of their own making. After 30 months of virtual slavery under Japanese rule during the second world war, the island was almost completely devastated of buildings and resources in the American effort to retake Guam. Starting from nothing, the island had to begin rebuilding from scratch. Two additional major set backs in the rebuilding process occurred in 1962 and 1976 when typhoons of record setting intensity virtually devastated the island for a second and third time.

The Guamanian people are dedicated, loyal and capable people, whose ultimate desire is to become full-fledge Americans in privilege as well as in name. However, because of their history of subjugation and violence at the hands of foreign powers, the Guamanian people need tolerance and understanding ^{from Americans} as they strive to achieve parity with their stateside counterparts. For this reason, it is felt that a brief history of Guam's cultural, economic and political development must be an integral part of any State Plan which will be used to provide the direction for future health care on Guam.

GEOPHYSICAL

Guam is the southernmost island of the 240 mile long chain of 15 islands which constitutes the Marianas district of Micronesia. The island has a total land area of 212 square miles, is 30 miles long by 4 to 11 miles wide and, in outline, resembles the imprint of a left foot implanted on a roughly north-south axis. The northern half or "toe" of Guam is composed of a series of uplifted coral terraces ranging from 200 to 600 feet in height. The relatively thin soil and underlying faulted limestone of this area permit rapid percolation of rain water. Consequently, there are no streams or rivers and water supplies for this region are obtained from numerous wells.

Guam's rolling southern half, dominated by a chain of mountains whose peaks reach as high as 1,344 feet, is primarily of volcanic origin. Here a heavy clay soil permits only slow absorption of rain water and rivers and streams abound. Drinking water for the southern area was provided by a system of reservoirs and hold tanks, but water from northern wells is now being piped to parts of the south.

Annual rainfall averages about 85 inches. During the rainy season stretching from July through November, rain will fall an average of 23 to 25 days each month accumulating 8 to 14 inches monthly. During the January to May dry season, rain can be expected to fall on 15 to 19 days each month for precipitation totals of 2 to 4 inches. June and December are considered transition months.

Typhoons have probably dealt heavily with the island of Guam and her people since time immemorial. The first destructive typhoon to occur in

historical times passed by on September 8, 1671 leaving most native homes, a recently completed stone church and thousands of breadfruit and coconut trees leveled in her wake.

Rarely does a year pass during which at least one typhoon or tropical storm has not made her presence in the vicinity of Guam felt by high winds, rain and heavy seas. Particularly destructive typhoons are recorded as occurring in August of 1848 and during the month of November in 1913 and 1940. Another especially destructive period began with the typhoon of April, 1949. It was followed in November of the same year by a second typhoon and by a third in May of 1950. This triple attack was a serious setback to the island's economy in general and to its agricultural resources in particular. The island enjoyed a brief respite until October 1953 when another typhoon inflicted severe damage, particularly in the northern part of the island.

Slightly more than nine years later on the night of November 11, 1962, what was probably the most destructive storm ever to hit Guam came ashore. With sustained winds of 180 miles per hour and gusts to 207 m.p.h., scarcely anything could stand in the way of Typhoon Karen as she cut a wide swath of destruction from east to west across the densely populated central waist of the island. Despite adequate warning and the general use of typhoon-proof shelters, nine deaths were recorded. An estimated 78% of the privately-owned residential and commercial structures on the island were destroyed and total damage was estimated to be \$40 million.

In May of 1976, a typhoon of equal or greater intensity than Karen once again ravaged the island leaving two dead and causing uncounted millions of

dollars in damages.

Earthquakes, too, have exerted a strong influence on the island of Guam. Between 1825 and 1936, ten quakes were severe enough to cause structural damage to buildings. What was perhaps the most destructive quake of modern times occurred on September 22, 1902. Virtually every masonry building on the island was damaged if not entirely destroyed. In many parts of the island cracks appeared in the ground spewing forth, in some cases, columns of water or sulphurous fumes.

THE PEOPLE

Guam was the first island of the vast Pacific to be discovered by Europeans, the first to be colonized by commercial interests and the first, but by no means the last, whose population was to be decimated by this confrontation with western civilization.

The original inhabitants of Guam, known as Chamorros, are thought to have been a Malaysian race that migrated from southeast Asia. The Chamorros were by all accounts a healthy race. They were described as tall, robust, and amazingly strong by European standards.

On June 15, 1668, the first serious attempt to colonize the Marianas began when five priests of the Jesuit order and a garrison of 35 soldiers stepped ashore on Guam. Although at first genial hosts, the Chamorros soon grew disillusioned when they found that fulfillment of the ambitious Spanish plans for a thriving colony meant long hours of tilling fields or building roads and other civic improvements. In addition to the imposition of forced labor, zealous priests tried to enforce a new code of living to replace existing deeply ingrained cultural institutions. After a single year of apparent

progress, a rebellion erupted that was to prove to be the prelude to a quarter century of almost continuous warfare. While the population of Guam alone had been estimated at 50,000 in 1669, by 1720 the total Chamorro population of all the Mariana Islands had been reduced to less than a thousand persons, probably not a single adult male among them.

With peace established at the price of the extinction of a race, there began a long period of slow rebuilding. With contributions from their Spanish rulers, from Mexican colonists, Philippine political prisoners, laborers and tradesmen, Japanese merchants, and from an occasional British, American or German seaman who had had his fill of life on the high seas, there eventually arose a distinctive new people to replenish the land. These were the modern Guamanians, proud of their ancient Chamorro ancestors, retaining much of the flavor of their Spanish heritage and, more recently, enthusiastically adopting yet a new role as citizens of the United States of America.

Population estimates of Guam as released by Health Planning and Resources Development and based upon a 1977 study by Touche Ross showed a civilian population of 84,701, excluding non-immigrant aliens and the military and their dependents staying on military bases, and 9,800 immigrant (permanent residents) aliens. Based on the official 1970 census, 56% of the people are predominantly Chamorro, 19% Filipino, 9% Caucasian, 4% Chamorro-Filipino mixture, 3% Chamorro-Caucasian, 2% Japanese, Chinese and Korean, and 7% others. The median age of the civilian population is 18.9 years with females comprising one-half of the population. The average family consists

of three children and two adults. According to the 1970 census, of the total number of families, about 40% have children under six years of age and 70% under 18 years of age. Nine percent of families have a female head. No racial census has been undertaken since 1970.

POLITICAL DEVELOPMENT

The matrilineal society of the ancient Chamorros was ruled by district chiefs whose power was based on inherited wealth in the form of land and special prerogatives such as the right to make certain types of shell money.

With the arrival of the Spanish, centralized authority was established, initially in the form of a military commander and eventually as a governor appointed by the royal court in Madrid. Although the authority of the governor was absolute, a semblance of self-government was permitted in the selection of district administrators who replaced the former native chiefs. These were appointed by the governor from a slate of three names presented by village leaders.

As a result of the 1898 Treaty of Paris which formally ended the Spanish-American War, Guam became a possession of the United States of America.

Placed under the administration of a branch of the military services (Navy Department) due to its strategic importance, it is probably not surprising that an attitude of benevolent paternalism characterized the new government of the Territory of Guam. While for whatever reason reluctant to grant Guamanians the full range of political freedoms that American history books and newspapers led them to covet, to the credit of the U.S. Naval governors it must be said that they tolerated and encouraged progress, however

slow, towards realization of these ambitions.

One significant step in this direction was the establishment of the First Guam Congress in 1917. Although serving strictly in an advisory capacity and composed entirely of islanders appointed by the Governor, it provided a platform for the expression of popular opinion on matters of local interest.

In 1930, further progress towards self-government was advanced by the inauguration of a revitalized Second Guam Congress. Although again all legislation was subject to approval by the governor, in this case the legislators were selected by popular election.

Further progress was temporarily interrupted when the Imperial Japanese Army invaded Guam in December of 1941. There followed what was to be for the Guamanians their darkest period since the Spanish campaigns of subjugation. Making no pretense of fostering a democratic form of government, the Japanese promptly put an end to the liberties to which Guamanians had become accustomed.

Although Agana had been the population center of pre-war Guam, most families moved to their ranches in the countryside for the duration of the occupation.

As the tides of war began to turn against the Japanese and it became apparent that the Americans would soon attempt to retake the island, conditions took a decided turn for the worse. Most able-bodied men were forced to work on the construction of new air fields, beach defenses and elaborate cliffside tunnel shelters. Lest they escape into the jungle, the men were

frequently held in stockades under primitive sanitary conditions and were unable to visit their families.

After the liberation of Guam, there followed a two-year period under a military government devoted primarily to the reconstruction of a devastated island.

On May 30, 1946, the interim military rule ceased, a civil government under the administration of the Navy Department was established and full civil liberties were restored. In June of the same year, voter registration was held and the following month elections were held for the first post-war Guam Congress.

On August 7 the following year, the Acting Secretary of the Navy granted the Guam Congress the sole right to modify existing Guam law and, in addition, the power to override vetoes of legislation by the Governor (overridden measures were submitted to the Secretary of the Navy for final action).

In September of 1949, President Truman transferred responsibility for the administration of Guam from the Department of the Navy to the civilian Department of the Interior and appointed Guam's first civilian governor. The following month legislation was introduced in the U.S. Congress that was to fulfill the aspirations for which two generations of Guamanians had labored. Passed by Congress and signed into law by President Truman, what was to be known as the Organic Act of Guam became effective on July 21, 1950. On that date, the sixth anniversary of the liberation of the only United States soil to be occupied by enemy forces during World War II, the Guamanian people were granted full U.S. citizenship and increased self-rule.

The most recent and perhaps most dramatic event in Guam's long history of political development occurred in November of 1970 when island residents went to the polls to select their first elective governor. Now, with both a popularly elected legislative body and chief executive, it could truly be said that self-government had come to Guam.

ECONOMIC DEVELOPMENT

The economy of the ancient Chamorro inhabitants of Guam was based primarily on gardening in jungle clearings, the gathering of wild fruits and vegetables and fishing.

While the Chamorros had lived in numerous small villages that formed an almost continuous chain along the island's beaches and fertile river valleys, by 1680 the Spanish had begun to force them to concentrate in a few large villages where more control could be exercised over their activities.

