

#29

A BASELINE STUDY
OF THE HEALTH STATUS OF
THE RESIDENTS IN KALAPANA, HAWAII

JANUARY - JUNE 1987

By David B. Johnson, Ph.D.

Former Coordinator, Health Surveillance Program

and

William R. Arbeit, M.A.

Coordinator, Health Surveillance Program

Research and Statistics Office

Department of Health, State of Hawaii

August 1988

The conduct of this survey and completion of the report of the survey was financed by Campell Estate and the Mid - Pacific Geothermal Venture.

/

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

JOHN WAIHEE
GOVERNOR OF HAWAII



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH

P. O. BOX 3376
HONOLULU, HAWAII 96801

In reply, please refer to:
File:

August 6, 1988

Rod Moss
Vice President
True Mid-Pacific Geothermal
Ft Street Mall
Honolulu, HI 96813

Dear Mr. Moss,

Enclosed you will find six copies of the report "A Baseline Study of the Health Status of Residents in Kalapana, Hawaii January - June 1987", as per our agreement.

We are also sending copies, as per our agreement, to the following:

- 2 copies to Hawaii County Planning Department
- 1 copy to each of the County Libraries in area of survey
- 1 copy to Sierra Club (Hawaii)

We hope that this will satisfy the terms of our agreement

Sincerely,

A handwritten signature in cursive script, appearing to read "W. Arbeit".

William R. Arbeit
Coordinator
Health Surveillance Program
Research and Statistics Office

ABSTRACT

A community health survey was conducted during the first five months of 1987 in Kalapana, Hawaii. Some 676 residents were interviewed during the study, which represents some 82% of all households in the community. The goal was to obtain base-line data on the health status of all community residents and ambient air quality, in order to evaluate any changes in health status of residents after geothermal development in the area.

The health status of Kalapana residents (as measured by morbidity, restricted activity due to illness, activity limitation and hospitalization) is worse than that of Hawaii County or State residents as a whole. Differences are primarily, but not exclusively, associated with higher levels of acute and chronic respiratory illness conditions.

While ambient air monitoring indicated the presence of hydrogen sulfide and atmospheric radiation, the levels were not high enough to be unsafe to humans.

Some natural volcanic ventilation exists in the study area and is considered to be responsible for the levels of hydrogen sulfide and radiation found in the atmosphere. Wind patterns may bring some of this pollution into the study area. It is unlikely that geothermal wells operating in other nearby communities affect the study area, since previous studies have found no difference in air quality of those communities from the wells.

INTRODUCTION

During the period of January through March 1987, a baseline health survey was conducted in the Kalapana community of the island of Hawaii. Kalapana is located on the Kilauea East Rift Zone on the island of Hawaii. This one of the most promising areas for geothermal energy development in Hawaii. It is a volcanically active area where natural emissions of steam, sulfur dioxide (SO₂), hydrogen sulfide (H₂S) and other gases occur continually. Geothermal development for the production of electrical energy began in 1976. Since the first geothermal production began in 1976, residents in the area have raised concerns that the H₂S released into the atmosphere from the geothermal wells may have an adverse impact on their health. In 1984 a study was conducted pertaining to the health status of residents in Puna, Hawaii (located some 10 miles from the proposed geothermal development near Kalapana) and the impact which the early wells had on the area. Two communities were studied, one (Leilani Estates) which was exposed to emissions of geothermal wells and one (Hawaii Beaches Estates) which was not exposed. It was found in that study that there were "no differences in the prevalence of self-reported acute and chronic health conditions or various measures of disability" between the exposed and unexposed areas. They did find that both communities "had relatively high rates of chronic respiratory conditions when compared to Hawaii County and State-wide rates" (R & S, 1987).

The current survey was undertaken to establish baseline measures of the health status of residents of the Kalapana community (See Figure 1). This community is downwind of the proposed geothermal development, located south and west of the Puna community (where existing geothermal wells are located). The existing wells located in Puna are assumed to have no impact on the Kalapana area.