Food for the Spanish garrison was raised on lands confiscated by the Crown. As a result of poor economic policies by its administrators and a lack of any special natural resources, the island suffered economic stagnation. Since it produced little of value, serving only as a water and provision depot for infrequent ships crossing the Pacific, it soon became a burden on the Mexican treasury and the annual grant for administrative purposes was reduced from 20,000 pesos to 8,000. As Spain began to decline as a major power, her colonies were increasingly left to their own resources and even the few well-intentioned governors of Guam were hard pressed to maintain deteriorating conditions. In 1815, the last State Galleon visited Guam and

thereafter the island was dependent on the chance visits of merchantships, warships or whalers for contact with the outside world.

By the end of the Spanish occupation of Guam, what had once been an island paradise had been allowed to deteriorate into a tropical slum. With the advent of American rule, an improvement in sanitary conditions was to be a major preoccupation but the need to improve economic conditions was recognized also.

Although major abuses were corrected, economic progress during the first half of the twentieth century was slow. Guam is poor in natural resources. Insufficient forestation remained to support serious lumber production and no mineral deposits of consequence had been discovered.

Copra was produced as a cash crop and was the island's largest single industry in pre-World War II days. In 1937 the value of the copra exported from Guam was put at \$157,051.92 (U.S.). Despite the use of improved techniques such as mechanical driers, by 1940 the value of copra exports had plummeted to \$50,552.86, due both to falling world market prices and a developing preference of many Guamanians to earn their living working for the Naval or Island Government or in private business.

By the end of WW II many of the copra plantations had been destroyed and by 1949 this industry had, for all practical purposes, ceased to exist. Even the family ranches were generally neglected as most Guamanians sought paying jobs. In contrast to the pre-war subsistence agricultural economy, post-war Guam could be likened to a metropolitan area, as dependent on off-island sources of food and other necessities as any city of comparable size

would be dependent upon sources beyond its own corporate limits for the same goods.

In 1961, the basis for an economic upsurge was laid when the requirement that visitors to Guam obtain a military security clearance was suspended. In 1963, the Guam Tourist Commission was established to help expand the island's economic base by encouraging the development of tourist-oriented industries. Whereas in 1964 Guam had less than 50 transient rooms to accommodate visitors, by 1968 this had been increased to 500 rooms. Between 1964 and 1968, the number of visitors to Guam remaining 24 hours or longer increased from 1,975 to 18,000 and spending by tourists increased from \$210,000 to \$3,000,000.

Guam is now served by four airlines licensed as international carriers, some giving twice daily service while as recently as 1966 a single airline provided only two flights weekly to Guam. Further evidence of a healthy economic future for the Territory includes diversification. Latest developments in this area include the establishment of a 29,500 barrel-per-day fuel refining plant. With a gross territorial product that has increased from \$70 million in 1961 to \$350 million by 1971, Guam's economic future does indeed look better.

ORGANIZATION OF HEALTH SERVICES

Little information is available about the organization of health services on Guam during the Spanish administration. At least as early as 1856, however, it apparently was customary for a "surgeon" to board arriving

vessels and examine the passengers for the presence of communicable diseases.

With the advent of the American administration, preventive medicine and health care assumed an important role. While administratively there existed both a Medical Department, Naval Government of Guam and a Department of Health, Island Government of Guam, for all practical purposes they functioned as a single agency since the same personnel served both organizations.

As first organized in 1900, health services were provided by three naval medical officers and a Guamanian leper hospital attendant. By 1920, staffing had been increased to eight physicians, 30 corpsmen, eight Navy nurses, 14 native nurses and two dental surgeons. Staffing remained at about this level until the Japanese invasion. During this period, one medical officer was assigned to act as Health Officer. His duties were to assure the purity of water and food supplies, provide for proper sewage disposal, oversee the general sanitation of the island and investigate any communicable disease that might occur among island residents, military or civilian.

No official records of health activities during the Japanese occupation are known to have survived the war. Although health services were offered free of charge to civilians who came to the hospital, many were reluctant to do so except in dire emergency. This is not surprising in view of the treatment they experienced at the hands of non-medical occupation personnel.

That this period did not develop into one to be noted for particularly poor health may perhaps be attributed to several factors. The Americans had been enthusiastic vaccinators and sufficient "herd immunity" may have been established to protect the population against many diseases for the duration

of the occupation. Secondly, most residents of the larger villages, Agana in particular, left their town homes to live on relatively isolated ranches. Although sanitary facilities there were in many cases minimal, 40 years of health education effort had provided at least the rudiments of the knowledge necessary to lead a healthful existence.

The role of the native nurses who had been trained prior to the war was also particularly important during this period. By the time the nursing school was closed by the Japanese, there had been approximately 89 graduates. They, together with a single Guamanian physician, constituted the principal source of health care for the indigenous population of the island, numbering at that time about 23,000 persons. Among the myriad problems they faced, perhaps the most critical was a shortage of medicines. All drugs had been confiscated by the Japanese and although the nurses were at times able to smuggle medicine out of the hospital to aid sick Guamanians, they frequently had to resort to the use of locally available home remedies. It is not surprising that this period saw a rebirth of the folk medicine art that earlier had been threatened with extinction.

When the Americans returned to Guam in 1944, health services were again organized as they had been before the war, the Department of Health being responsible for all health-related services. Effective July 1, 1964, under civilian administration, health service functions were divided between two agencies: the Guam Memorial Hospital and the Department of Public Health and Social Services. The hospital provided medical treatment, certain rehabilitation services and, at a later date, mental health services.

The Division of Public Health of the Department of Public Health and Social Services was responsible for maintaining adequate health standards for the community. This was to be accomplished through immunization programs, sanitation inspections of private and public facilities, special programs to control specific contagious diseases such as tuberculosis and leprosy, and the provision of public clinics for the early detection of disease. Although the division does provide treatment services in a few instances such as to prevent or control incapacitating disease complications or epidemics, its activities are primarily preventive in nature.

An indication of the current commitment of the Government of Guam to the preservation and improvement of the health and well-being of island residents may be gained by a review of expenditures for those purposes. With a civilian population of approximately 60,000, total government expenditures for Fiscal Year 1971 were \$54,761,177.44. Of this total, operation and maintenance of Guam Memorial Hospital accounted for \$4,539,708 while expenditures of the Division of Public Health amounted to \$1,891,466.70. Guam Memorial Hospital had a medical staff roster of 52 physicians (9 employed full-time) and four dentists and employed approximately 120 nurses. Public Health employed full-time three physicians, three dentists, one veterinarian and 48 nurses. Public Health also employed several physicians on a part-time basis to conduct its numerous clinics.

HEALTH SERVICE FACILITIES

The date that the first hospital was established on Guam is not known but one may have existed as early as 1667 since the Colegio de San Juan de

Letran constructed in that year was at times used as a hospital. Staffed at the most by two military doctors and two corpsmen (there were no nurses in those days), the services of this facility were generally limited to caring for Spanish military or administration personnel and their families. Guamanian patients, for better or for worse, were treated at home.

Visitors to Guam as early as 1818 reported that lepers were confined to isolated houses but it was not until 1890 that an attempt was made to gather all leprosy patients in a hospital especially constructed for that purpose near the village of Pago. An interesting aspect of this endeavor was the means by which it was financed. Due to the extreme shortage of funds available for any public improvement projects, the Governor used the profits from the sale of beef and pork produced on the neighboring island of Tinian to support the hospital. Within two years, however, a typhoon had destroyed the facility and patients were dispersed throughout the island once again.

With the arrival of the first American administrators in 1899, free dispensaries were established in Agana and Port Luis d'Apra. In their first year of operation, 1,141 islanders (about 10% of the native population) were treated. As the primitive condition of island roads made travel difficult and hazardous, a navy ship was also outfitted to serve as a floating clinic to serve the otherwise isolated coastal villages of the southern part of Guam. By 1920, outpatient clinics staffed by corpsmen had been established in six outlying villages and an additional six villages had aid stations manned by a patrolman or school teacher trained in first aid.

A hospital for lepers to replace the one destroyed by the typhoon of 1892 was built at Asan in 1899 but it in turn was destroyed by another storm in 1900. In 1902, a hospital-farm was established for lepers in the Tumon Bay area and patients were confined there as they came to the attention of health authorities. An intensive search ordered by the Governor in that year turned up 20 cases who were being hidden by well-meaning, if misguided, friends and relatives. In 1907, the U.S. Congress made a special appropriation to support the care and treatment of leprosy patients; by this time, residents of the colony numbered 85.

Although a modest inpatient facility for the general care of military personnel was established in temporary quarters by 1900, it was not until 1901 that a civilian hospital was constructed. It continued to operate as a municipal hospital until 1910 when it became Ward I of the U.S. Naval Hospital, serving both Guamanians and military dependents. In 1905, a ten-bed civilian hospital and dispensary was established through public subscription. It served as a ward for women and children until it was destroyed by the earthquake of 1909. Before the year was out, however, the Navy had constructed another facility to take its place. This structure was labeled Ward III. The same year the temporary military hospital established in 1900 was replaced with a permanent structure to be known as Ward II.

By 1911, the need for additional civilian hospital services not provided by the Naval Hospital (Wards I, II, and III) was apparent. The construction of a second Susana Hospital was financed by public subscription. Total cost was \$1,500 for building materials--labor for its construction was donated by island residents.

Again to help alleviate crowded conditions, a 30-bed civilian tuberculosis hospital was constructed in 1916 on a hill overlooking the principal complex. This site was chosen because it was felt that the brisk breezes to be enjoyed in that area would be particularly beneficial to TB patients. This structure was in use until after 1930 when it was necessary to temporarily return the TB patients to the main hospital complex. Construction of a modern two-story concrete addition to provide them with new quarters was interrupted by the Japanese invasion.

All hospital facilities except the new TB wing were destroyed during the closing days of the war. As American forces landed, temporary field hospitals were established in secured areas of the Agat and Anigua beach-heads. Later, both the civilian and military wards were moved to a complex of Butler buildings in the village of Tamuning. The civilian ward, renamed Guam Memorial Hospital in 1946 in honor of the Guamanian casualties of WW II, came under civilian administration in 1950 and in 1956 moved into a modern reinforced concrete 236-bed structure nearby.

By the early 1970's, it became apparent that this hospital facility was showing the stress of two major typhoons and had become inadequate to serve the entire civilian population of the island. By January of 1977, the Diocese of Agana had constructed a new 146-bed hospital named the Medical Center of the Marianas. This hospital was developed to provide only acute and short-term care in hopes of avoiding the financial strain placed on hospitals maintaining intermediate and long-term care programs. Guam Memorial Hospital, in an effort to maintain some financial integrity,

continued to also provide acute care. In the ensuing battle for acute care patients, the Medical Center of the Marianas could not maintain enough patients to remain solvent and declared bankruptcy one year after opening. The Government of Guam took over the Medical Center of the Marianas shortly thereafter. Through legislation, a non-profit community hospital corporation was formed, removing both facilities from Government administration and placing their administration in the hands of a Board of Trustees appointed by various island civic organizations. Presently, the new facility is used to provide acute and short-term care and emergency services, while the old facility is used to provide intermediate and long-term care and is still housing the renal-dialysis unit and mental health.

The U.S. Naval Hospital moved from its temporary buildings to a typhoon-proof 350-bed structure overlooking the city of Agaña in 1954. In addition to caring for active duty military personnel and their dependents throughout the Western Pacific, it cooperates with civilian authorities of Guam and the Trust Territory of the Pacific Islands by providing both routine consultative and emergency services.

The earlier policy of providing village level services was continued after the war also. In 1970, the Division of Public Health operated 11 village clinics that provided complete well child and maternal care services as well as cancer detection services, family planning information and home care supervision. Central clinics located in two additional strategically located villages also provided dental health and communicable disease control services as well as chronic disease supervision and some crippled children

services.

In 1974, the world suffered an economic decline which had severe economic implications on Guam. Raising medical costs and a lack of local dollars threatened to collapse Guam's economic ability to support established health programs, as well as other Government activities. In order to maintain adequate services to all eligible clients, the Department had to close the 11 village clinics and replace them with five strategically located regional centers. As it turned out, this had minimal affect on clients, as roads and transportation had improved substantially making these regional clinics as readily accessible to most clients as were the old village clinics.

INDIGENOUS MEDICAL BELIEFS AND PRACTICES

An early observer of Guam's native population remarked that as "...they know few infirmities so they know few medicines, and cure themselves with a few herbs which necessity and experience have taught them to be possessed of some virtue."

The Chamorros believed in the immortality of the soul and the skulls of departed ancestors were carefully preserved in plaited baskets which occupied a prominent place in each household. The souls, or anti, were not necessarily confined to these baskets but it was hoped they would accept them as their earthly abode when not traveling to and fro on whatever business or mischief they wished to conduct. It was believed that the anti were possessed of supernatural powers which they would be willing to use to assist those they favored or harm those who dared to incur their

wrath.

While there was no organized priesthood to enforce Chamorro religious beliefs, a class of professional sorcerer known as makahna existed who were believed to possess special abilities to converse with the anti and, with their help, control the weather, produce abundant or poor crops and bring health, illness or even death to island residents.

By the end of the Spanish military campaigns to subjugate the Marianas, the makahnas had been eliminated but two less powerful groups arose to take their place. These were the kakahna who retained some supernatural powers and are believed to be able to cause illness as well as cure it, and the suruhana whose vocation is limited to the use of herbs to treat illness. Although their activities are frowned upon by health authorities, as late as 1972 at least 24 "herb doctors" were known to be practicing their art on Guam; several of these had reputations as kakahna as well.

MEDICAL AND PARA-MEDICAL EDUCATION

Education available to Guamanians during the Spanish period consisted of elementary reading, writing, arithmetic and Spanish grammar and generally was provided only for acolytes of the church.

Under American administration, school attendance between the ages of 8 and 14 was made compulsory in 1900. Classes for adults were also provided and the same year it was decreed that every adult resident must learn to write his name. By 1917, the first high school classes were offered and the first high school facility opened its doors in 1923.

Probably anticipating that military medical officers would continue to

be available for the supervision of medical services, the American administration decided that the most efficient means of improving local health care would be to create a corps of local women trained to provide nursing services. Accordingly in 1905, eight Guamanian women were recruited to begin a three-year period of on-the-job training as nurses at the Susana Hospital.

A formal curriculum for the instruction of midwives was started by Navy Medical Officers in 1907 and some of the recently trained Guamanian nurses served on the teaching staff. In 1911, the first three U.S. Navy nurses to be assigned to Guam arrived to formally establish the U.S. Naval Hospital School for Native Nurses.

One of the early problems encountered by the school was difficulty in recruiting students. Although native girls willing to undergo the rigorous training were not lacking, parents steeped in Spanish tradition frequently were unwilling to permit their daughters to leave their homes. This problem was to a large degree eliminated when Maria Roberto, a respected Agana matron, was appointed to the position of Chief Native Nurse. Initially, her primary duty was to act as the official chaperone for the student nurses. She lived with them, worked with them in the hospital and, when they were off duty and wished to return home, she saw to it that they were delivered safely to their parents.

During the early years of the nursing school classes were loosely organized and instruction was largely by the apprenticeship method. The first formal curriculum was two years in length. In the early thirties, it was increased to three years and revised to provide more time for

academic instruction in such subjects as anatomy and physiology, pharmacology, bacteriology and contagious diseases. Graduates of the school were issued licenses which had to be renewed annually. Those who wished to practice midwifery had to attend a three-month session of specialized post-graduate training before they were granted special licenses.

By the time the school of nursing was closed by the Japanese in 1941, at least 89 graduates had received their commencement pins. During the war years, these women were in many cases the only source of medical care available to the Guamanian people. After the liberation of Guam, the nursing school was reestablished in June of 1945 with a faculty of ten U.S. Navy nurse educators. The initial class of 12 students included some of those whose formal training had been interrupted by the war.

When responsibility for the administration of Guam was transferred from the Navy to the Department of Interior in 1949, the school of nursing was closed. The then College, now University of Guam, soon acted to fill this void, however, by establishing a two-year nursing program leading to an Associate in Arts degree and eligibility for entrance to the examination for licensure as a registered nurse. In addition to both academic and laboratory instruction at the University, students receive practical nursing experience by working at Guam Memorial Hospital, the U.S. Naval Hospital and regional health centers maintained by the Division of Public Health.

A Guam School for Practical Nurses was opened in January of 1962 offering a curriculum patterned after those of approved schools of practical nursing in the U.S. Of the ten initial students, nine completed the course and were licensed as Practical Nurses. Unfortunately, before a second class had been

admitted, Typhoon Karen destroyed most of the school's facilities and it was not reopened.

In an attempt to further improve medical care for the rapidly expanding island population, on March 15, 1946, the Navy established a School of Medical Practitioners which offered a four-year course in general medicine leading to eligibility for certification as a Medical Practitioner. Promising students from Guam, American Samoa and the Trust Territory of the Pacific Islands were admitted to the program. While it was recognized that the course could not duplicate the caliber of training available in established medical schools of the United States, graduates were expected to be able to diagnose and treat ailments commonly encountered in their areas and to distinguish medical or surgical cases that would require referral for specialized care.

In 1947, a companion School of Dental Practitioners was also established. Attending the same basic courses with student Medical Practitioners during the first two years of their training, they spent the remainder of their four-year curriculum receiving more specialized training and clinical practice. Graduates of the program were deemed sufficiently trained to do general extractions, fillings, periodontal work and, to a lesser degree, apply prosthetic appliances.

With the advent of civilian government in 1950 and the passage of stringent medical and dental practice acts, both the medical and dental practitioner schools were closed. Although barred from practicing medicine or dentistry on Guam, several of the graduates continued their education and serve today in various other positions in health-related fields.

VITAL STATISTICS

Prior to 1969, there was no organized statistical apparatus developed on Guam with which to provide an annual measure of the general health status of the civilian population. Both the Naval Governors and appointed civilian Governors were required to submit an annual report which included comments concerning on-going health activities. However, these reports generally centered around disease outbreaks, sanitary improvements and similar activities. Statistical information was lacking or was not provided consistently enough to provide a statistical base. It wasn't until January 1, 1969, that Guam adopted the United States standard certificate of birth which reflects these factors, such as infant mortality, generally believed to provide an index of general health conditions. However, the leading causes of death were faithfully recorded during most years and provide us with some insight as to the changes that have occurred over an expanse of the last half century. Shown in Table I are the causes of death for the years 1925, 1960 and 1977.

TABLE I. Leading causes of death on Guam: Number of deaths and approximate rate per 100,000 population.

<u>CAUSE</u>	<u>1925</u>	
	<u>NUMBER</u>	<u>RATE</u>
1. Bacillary dysentery	32	192
2. Tuberculosis	13	78
3. Typhoid Fever	8	48
4. Hookworm	2	12
5. Ascariasis	2	6

<u>CAUSE</u>	<u>NUMBER</u>	<u>RATE</u>
6. Measles	1	6
7. Peritonitis	1	6
TOTAL DEATHS	97	583
TOTAL POPULATION	16,648	

1960

<u>CAUSE</u>	<u>NUMBER</u>	<u>RATE</u>
1. Diseases of the Heart and Arteries	61	91
2. Diseases of Early Infancy and Prematurity Unqualified	37	55
3. Pneumonia and Other Diseases of the Respiratory System	30	45
4. Accidents Other than Motor Vehicle	29	43
5. Vascular Lesions of the CNS	18	27
6. All Other Diseases of the CNS and Sense Organs *	17	25
7. Malignant Neoplasms	15	22
8. Motor Vehicle Accidents	14	21
9. Tuberculosis, Pulmonary	10	15
10. Meningitis, Non-meningococcal	6	9
TOTAL DEATHS	351	524
TOTAL POPULATION	67,004	

* Primarily Amyotrophic Lateral Sclerosis - Parkinsonism Dementia

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1977

<u>CAUSE</u>	<u>NUMBER</u>	<u>RATE</u>
1. Diseases of the Heart	71	82
2. Motor Vehicle	38	44
3. Malignant Neoplasms: All Sites	32	37
4. Cerebrovascular Diseases	26	30
5. All Other Accidents	21	24
6. Other Diseases of the Central Nervous System: ALS/PD	20	23
7. Certain Causes of Death in Early Infancy	19	22
8. Pneumonia	17	19
9. Suicide	15	17
10. Cirrhosis of Liver	13	15
TOTAL DEATHS	380	437
TOTAL POPULATION	86,480	

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ENVIRONMENTAL HEALTH

When the first American governor arrived on Guam, he found sanitary conditions to be generally poor. The capital city of Agana, which was then home to approximately 50% of Guam's population, was in a particularly deplorable state. There the streets were narrow and unlit, dusty in the dry season and rivers of mud during wet months. Animals used for transport left the streets dirty and smelly. There was no electricity, no sewer system and no running water. A particular problem in the Agana area was that of obtaining safe drinking water. Due to its vulnerable position enclosed by high cliffs on one side, the sea on another and a river running through its center, the city was subject to frequent flooding. At these times, flood waters carried contamination into wells and, as a result, epidemics of water-borne disease were commonplace. Accordingly, when a supply of pure piped water first became available in 1910, all wells in Agana were ordered to be filled in.