PURPOSE AND STUDY OBJECTIVES

The purpose of this survey is to establish the health status of residents in the designated area (See Figure 1) so that a change in health status would be measurable in the event ambient air quality is impacted from geothermal resource development. The information obtained in this survey can be compared with follow-up surveys which may be conducted in the future in order to determine if there has been a change in the health status of the residents. An evaluation of the health status of residents of the Kalapana area can be made by comparisons with both Hawaii County and the entire State.

METHODS AND PROCEDURES

A community wide door-to-door survey of residents of Kalapana, that is those currently residing within the study area as depicted in Illustration A, was designed. Because of the small size of the community, it was decided that all residents should be contacted, rather than a sample. There were three phases of the study. First, there was an updating of existing maps and lists of households in the study area, as maintained by the Health Surveillance Program. Second, there was ambient air monitoring in order to measure the amounts of H₂S in the atmosphere, atmospheric radiation and the velocity and direction of wind in the study area during the time of the survey. Third, the door-to-door personal interview conducted with all residents of the Kalapana community (study area). The first phase began in January 1987 and continued until the end of March 1987. The second phase began during the second week of March 1987 and continued through the first week of April 1987. The third phase began in April and continued through May 1987.

Phase One: Updating of Maps and Lists

It was necessary to update the maps and lists of the study area because the existing maps and lists had not been updated for four years prior to the study and there had been a number of changes occurring in the area during that time. There had been some fifty homes destroyed by recent volcanic activity in the area, and some roadways had changed as a result. Also, there had been some new home construction in the areas more distant from the volcanic activity. It was found that there were 315 households in the Kalapana area at the time of the study. The study area was defined as Census Tract number 211, Segments one, four and five. Segment one contains some two dozen residences in the Kaohe Homesteads located on the slopes of Kilauea approximately three miles south-west of Pahoa town. Segment five connects with Segment four on the west and is located in a lower elevation stretching to the sea approximately five miles south of Pahoa town, bordering Opihikao road on the north east and Black Sands Beach on the south west. Segment five has about one third of the residences in the total study area. Segment four connects with Segment one on the north and Segment five on the east and includes the town of Kalapana and continues into Volcanoes National Park on the west and north. Segment four has over half of the residences in the study area and has been the scene of considerable volcanic activity in recent years. (See map of the study area in Figure 1)