By 1937, 1,038 of the 1,616 dwellings in Agana had a source of running water (usually one faucet located either outside or inside near the kitchen) but only 339 had flush toilets. The dawning of each new day brought the sound of squeaking wheels to those fortunate enough to be able to remain abed as carts drawn by the village residents carried the night's accumulation of human waste to be dumped at the edge of the bay.

Although some progress was made in encouraging owners of private dwellings not equipped with flush toilets to construct bore hole latrines or to use public latrines, it was not until post-war reconstruction began that real advances were made in providing for adequate disposal of sewage.

Garbage disposal, once organized, was conducted by police prisoners in Agana and by private contractors in the other population centers of Sumay and Agat. It was disposed of at a number of public dumps and, in some cases, directly into the sea. After the war, the collection of garbage was taken over by the Department of Public Works and by 1970 a single government supervised sanitary landfill site was provided for all civilian dumping.

Rodents and monitor lizards (the principal sin of the latter being their predilection for eggs and young chickens) were once subject to bounties of a few cents each. Although this was effective in keeping the population of these pests within acceptable bounds, the program was eventually discontinued, perhaps due to reports that some individuals had established rodent farms for the sole purpose of collecting bounties. The Government of Guam for a time employed rodent trapping crews but this too was discontinued as it was felt that the elimination of rodent food sources and harborages through sanitation code enforcement, as well as consultation with individuals experiencing particular rodent problems, would be a more efficient and permanent solution to this problem.

Two epidemics of mosquito-borne illness are known to have occurred on Guam; dengue in 1944, apparently transmitted by Aedes egypti and Japanese B encephalitis (JBE) in 1948, for which Culex annulirostris has been incriminated as the vector. An intensive A. egypti eradication program launched after the dengue outbreak was apparently successful in at least temporarily eliminating both the vector and the disease as no specimens of A. egypti were recovered again until the species were reintroduced in 1970 (by which time its ecological niche had been occupied by A. albopictus, another

efficient vector of dengue) and serological surveys have demonstrated dengue antibodies only in sera from persons born before the A. *egypti* eradication campaign.

From December 1947 through March of 1948, 54 cases of encephalitis were reported by physicians on Guam. Five of the cases terminated fatally. Subsequent studies showed that epidemics of JBE and mumps had occurred simultaneously. At least 1,647 cases of mumps were recorded; serological studies suggested that infection rates for JBE were as high as 80% in some villages. This epidemic was of particular interest as it was the first time that an epidemic due to JBE virus had been recognized within the tropics. It is suspected that an extended period of rain provided the conditions necessary for the epidemic to occur; that no autochthonous cases of JBE have been reported since suggests that some factor of Guam's environment, perhaps the absence of a suitable reservoir, did not permit the disease to become endemic.

In 1966 and again in 1969, several cases of malaria occurred on Guam in which the possibility of local transmission could not be ruled out. Since the civilian Government of Guam had not yet established a vector control program, the assistance of the U.S. Public Health Service was sought in evaluating the current vector situation and making recommendations for future action. A survey by U.S.P.H.S. Personnel showed that as of 1969 Guam had five species of Aedes mosquitoes, including A. *albopictus* which is known to be a capable dengue vector and A. *vexans* which can transmit JBE virus as well as Eastern, Western and St. Louis Encephalitis viruses; one Anopheline mosquito, A. *subpictus* indefinitus, which is a potential vector

of malaria; 7 Culex group mosquitoes of which Culex tritaneniorhynchus, the most important vector of the JBE virus and Culex quinquefasciatus, the primary vector of Bancroft filariasis are representatives; and Mansonia uniformis, the vector of Malyan filariasis. In addition to these mosquitoes, a number of filth-inhabiting flies and Xenopsylla cheopsis, the principal vector of plague, are present on Guam.

As a result of this survey and the accompanying recommendations, a Vector Control Branch was established within the Bureau of Environmental Health and Consumer Protection.

Surveillance of the food industry is also an important aspect of Guam's environmental health program. Food poisoning incidents are less frequent than might be expected in view of Guam's tropical climate; the majority of those investigated have been due to staphylococcal intoxication.

Guam at present has a multi-source drinking water supply system. The portion of the system operated by the U.S. Navy, utilizing a reservoir and modern water treatment plant, serves the Naval Station and civilian villages of the southwestern portion of the island. The relatively isolated villages of Guam's southern and southeastern coast have individual spring or river origin water supply systems. The water supply for the northern half of the island is obtained from numerous wells sunk in the limestone plateau of that area.

While the water in the Navy system is chlorinated sufficiently to maintain some free-chlorine residual at most points in their distribution system, chlorination of the civilian water supplies has been sporadic due

to the difficulties of maintaining chlorinators at the numerous individual sources. In this situation, contamination of ground water reserves is a serious potential problem, particularly in the limestone plateau area where there is an absence of deep soil layers to provide natural filtration and purification. Under these conditions, wastewater may travel directly to the aquifer via cracks or channels in the underlying limestone.

With the advent of the Federal Environmental Protection Agency, large sums of federal monies became available for the construction of elaborate sewage treatment facilities and major sewage collector lines. Between 1968 and the present, tens of millions of dollars have been spent building a massive sewage infrastructure on Guam. Unfortunately, this initially did little to resolve sewage transmitted disease problems, as in many villages, the houses were not equipped with water flush toilets and other plumbing fixtures which could be connected to the sewers. Additionally, major collector lines followed existing roadways rather than the natural fall of the land. Thus, the majority of the raw sewage is transported to treatment plants through pumping stations rather than by gravity flow. An unreliable power supply creates frequent power outages and subsequent failures in the sewage pumping facilities. With each unanticipated power loss, huge quantities of raw sewage overflow the non-functioning pumping stations and contaminate rivers, ocean lagoons and other low lying areas.

A Cholera outbreak in 1974 was traced to the consumption of small fish caught in an ocean lagoon frequently contaminated by raw sewage which overflows a sewage pumping station located along the beach. Fortunately, the outbreak was confined to six individuals but, unfortunately, one

individual died of the disease.

With the fall of Saigon in April of 1975, Guam was inundated by 120,000 Vietnamese refugees, placing an enormous strain on Guam's fragile water supply and sewage disposal facilities. The health of the refugees was extremely poor, with an estimated 5,000 refugees infected with Dengue, 79 identified with recurring malaria infections and an uncounted number with mild to severe gastroenteritis problems. Both typhoid and cholera organisms were frequently isolated from sewage discharged from the refugee camps. All such sewage was dumped, untreated, into the ocean waters surrounding the island. The Governor of Guam declared a local state of emergency, and most Public Health resources were redirected toward efforts to prevent these diseases from spreading to the civilian population for the remainder of the refugees' stay on Guam.

COMMUNICABLE DISEASE PROBLEMS

Leprosy and yaws were for many years the diseases which commanded the most attention of health authorities on Guam. Fortunately, with the advent of modern chemotherapy, they have ceased to be serious public health problems. Yaws has for all practical purposes been eradicated although a few elderly victims of gangosa still remain to remind us of a less fortunate era. Six new active cases of leprosy were discovered in 1969 and three in 1970; they were treated on an outpatient basis and their immediate household contacts were examined annually for at least five years.

Tuberculosis continues to be a serious public health problem and although the incidence of new active cases continues to drop as the result of an intensive case-finding, chemoprophylaxis and treatment program

inaugurated in 1966 to replace the routine use of BCG, the rate is still nearly four times that of the continental United States.

This is gratifying progress considering that from 1905 to 1970, deaths from TB exceeded the number of deaths from all epidemics occurring during that period ($\frac{1}{2}$ of the deaths of persons between the ages of 15 and 30 also being due to TB) and that even as late as 1952 TB was the greatest single cause of death on the island, accounting for 22 deaths and a mortality rate of 71/100,000 population that year.

As elsewhere throughout the world, the incidence of venereal disease appears to be on the increase in Guam. Two cases of syphilis and 39 cases of gonorrhea were reported to the Division of Public Health in 1960 as compared to eight cases of syphilis and 275 of gonorrhea in 1970.

Intestinal parasitism was a major problem at the turn of the century. A stool survey in 1918 revealed a prevalence of hookworm infestation ranging from 66% for residents of rural ranches to 92% in a southern village, the island average being 72%. There did not appear to be significant age or sex distribution differences. A subsequent survey in 1923 indicated that the prevalence of roundworm infestation was 95.2%; of whipworms, 71.2% and of hookworms, 25.9%. Only .9% of the stools examined contained no parasite ova. At this time, the prevalence of hookworm infestation was slightly higher in adults than children, the reverse was true in the case of roundworm infestations. Deaths, particularly of young children, were occasionally attributed to parasitism; hookworm disease and ascariasis accounted for two each in 1925 and ascariasis alone accounted for five deaths as late as 1930. Although of doubtful long-term value, this problem

led the Naval health authorities to institute routine annual or semi-annual deworming campaigns for all school children.

By 1947, the prevalence of intestinal parasitism had been reduced to an estimated 40%. This improvement can probably be attributed to generally improved sanitary conditions and elevated personal hygiene standards rather than treatment of individual cases.

In 1973, an intensive survey of the parasitism problem in the southern villages of Umatac and Merizo was undertaken. This survey demonstrated that better than 46% of the individuals in these two villages suffered from chronic parasitism, with exceedingly high rates among young children. This problem could be directly correlated to poor sewage disposal facilities in the two villages.

Typhoid fever broke out among U.S. Marines soon after they landed in 1899 and the disease remained endemic even after most dwellings in Agana were supplied with safe water. Some outbreaks were associated with contact with the Agana River which became highly polluted on its serpentine course to the sea through the village from which it gained its name. With the provision of sewers in Agana following the war and the general use of flush toilets, typhoid became a rarity. Only three cases were recorded between 1954 and 1970. However, there are indications that the problems of typhoid fever, as well as Salmonella infections, Cholera and Vibrio parahaemolyticus, have been increasing during the last five years. Recent serotyping of stool samples from individuals with acute gastroenteritis have revealed some interesting epidemiological information. Several such isolates have now confirmed the pathogenicity of certain non-agglutinating Vibrio organisms,

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closely related to Cholera. This revelation has led to the quarantine of shellfish importations from the Philippines. Serotyping of Salmonella infections has lend to the possible implication of products imported from Australia. During the past year, almost 50% of all Samonella infections were serotyped as S. waycross, an organism found almost exclusively on Guam and southwestern Australia. Over 50% of these infections are found in children under one year of age. Since many animal products, including powdered milk, are imported from southwestern Australia to Guam, a proposal has been submitted to the Department of Health, Education and Welfare (DHEW) requesting financial support to investigate the impact of S. waycross on Guam, the Northern Marianas and U.S. mainland as a result of these imports.

A high rate of hearing loss exists among Guamanian school children (at least four times that of children in North American cities) and disqualifications of Guam youths for military service due to hearing loss are correspondingly high. Although no specific agent was incriminated, it has been noted that 50.3% of the school children with hearing loss exhibited evidence of otitis media. It has also been observed that severe hearing loss was twice as common and perforation of the ear drum seven times as common among children having five or more sibs and it has been suggested that education of parents to seek early medical treatment when their children develop symptoms of middle ear infection would do much to solve this problem.

The problem of deafness among young children was further aggravated when Guam experienced a rubella epidemic in 1964. Largely due to the anticipated needs of these children, the Department of Public Health and Social Services established a Hearing and Speech Center in 1968. Within one year,

the Center had identified and evaluated 40 deaf children and initiated into regular classes with their normal-hearing peers.

During the last five years, the Hearing and Speech Center, in conjunction with the Department of Education, has identified and diagnosed hearing losses in hundred of Guam children. In hopes of identifying and correcting hearing problems before they become severe or irreversible, the Center began a hearing screening project involving children one to four years of age during 1978.

Immunization continues to be an important part of Guam's public health program. During 1970, approximately 10,000 school children were immunized against measles, rubella, polio, diphtheria, pertussis and tetanus. Included in these activities was a project conducted in cooperation with the National Center for Disease Control to demonstrate the effectiveness of a tri-valent measles-mumps - rubella vaccine. A specific immunization plan for children in the Maternal-Child Health project is addressed in this State Plan.

ZOONOSES

Although it was stated as recently as 1950 that the only zoonosis on Guam was tapeworms (type not specified), this assumption may have been overly optimistic. As previously mentioned, epidemics of dengue and Japanese B encephalitis occurred during the forties. Dogs on Guam are frequently infected with ascarids; it is not unreasonable to assume that cases of visceral larva migrans occasionally occur. A serological survey of 180 local stray or abandoned dogs begun in 1970 showed that slightly more than 1% had

been exposed to leptospiral organisms, a level considerably lower than has been reported elsewhere. Two cases of human brucellosis were reported to public health authorities in 1958, and two cases of leptospirosis were reported in 1967 and 1974 respectively. Although Guam has no dairy or beef herds and no surveys for disease among the scattered individual cattle have been reported, zoonoses of bovine origin are not likely to become serious public health problems in view of the small number of these animals present and their relative isolation. Two cases of trichinosis were reported in 1958; that the incidence of this disease is no higher can perhaps be attributed to cultural influences which dictate that pork be thoroughly cooked. Cases of ichthyosarcotoxism occur occasionally although fatalities are rare. Recent surveys indicate that as high as 20% of local dogs may be infected with Dirofilaria or Dipetalonema filaria, although no instance of human infestation with either of these parasites has been recorded on Guam. Angiostrongylus cantonensis, the parasite causing eosinophilic meningoencephalitis, is also known to be present on Guam and several human cases have been reported.

Perhaps the most dramatic occurrence of a zoonosis on Guam was an epizootic of rabies in 1967. A total of 89 cases involving six species (primarily dogs and cats) were detected over a period of seven months. Fortunately, there were no human cases. An intensive stray animal control program was apparently successful in eliminating the disease from the island; and in December 1971, local health authorities were able to recommend that Guam be officially declared rabies-free. To prevent the re-entry of rabies to Guam, a 120-day quarantine period for all imported carnivorous

mammals is being strictly enforced.

CHRONIC DISEASE PROBLEMS

Diseases of the heart and blood vessels are the current leading cause of death on Guam, accounting for 10.7% of all deaths in 1970. Since the majority of these deaths occur in older age groups and since Guam has a relatively young population (60% of the non-transient population being under 20 years of age, only 13.1% 45 or older) it can be anticipated that mortality due to these diseases will be even higher in the future. An epidemiologic study of Chamorro residents of Rota, Guam and California suggests that the stresses of sociocultural discontinuity resulting from rapid westernization may also be associated with the apparent increased incidence of coronary heart disease.

Malignant neoplasms were the second most frequently reported cause of death in Guam during 1970. As in the case of diseases of the heart and blood vessels, it is suspected that the apparent increase in the importance of this health problem parallels similar trends in other countries rather than there being any unique responsible etiological factor in Guam's environment. Again in both cases, education of the public will continue to be the principal means used by health authorities in their attempt to control these problems while awaiting scientific break-throughs that will provide the tools for a more specific means of attack.

In 1952, an unusually high incidence of a generally rare chronic degenerative disease of the central nervous system known as amyotrophic lateral sclerosis (ALS) was noted on Guam. After intensive case finding efforts were initiated, it was estimated that ALS occurred on Guam with a frequency 100

times greater than in any other region of the world. A high incidence of another relatively rare disease syndrome known as Parkinsonism-dementia (PD) was noted at that time and similarities in age of onset, duration and familial pattern led investigators to suspect that ALS and PD as seen on Guam represented different clinical manifestations of a single disease process.

Continuing investigation as to the etiology of the ALS-PD complex, or "Guam Disease" as it has been referred to, has failed to clearly incriminate hereditary, diet, or environmental factors. Recent research has centered on an attempt to isolate an infectious agent, perhaps a "slow" virus such as is known to cause scrapie in sheep, but thus far these efforts have been fruitless also. Studies are also underway to determine if Guamanians who leave Guam have the same rates of ALS-PD as do those who remain on the island and to see if Caucasians who have lived on Guam for extended periods have higher rates of "Guam Disease" than would normally be expected. Attempts are also being made to see if clusters of motor neuron disease or degenerative CNS disease exist on other islands of Micronesia as they do on Guam. For the present, however, it can only be said that while there must be causes for the ALS-PD complex as seen on Guam and these causes must be more concentrated here than anywhere else in the world, past studies have only been successful to the extent that they have provided some indication as to what factors are not involved.

It has now been adequately demonstrated that westernization has had major effects on almost all aspects of the native societies in the Pacific Basin Islands. This impact has not only altered their socio-economic structure, moral values and agriculture practices but has had a major impact on

their health. Unfortunately, the impact on health has been almost entirely detrimental.

The devastation created on the Pacific Island population by the early European explorers, when they introduced those many new infectious diseases, has been fairly well rectified by Western medical practices. However, the demise of these infectious diseases has exposed health problems which may have even more disastrous consequences for the Pacific Islanders. Today, as these societies move towards western-style living, a different disease profile has emerged. Diabetes, heart disease, obesity and hypertension have become major medical problems, sometimes of epidemic proportion.

The real significance of most of these diseases in island populations has not been studied. However, an epidemiological team from the South Pacific Commission has spent the last seven years investigating the diabetes problem in the peoples of the Pacific Islands. The generally-accepted base-line for prevalence of diabetes in a given population is 1.7% which was established in a study of Caucasians in North America. By way of comparison, a South Pacific Commission (SPC) study of a recently westernized Pacific Island population showed a diabetes prevalence rate of 34.4% in individuals 15 years of age and over. This figure exceeds the prevalence rate seen in the American Pima Indians--the highest rate previously reported, and is approximately 20 times the rate established for Caucasians. In the 50 to 59 year age group, 72.5% were identified as diabetic with an additional 5% classified as borderline diabetic.

Diabetes is rare in non-urbanized Pacific Island populations, but increases rapidly with westernization. It has been suggested that these

island people have a diabetic genotype which confers a definite survival advantage in famine situations, a condition which, with westernization, becomes lethal. This concept has been supported by laboratory evidence. There is every reason to believe that the population of Guam is as prone to diabetes as other Pacific Island populations.

Cardiovascular disease is now the leading cause of death in Guam. Dietary practices such as excessive calorie intake, high fat, sugar, and salt consumption aggravated by the reliance on purchased canned products and carbohydrate products like breads with particular emphasis on refined carbohydrates, contribute to severe cardiovascular disease risk factors in the population, namely, elevated serum cholesterols, obesity, and elevated blood pressure. Sedentary living, lack of exercise, and stress are also contributing factors.

Out of 1,756 adult men and women screened for high blood pressure in 1976, 26% had high blood pressure and about another 15% were marginal. For those with hypertension, males outnumbered females almost 3:1. Of the number of patients counseled on diet, there was a substantial increase in patients counseled on diabetes, hypertension and reduction diets from Fiscal Year 1977 to Fiscal Year 1978.

Neoplasm rank third as a leading cause of death. Fifty percent of all cancer deaths occur in women. Breast and lungs were the common sites; the uterus was the fourth most common site.

NUTRITION

The first post-war public nutrition program was started in 1961 by a nutritionist whose activities included preparation of nutrition education

materials such as a basic nutrition chart using locally available foods, diabetic and obesity leaflets, special diet sheets, a diet manual, meat cookery pamphlets, etc. Diabetic, obesity and prenatal classes were held at various area health centers and in-service training was offered for public health nurses, students of the Guam School of Practical Nursing and elementary school teachers. Consultative services were rendered to various groups and agencies upon request. The introduction and successful passage of a Rice Enrichment Law requiring the addition of thiamine, riboflavin and iron supplements to imported rice was a major accomplishment of the Nutrition Section during this period.

During the period from 1965 to 1968, there was no public health nutritionist on Guam. As a result, the nutrition program dissipated for lack of direction and much headway gained in terms of nutrition education was probably lost. Another nutritionist arrived in March of 1968 but left in October of the same year. Activities during her brief stay included food preparation, demonstration of commodity foods (foods distributed to needy families under a program which was begun in 1968 by the Office of Economic Opportunity), group in-service training, collection and circulation of nutrition information and coordination with other agencies responsible for food services.