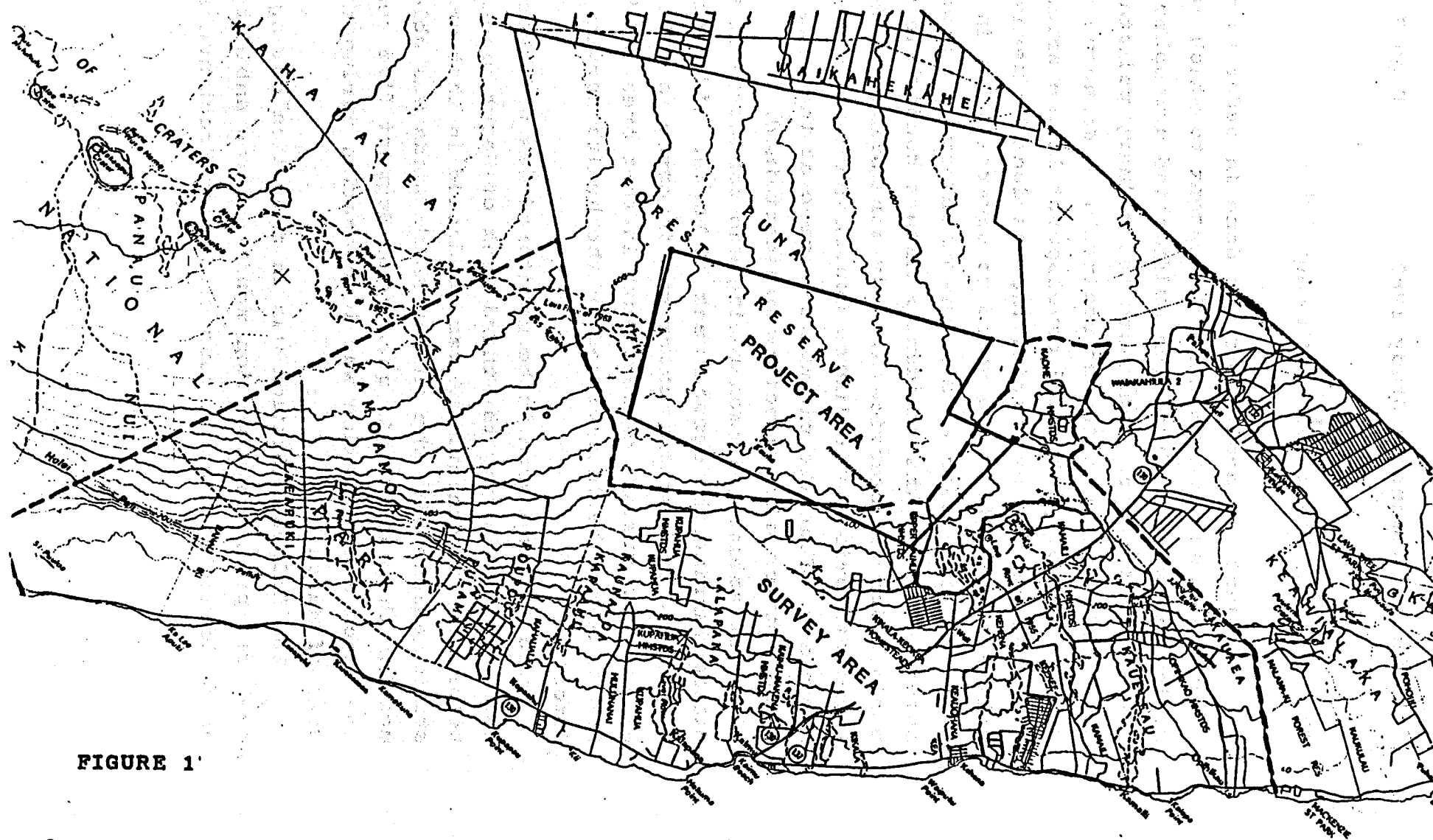


FIGURE 1

Phase Two: Ambient Air Monitoring

Ambient air monitoring was done in order to measure ambient air quality, meaning the extent to which specific air pollutants such as hydrogen sulfide and atmospheric radon are present in the air. These are the primary pollutants which affect the health status of residents in Kalapana which may be contributed by geothermal development in the area.

The ambient air monitoring was done by means of mobile units which were moved to several sites in the Kalapana area prior to the time of interview. Since the survey obtained the resident's illness conditions during the month prior to interview, the air monitoring was done during the month prior to the dates households were scheduled for interview. Thus the air was measured at the same time the health status of residents was ascertained.

The ambient air monitoring was conducted at the Kaohe Station during the second week of March. This station was positioned in Segment number one in order to monitor the ambient air quality of residents in that area. This was the first area to be interviewed in the health survey one month later.

The second area to be monitored was Opihikao, which was measured during the third week of March, one month before the health survey was conducted in that area. This station, along with the one at Black Sands was able to monitor the ambient air quality of Segment five residents. The Black Sands Station was in operation during the fourth week of March.

The Kalapana Station was in operation during the first week of April. This station monitored the ambient air quality of residents in Segment four of Census Tract number 211.

Health Interview Survey

The survey was accomplished by means of the standard Hawaii Health Interview Survey questionnaire. This questionnaire was designed after the National Health Interview Survey questionnaire and has been in use since the late 1960's by the Health Surveillance Program (NCHS, 1975).

The Health Surveillance Program conducts a sample survey across the State and produces estimates of the incidence and prevalence of self-reported acute and chronic illnesses, as well as associated measures of disability and restricted activity for each of the Counties and for the State of Hawaii as a whole (R & S, 1986).