During the period 1968-1970, a Maternal and Child Health Program staff worker with a degree in Food and Nutrition was assigned to carry out diet counseling in maternity clinics and work with public health nurses to enable them to provide more effective nutrition counseling. Nutrition was made a subsection of the Health Education Section, Department of Public Health and

Social Services, in July of 1970. The Maternal and Child Health Program staff worker was designated Acting Public Health Nutritionist. Activities of the Section included nutrition counseling and education in both public clinics and private homes, group in-service training sessions, dissemination and collection of nutrition information including preparation, revision and printing of nutrition and diet pamphlets such as the local "Basic Foods" chart preparation of Your Baby's First Food pamphlet, preparation of color slides showing nutritious local fruits and vegetables and presentation of a weekly television feature on nutrition. Another important achievement during this period was the creation of the nutritionist position under civil service with the help and supervision of the Health Education and Nutrition Administrator.

Contact with other programs responsible for food services, nutrition education or diet instruction was also reestablished. This included the Food Commodity Program which became a section in the Division of Social Services in January of 1970 and supplies supplemental foods to low-income families.

DENTAL HEALTH

Dental caries with resultant loss of teeth was extremely rare among young Chamorros, perhaps due to the absence in earlier days of modern highly refined convenience foods. However, the fondness of their race for the nut of the betel palm or, more specifically, the lime and pepper leaf concoction chewed with the betel nut to heighten its narcotic effect, led to the production of extensive lime accretions, particularly on the facial

surface of the molars. These calcium salt deposits increased with age, first being noticeably present at about 35, and in many cases led to gingivitis, alvelar disease and eventual loss of teeth.

This situation has changed considerably, and generally for the worse, with the advent of the modern era. Although addiction to betel nut chewing had declined somewhat, the incidence of dental caries had increased to such an extent that by 1927 the Governor's annual report cited this as a serious public health problem. That year a survey of the dental health of 118 intermediate school pupils showed that the teeth of 80 were in "poor" condition: only six were considered perfect. To help improve this situation, the island's first civilian dentist was recruited in 1928 by the Naval Government to provide free dental treatment for school-age children.

Unfortunately, dental health has not improved significantly since then. Another survey of school children in 1956 revealed that "nearly all" had dental caries, with an average of 5.2 carious teeth per child.

Although no claim can be made as to solving the problem of dental caries on Guam, progress in ameliorating its effects continues. Responsible for providing for the dental health of all children through 16 years of age, the Public Health Dental Clinic saw 15,475 patients in 1970. Recognizing that treatment alone will not provide an answer to the problem, emphasis was placed on education to develop good eating and dental hygiene habits. Construction of a second clinic to serve residents of the southern end of the island was begun in 1970 and, with the hope that it would prove to have a profound effect on Guam's dental health picture in the near future, a one-year Dental Auxiliary Training Program in cooperation with the University

of Guam was inaugurated in January of 1971.

The Dental Auxiliary Training Program has since graduated classes of eight in 1971 and 17 in 1972. A large proportion of these graduates are now employed in Public Health Dental Clinics where they perform traditional functions of both dental assistants and dental hygienists in addition to some functions that have previously been restricted to the dentist.

During Fiscal Year 1978, the Public Health Dental Clinics provided basic dental services to over 24,000 patients under 16 years of age. The program has been effective in saving decaying teeth, but the rate of decayed, filled and missing teeth in the children of Guam remains slightly higher than in their U.S. mainland counterparts.

In an effort to prevent tooth decay in our local children, Guam became a participant in a three-year fluoride mouth rinse program, sponsored by the National Institute of Dental Research. A preliminary review of the results of this project indicate a reduction in the dental caries rate of 30 to 40% in children participating in the project. This very effective prevention program terminated in September of 1978.

During May 1978, the Department of Public Health and Social Services screened 152 Guam children for the presence of oral malocclusions. Of that group, 55% were found to have orthodontic problems needing correction or intervention. It is estimated that 60% of these malocclusions can be intercepted and corrected before they develop into severe problems.

MATERNAL AND CHILD HEALTH

Prior to 1970, the general non-military stable population of Guam was characterized by comparatively large families and confronted with relatively

low income and high living costs. Dietary habits were often unsatisfactory because of the changing cultural patterns and the scarcity and/or high cost of meat, fish, fresh produce, and dairy products. These factors plus the lack of understanding and appreciation, by many mothers, of their own health needs as well as those of their children, lead to too frequent pregnancies and a number of other conditions detrimental to good maternal and child health.

Maternal morbidity is associated with premature births, hence, neonatal deaths. Maternal morbidity often causes the occurrence of various birth defects. Because of insufficient reporting and the small population base of Guam, maternal morbidity and mortality rates are unusable in any analysis. However, low income populations living elsewhere in the U.S. are known to have relatively higher maternal morbidity and mortality rates than their more affluent counterparts.

Among preschool age children, there appears to be a high incidence of iron deficiency anemia, dental caries and intestinal parasitism. It is also suspected that undiagnosed and untreated chronic illnesses exist secondary to lack of treatment of acute disease. This is in part due to the fact that many parents do not recognize these problems and, therefore, do not seek medical treatment.

Middle ear infection often goes untreated in the preschool years because mothers fail to recognize this as a disease. Probably as a result of this, there is a high incidence of hearing loss in school age children. As shown in a recent study, the frequency of hearing loss in Guamanian school children is four times that of school children in the U.S. In addition, more than 40

children suffering from hearing loss as a result of the rubella epidemic in 1964 have been identified and provided with special education.

The existence of minor health problems such as pediculosis (head lice) and intestinal parasitism suggest the existence of suboptimal living conditions, the need for more effective health education programs and better enforcement of environmental sanitation codes..

In any relatively isolated population of small size where intermarriage among a limited number of families over a long period of time occurs as it has on Guam, there is always an increased chance for the generation of inherited factors which either give rise to certain defects or predispose the individuals so endowed to diseases or other health problems. That genetic factors should be recognized as an important potential source of health problems in Guam is suggested by the extremely high incidence of Amyotrophic Lateral Sclerosis-Parkinsonism dementia and a high incidence of diabetes. Other atypical conditions occurring on Guam that may be associated with genetic factors include an unusual excess of male births and a high rate of male fetal and infant mortality.

Two programs of the Department of Public Health and Social Services concentrate on the problems of maternal and child health. These are the Maternal and Child Health Program and the Crippled Children Services Program. The general objective of the Maternal and Child Health Program is to improve the health of mothers and their infants and children. It is estimated that over half of the local mothers giving birth each year on Guam receive pre-natal and post-partum care from Public Health facilities. Clinics for women were held at six convenient localities throughout the island. Regular examination by physicians, medication, special education classes and counseling

by nurses, laboratory studies, cancer detection, and family planning services are provided. High-risk mothers are offered special care during pregnancy through a Maternal-Infant Care Project.

Special in-service training has increased the abilities of the public health nurses in the area of Child Health Services. Primary attention is devoted to assisting the mothers to provide care that will prevent the many preventable health problems that now exist on the island. Vaccinations, laboratory studies, vision testing and medication are provided to all patients. Those with special problems are referred for specialized care.

In 1970, a new family planning grant proposal submitted by the Director of Maternal and Child Health was funded in the amount of \$56,018 to be used in expanding and improving existing family planning services. The MCH Director also attended a two-week family planning training course for physicians sponsored by the Center for Disease Control.

The present Crippled Children Services (CCS) Program has been in operation since December 11, 1969. It provides both medical and paramedical services for children with mental and/or physical handicaps and those with potentially crippling conditions.

For the purposes of the CCS Program, a crippled child has been defined as a person under 21 years of age residing in Guam who is suffering from a condition or conditions resulting from congenital anomaly or acquired through disease, accident, or faulty development which hinder him from achieving his full physical, mental or social potentialities. The primary objective of this program, therefore, is to help rehabilitate or develop potentialities to the maximum by providing medical, surgical, social,

physical therapy, occupational therapy, or psychological services as needed. The unique aspect of the CCS Program is its ability to provide coordinated case management for children whose handicaps require long-term multiple services which, because of chronicity, complexity and financial burden, cannot be effected by private care alone.

All cases are considered individually, but to be accepted for CCS care, a child must be considered to be capable of rehabilitation. Since funds, personnel and facilities will always be limited in relation to need, criteria are set for assigning priorities which include such factors as prognosis for life, reasonable expectation of cure or restoration of useful function, availability of accepted forms of treatment, and expense in each particular case. Treatment is limited to those unable to obtain it privately for financial or other reasons. Prepaid medical insurance, including Medicaid, is utilized first whenever possible to reduce program costs.

Lack of adequate record keeping and inconsistent statistical information has made it difficult to develop a proper scenario for evaluating the effectiveness of various Public Health programs. During the administration of Guam by the Navy, very few useful health statistics were preserved, and this situation was only slightly improved during Guam's administration by the U.S. Department of the Interior. Most of the statistics which are useful for evaluating improvements in the health of children and mothers are available only for the period from 1971 to the present. The two exceptions are the infant death rate and the birth rate, both of which have been faithfully recorded (with a few exceptions) since 1950. The steady decline in both the infant death rate and the birth rate are amply illustrated in

GRAPH I.

A careful review of this Graph shows that the decline in the infant death rate has not been materially affected by the implementation of the Maternal and Child Health Project in 1968, although there appears to be a marked improvement during the last three years. Likewise, the implementation of a Family Planning Program in 1970 appears to have had little affect on the naturally declining birth rate.

During May and June of 1978, all of the birth and death certificates for the years 1973 through 1977 were examined in detail to determine the status of the infant death rate and birth rate in the various villages throughout Guam. Appendix I provides a detailed breakdown of the births, infant deaths, infant death rate and a five-year average infant death rate for each village. As can be seen in Appendix I, the infant death rate was highly variable, with a low of 5.3 infant deaths per 1,000 live births in Agana and a high of 39.5 infant deaths per 1,000 live births in Inarajan. Likewise, there was considerable variation in the birth rate among the various island villages, with a low of 17.9 in Agana Heights and a high of 41.5 in Nongmong-Toto-Maite. (The 51.9 rate shown for Agana was discarded because the birth record often recorded the mailing address rather than village of residence.)

DEPARTMENT OF PUBLIC HEALTH AND SOCIAL SERVICES

The Department of Public Health and Social Services is a line Department directly responsible to the Governor of Guam. The Director and Deputy Director

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of the Department are appointed by the incumbent Governor. The Department is divided into two divisions: the Division of Public Health and the Division of Social Services. In order to insure continuity of health services during changes of administration, the Legislature created, at the request of the Governor, the position of Chief Public Health Officer. This is a Civil Service classified position with responsibility for the planning, implementing and administering of all functions assigned to the Division of Public Health.