This was seen as an excellent vehicle for measurement of the health status of the Kalapana community, since it would enable a comparison of current health status of the study area residents with residents both of Hawaii County and of the State at approximately the same time. In addition, since the Health Surveillance Program is an ongoing survey, it will be possible to measure changes in health status of residents in the study area at any designated time in the future, and again make a similar comparison with residents of Hawaii County and of the State at that time.

Health Status is defined for purposes of this survey as the incidence of self-reported acute illness, the prevalence of self-reported chronic conditions and disabilities, the extent of restricted activity due to illness, the number of hospitalizations and hospital nights, the number of work loss and school loss days and the number of days spent in bed during 1986-87, the twelve month period preceding the date of interview. In addition to these health related measures, the various socio-demographic characteristics of the community residents were also obtained.

RESULTS

Health Interview Survey

Some 259 of the 315 households in the Kalapana community were interviewed, meaning 82% of the households cooperated in the study. This is similar to the completion rate of the Health Surveillance Survey statewide. There were some 676 persons represented in the 259 households which were studied, giving an average of some 2.6 persons per household in the Kalapana community, compared to 2.5 persons per household in Hawaii County. This is slightly lower than the number of persons estimated per household for the State (about 3 persons per household). (See Table 2H)

Demographic and Social Characteristics

Table 2 shows the comparison of demographic characteristics of residents of Kalapana with Hawaii County and the State. In Kalapana there are fewer persons age 45 and over compared with Hawaii County and with the State. There is a larger proportion of residents of Kalapana in the mid-adult ages between 25 and 44 as compared to the County of Hawaii and the State. The average age of Kalapana residents is 29.3 years compared to 43.2 years for Hawaii County and 41.2 years for the State. (Figure 2) The ethnic distribution in Kalapana is substantially different from that of Hawaii County and the State. Some 59% of residents of Kalapana are Caucasian, compared to 23.8% of Hawaii County and 24.6% for the State. Japanese, Filipinos and Chinese are substantially under-represented in Kalapana when compared with the County and the State. Hawaiians and "Other/Mixed/Unknown" are more comparable to their proportional representation in the County and the State. This

is, no doubt, a result of considerable in-migration of Caucasians primarily from the Mainland U.S. and from other areas of the State to the Kalapana area. (Figure 3)

Table 2K shows only 30% of Kalapana residents were born in Hawaii County, with 10% born elsewhere in Hawaii. Some 50% were born in the Mainland U.S. (Figure 4) Fifty four percent of Kalapana residents age 18+ have lived there less than ten years, compared to 10% in Hawaii County and 22% for the State. (Table 2J and Figure 5)

A slightly lower percentage of Kalapana residents age 18 and over are working (47%) than are Hawaii County residents (57%), both of which are lower than the State percentage (66%). (Table 2E and Figure 6)