The Division of Public Health serves the dual functions of a State Health Department and a local Health Department. Additionally, the Division is responsible for certain health functions that are provided by federal agencies in the states. Since there is no United States Public Health Service (USPHS) representation on Guam, the Division of Public Health provides the U.S. Immigration Service with the medical services normally provided by U.S.P.H.S. The majority of the immigrants coming from Southeast Asia and the Philippines enter the United States through Guam. The health status of these countries is relatively poor, making the task more difficult than normal. Continual diligence is necessary to prevent the entry of exotic diseases, and the Division must provide case management and treatment for a large number of TB waiver cases. Other U.S.P.H.S. functions, such as international quarantine, enforcement of World Health Organization (WHO) regulations, and international certification of airports and seaports, have become a Division responsibility also.

The Department of Public Health and Social Services also serves in a

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national role in its relationship with the World Health Organization. While the continental United States belongs to the American region of the World Health Organization, Guam belongs to the Western Pacific region where it is considered a separate country for purposes of providing regional health care. The same basic relationship is enjoyed with the South Pacific Commission.

Because the Department must serve these many roles, its organization is somewhat different than the organization found in most state health agencies. The Department and Division of Public Health organization charts are provided in Appendix II.

During the early 1970's, there were 14 village health centers which were used in the provision of direct health care services. Destruction of some of the village health centers during Typhoon Pamela on May 21, 1976, compounded by a shortage of nurses and a world recession, led to a reduction in services and a reorganization of clinic services. At present, specialty clinics for Maternal Child Health, Crippled Children Services programs and other departmental programs are available at Central Public Health Facility. Basic Maternal Child Health (MCH) services are provided through Family Health Care Clinics with services for the entire family available at five regional health centers. Primary MCH care is carried out through the Family Health Care Clinics which provide medical screening, prenatal care, post-partum care, medical services for children and youth, immunization and detection and treatment of chronic and communicable diseases by multidisciplinary health staff personnel. The regional health centers also serve as the health information and referral resources for area residents.

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HEALTH PROBLEMS AND NEEDS

1. As the Public Health Agency on Guam, it is the responsibility of the Department of Public Health and Social Services to identify community health problems. Once identified, these problems must then be placed in an historical perspective to determine if the problem is increasing, decreasing, or remaining static. Without this information, it is difficult to assess the long-term affects of any program which is implemented to correct this community problem. The failure to develop, record and maintain a specific health data system prior to 1970 has made the task of identifying and assessing community health problems a tedious and often unrewarding task.
2. The prevalence of conditions leading to chronic diseases, particularly diabetes, hyptertension and obesity, is alarmingly high on Guam. There is no sufficient background data to demonstrate positively that this is of recent occurrence. However, studies of other island cultures with similar health problems have demonstrated that such conditions tend to be a response to the westernization of the island community. These studies also suggest that the onset of these problems can occur in individuals as young as ten years of age, and that as much as 80% of the individuals over 40 years of age are affected.
3. It can be demonstrated that the infant death rate on Guam has been gradually decreasing over the last 25 years and has now reached the point where it is almost comparable to the average rate identified for stateside communities. However, it has now become apparent that this

reduction in infant deaths is not evenly distributed, and that the infant death rate is still alarmingly high in some villages. The reason for the great disparity in infant death rates among the villages is not clearly understood, but does not seem to be correlated to the availability of prenatal care services.

4. As with the infant death rate, the birth rate on Guam has been gradually declining for the last 25 years. However, detailed examination of birth records indicates that the birth rates in certain villages are still unusually high. The reason for this needs further investigation since it cannot be correlated with the availability of family planning services.
5. While the Dental Program within the Department of Public Health and Social Services has been quite effective in providing basic dental services to children, preventive services have not been too effective. Prevention of dental caries through fluoridation of the island water supply does not appear to be feasible, at least in the near future. There is presently no program to prevent severe malocclusions from developing in children as they mature, although a recent survey indicates that over 50% of our children develop some degree of malocclusion as the mouth grows and develops.
6. Teenage pregnancies have increased dramatically during 1976 and 1977. This has created two problems: (a) a large increase in illegitimate births and (b) an increase in premature births and in fetal and neonatal deaths. Presently, family planning services cannot be made available to persons under 18 years of age without parental consent.
7. The introduction of the Western culture to Guam has brought with it many

new and complex health problems. It is suspected that processed sugar commodities are responsible for the alarming increase in diabetes and, perhaps, hypertension and obesity. The impact alcohol has made upon the community has not been assessed, but may be as severe as its impact on the American Indian and the Alaskan Eskimo. This specific lack of knowledge makes it difficult to develop nutrition programs that are acceptable and responsive to the health needs of the populace.

8. It is becoming increasingly apparent that the genetic makeup of the native Chamorro differs in many ways from the genetic makeup of their Caucasian brothers on the mainland. This is amply demonstrated by the unusual ALS-PD problem on Guam, the apparent susceptibility to diabetes and hypertension, the apparent lack of an RH negative factor and, quite probably, other things. However, we have no genetic profile of the Chamorro population and this is essential knowledge if we are to provide good health care. Of particular concern is our lack of knowledge concerning the drug sensativity of this population.

DEPARTMENT GOALS

In addition to those federal goals and objectives for the Maternal and Child Health Program mandated for Fiscal Year 1979 and Fiscal Year 1980, the Department has developed some long-term goals determined as necessary to improve the health of mothers and children.

1. Investigate old governor's reports, Navy records and other historical documents in a continuing effort to develop the necessary historical basis upon which to build a more effective health care system.

2. Determine the factors influencing the dramatic increase in chronic diseases on Guam, and plan programs directed toward their prevention, particularly among mothers and children.
3. Evaluate all of the infant deaths on Guam for which there is adequate information in an effort to determine the principal causes of infant deaths, particularly in those villages where the infant death rate is still high.
4. Develop a program directed toward the problem of pregnancies among teenagers, and reducing the numbers of illegitimate births and fetal and neonatal deaths.
5. Establish an on-going program that will help reduce dental caries among school children through the implementation of a fluoride mouth rinse project.
6. Design and implement a program which will reduce the incidence of malocclusions among children through early intervention of developing problems.
7. Establish a program that will begin identifying those hereditary factors within the Chamorro population that influence the quality of health among this population.
8. Develop nutrition and health education programs that can effectively respond and adjust to the knowledge gained from goals 1, 2, 3 and 7.

FEDERALLY MANDATED OBJECTIVES

Listed herein are the federally mandated objectives for all Title V projects for Fiscal Year 1979 and Fiscal Year 1980, along with our response

to these objectives.

1. ASSURE THAT FAMILY PLANNING SERVICES FOR WOMEN REPORTED BY STATES REPRESENT AN EXPENDITURE LEVEL EQUIVALENT TO AT LEAST SIX PERCENT OF THEIR TITLE V A&B FORMULA FUNDS.

RESPONSE: Special family planning projects will be directed toward those three villages with unusually high birth rates and towards special family planning services for teenagers in cooperation with the Guam school system.

2. DEVELOP AN OUTREACH PROGRAM WHICH CAN ASSURE THAT OF THE WOMEN RECEIVING MATERNITY CARE THROUGH TITLE V PROGRAMS, NO LESS THAN 75 PERCENT ARE INITIALLY SEEN AND PROVIDED SERVICES IN THE FIRST TRIMESTER, AND NO LESS THAN 95 PERCENT IN THE SECOND TRIMESTER.

RESPONSE: An outreach program will be established to encourage all high risk women in the four target villages to enter into a comprehensive prenatal care program during their first trimester of pregnancy.

3. ASSURE THAN AN ESTIMATED 90 PERCENT OF RH-NEGATIVE WOMEN AT RISK OF RH-SENSITIZATION AS A RESULT OF PREGNANCY RECEIVE APPROPRIATE IMMUNOGLBULIN FOR PREVENTION OF SENSITIZATION.

RESPONSE: A program will be developed in an effort to determine if, infact, the RH-negative factor exists in Guam's native population or in other predominant ethnic groups living on Guam.

4. DECREASE THE INFANT MORTALITY RATE BY TEN PERCENT PER YEAR IN CITIES OF 50,000 OR MORE WITH GREATER THAN 400 "EXCESS DEATHS" PER YEAR (1969-1973 BASE); OR DECREASE THE INFANT MORTALITY RATE

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IN EACH NON-SMSA COUNTY HAVING A FIVE-YEAR INFANT MORTALITY RATE HIGHER THAN THE STATE INFANT MORTALITY RATE FOR 1977, AS JUDGED BY THE COUNTY'S "RUNNING" FIVE-YEAR INFANT MORTALITY RATE.

RESPONSE: Four villages in southern Guam have been identified as having the highest infant death rates on Guam. A special project will be developed in an effort to determine the cause of these high rates, and to identify the high risk women in these villages to assure that they have continuity of care, follow-up care, quality care and appropriate referrals.

5. ASSURE THAT 90 PERCENT OF ALL CHILDREN UNDER 17 YEARS-OF-AGE ARE FULLY IMMUNIZED AGAINST THE VACCINE PREVENTABLE DISEASES (INFECTIOUS) AND ESTABLISH SYSTEMS IN EACH COMMUNITY TO ASSURE THAT ALL NEWBORNS ARE IMMUNIZED AT THE EARLIEST APPROPRIATE TIME.

RESPONSE: A special immunization project will be developed in the target villages directed toward assuring that immunizations are available to all children 17 and under, and assuring that newborns are immunized when appropriate.

6. IMPLEMENT THE SSI DISABLED CHILDREN'S PROGRAM SO THAT 90 PERCENT OF CHILDREN ELIGIBLE FOR SSI UNDER SEVEN YEARS-OF-AGE, AND THOSE WHO HAVE NEVER ATTENDED PUBLIC SCHOOL, WILL BE UNDER CARE.

RESPONSE: Guam is not eligible for the SSI program.

7. ASSURE THAT THE STATE CRIPPLED CHILDREN'S PROGRAM DEVELOPS LINKAGES FOR THE PROVISION OF SERVICES FOR HANDICAPPED CHILDREN WITH AT LEAST 25 PERCENT OF THE BCHS SUPPORTED PRIMARY HEALTH CARE PROGRAMS LOCATED

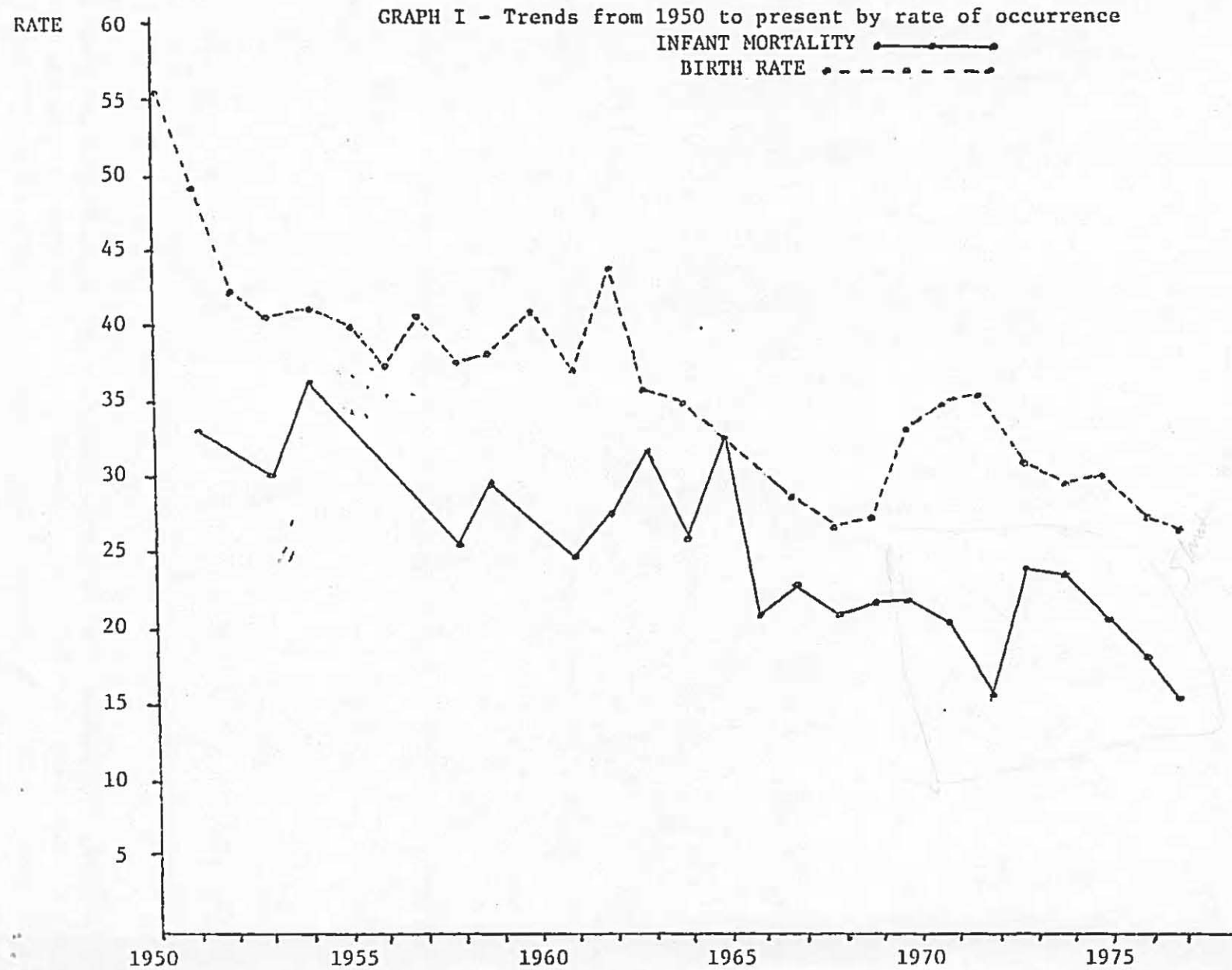
IN THE STATE.

RESPONSE: Guam has no ECHS supported primary health care programs.

8. INCREASE BY AT LEAST 80 PERCENT (FROM 116,000 TO 209,000) THE NUMBER OF ADOLESCENTS RECEIVING FAMILY PLANNING SERVICES IN TITLE V PROGRAMS.

RESPONSE: The Department will seek legislation which will enable adolescents to seek family planning services without parental consent. The Department will then work with the Department of Education in a cooperative effort to bring family planning services to adolescents requesting or needing such services.

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MERIZO

<u>YEAR</u>	<u>BIRTHS</u>	<u>INFANT DEATHS</u>	<u>INFANT DEATH RATE</u>
1973	78	1	12.8
1974	60	0	0.0
1975	55	2	36.5
1976	51	0	0.0
1977	53	0	0.0
		AVERAGE:	10.1

INARAJAN

1973	84	4	47.6
1974	64	5	78.1
1975	63	2	31.7
1976	75	1	13.3
1977	68	2	29.4
		AVERAGE:	39.5

TALOFOFO

1973	84	1	11.9
1974	89	1	11.2
1975	58	1	17.3
1976	65	0	0.0
1977	66	1	15.1
		AVERAGE:	11.0

UMATAC

1973	39	2	51.3
1974	28	1	35.7
1975	18	0	0.0
1976	28	1	35.7
1977	18	0	0.0
		AVERAGE:	30.5

DEDED0

1973	576	12	20.8
1974	583	19	32.6
1975	487	9	18.4
1976	568	8	14.1
1977	540	12	22.2
		AVERAGE:	21.3

AGAT

1973	180	8	44.4
1974	181	5	27.6
1975	174	4	23.0
1976	151	6	39.8
1977	147	1	6.8
		AVERAGE:	28.8

SANTA RITA

<u>YEAR</u>	<u>BIRTHS</u>	<u>INFANT DEATHS</u>	<u>INFANT DEATH RATE</u>
1973	82	2	24.2
1974	94	3	31.8
1975	79	2	25.3
1976	85	1	11.8
1977	90	2	<u>22.2</u>
		AVERAGE:	23.2

TTPI

1973	7	1	
1974	13	1	
1975	9	1	AVERAGE:
1976	9	1	98.0
1977	<u>13</u>	<u>1</u>	
	51	5	

AGANA

1973	79	0	0.0
1974	57	0	0.0
1975	77	0	0.0
1976	69	1	14.5
1977	90	1	<u>11.1</u>
		AVERAGE:	5.3

AGANA HEIGHTS

1973	107	2	18.7
1974	71	3	42.3
1975	67	5	71.6
1976	58	1	17.3
1977	49	2	<u>40.8</u>
		AVERAGE:	36.7

ASAN-MAINA

1973	76	1	13.1
1974	69	1	14.5
1975	88	1	11.2
1976	54	0	0.0
1977	33	2	<u>60.6</u>
		AVERAGE:	15.6

BARRIGADA

1973	199	5	25.1
1974	199	2	10.0
1975	167	5	29.9
1976	157	2	12.7
1977	165	3	<u>18.2</u>
		AVERAGE:	19.1

CHALAN PAGO - ORDOT

<u>YEAR</u>	<u>BIRTHS</u>	<u>INFANT DEATHS</u>	<u>INFANT DEATH RATE</u>
1973	118	2	16.9
1974	109	1	9.2
1975	112	2	17.8
1976	89	4	44.9
1977	79	1	12.7
		AVERAGE:	19.7

MANGILAO

1973	147	0	0.0
1974	128	4	31.3
1975	107	4	37.4
1976	139	5	36.0
1977	113	1	8.9
		AVERAGE:	22.1

MONGMONG-TOTO-MAITE

1973	180	5	27.8
1974	171	2	11.7
1975	154	3	19.5
1976	150	2	13.3
1977	147	3	20.4
		AVERAGE:	18.7

PITI

1973	58	2	34.5
1974	37	0	0.0
1975	38	1	26.3
1976	41	1	24.4
1977	36	0	0.0
		AVERAGE:	19.0

SINAJANA

1973	125	4	32.0
1974	89	4	44.9
1975	99	2	20.2
1976	102	1	9.8
1977	91	0	0.0
		AVERAGE:	21.7

TAMUNING-TUMON

1973	305	11	36.1
1974	350	6	17.1
1975	314	4	12.7
1976	327	6	18.4
1977	321	2	6.2
		AVERAGE:	17.9

YIGO

<u>YEAR</u>	<u>BIRTHS</u>	<u>INFANT DEATHS</u>	<u>INFANT DEATH RATE</u>
1973	113	2	17.7
1974	116	1	8.6
1975	118	2	17.0
1976	97	1	10.3
1977	115	2	17.4
AVERAGE:			<u>14.3</u>

YONA

1973	95	1	10.5
1974	109	5	45.9
1975	121	2	16.5
1976	122	3	24.6
1977	102	3	29.4
AVERAGE:			<u>25.5</u>

MILITARY AREA

1973	491	8	16.3
1974	598	11	18.4
1975	746	12	16.1
1976	596	10	16.8
1977	657	7	10.7
AVERAGE:			<u>12.3</u>

BIRTH RATE BY VILLAGE

<u>VILLAGE</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>AVERAGE</u>
Agana	62.7	45.3	58.3	41.6	51.6	(1) 51.9
Agana Heights	26.3	17.4	16.3	16.2	13.5	(19) 17.9
Agat	20.4	13.9	13.2	41.9	39.4	(14) 25.8
Asan	34.9	32.2	39.6	27.3	16.4	(10) 30.1
Barrigada	30.8	30.8	25.3	27.4	28.1	(11) 28.5
Chalan Pago - Ordot	36.1	34.0	33.8	34.3	29.7	(7) 33.9
Dededo	36.1	38.9	31.6	35.3	32.6	(5) 34.9
Inarajan	33.8	32.0	30.7	41.4	36.3	(6) 34.8
Mangilao	24.7	21.3	17.6	20.2	16.2	(17) 20.0
Merizo	38.2	29.4	26.3	28.3	28.7	(9) 30.2
Nongmong - Toto - Maite	56.7	53.8	46.5	25.8	24.8	(2) 41.5
Piti	39.6	29.6	29.7	16.1	14.0	(14) 25.8
Santa Rita	20.0	23.0	19.0	24.4	25.3	(16) 22.3
Sinajana	25.0	14.8	16.3	40.5	35.1	(12) 26.3
Talofofo	42.7	45.3	28.7	34.4	34.0	(3) 36.4
Tamuning	18.7	21.4	18.9	17.5	16.9	(18) 18.7
Umatac	18.9	22.9	14.6	45.6	28.6	(4) 36.1
Yigo	26.3	27.0	26.8	22.6	26.2	(14) 25.8
Yona	31.7	36.3	39.0	30.7	25.1	(8) 32.5
Military				27.1	29.0	