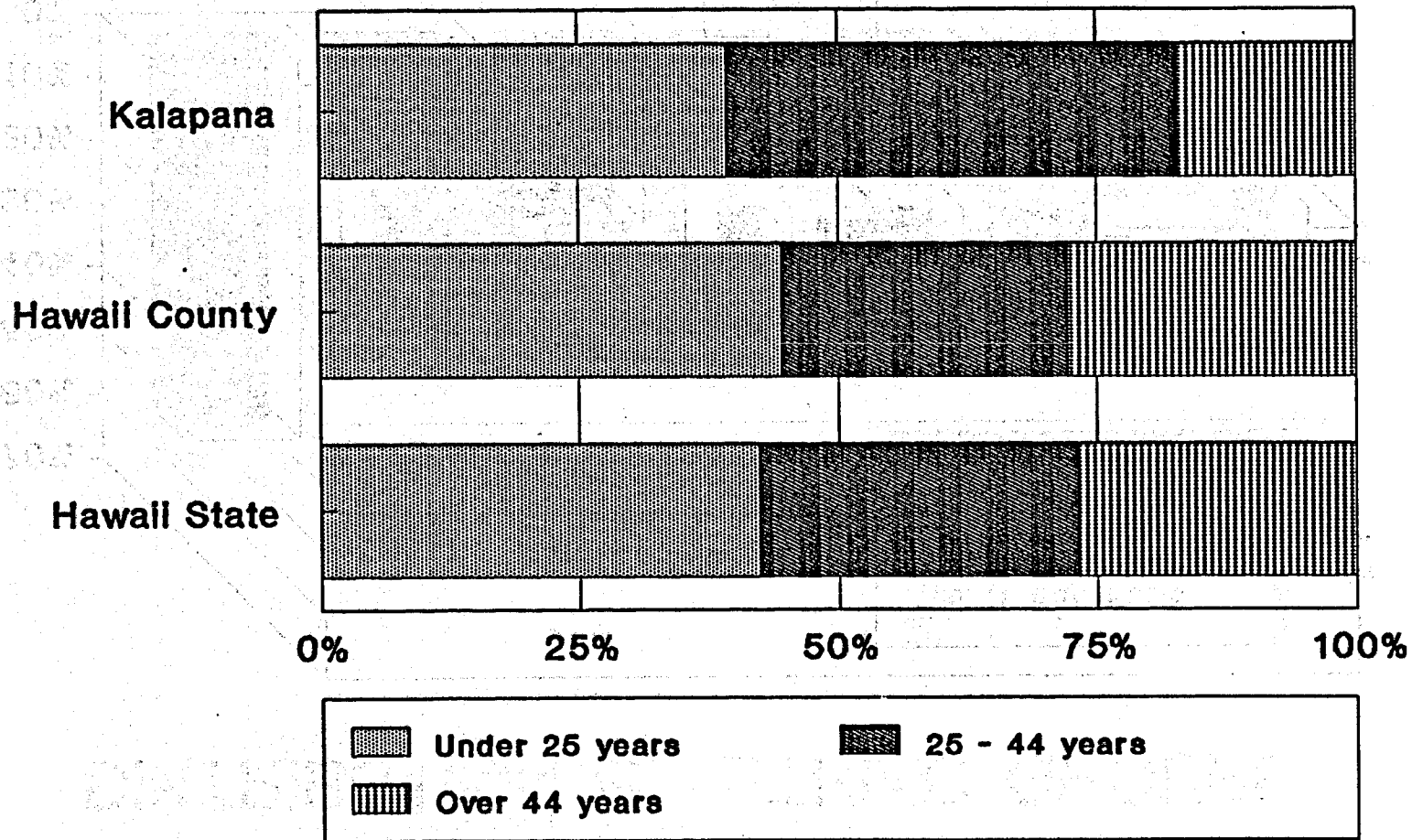
Kalapana residents are over-represented in agricultural and construction occupations and under-represented in service occupations compared to residents in other areas of Hawaii County and the State. (Tables 2L, 2M)

A larger proportion of Kalapana residents (27%) have family incomes under \$10,000 per year than residents of Hawaii County (12%) or the State (6%). (Table 2G) The median family income for Kalapana families is \$15,978 compared to \$17,333 for Hawaii County and \$26,971 for the State. When considering family income and the number of persons in a family the percentage of families who have a poverty level income in Kalapana is 26.7%. This compares to 8.1% for Hawaii County and 6.5% for the State. (Table 2H and Figure 7)

Kalapana residents have higher levels of completed education than are found in the County of Hawaii. Some 44% of Kalapana residents have gone to college with 16% graduating. In Hawaii County only 20% have gone to college and 10% graduated from college. The State has some 42% having gone to college with 18% graduating. (Figure 8)

Based upon the above description of demographic and social characteristics alone, one would not expect the health status of Kalapana's residents to be worse than other residents in Hawaii County or the State. Generally, since the age of Kalapana's residents is younger than the County and the State, prevalence of chronic conditions, which are generally much higher among the elderly, might even be expected to be lower than for the County and the State. Thus, it might be expected that Kalapana's health status might be better than the County. The predominance of Caucasians and in-migrants from the Mainland U.S. and other areas of the state would lead one to expect Kalapana residents' health status to be closer to that of the State or the Mainland U.S. than that of the Hawaii County residents. The following discussion will compare the health status of Kalapana with that of Hawaii County and the State.

AGE DISTRIBUTION

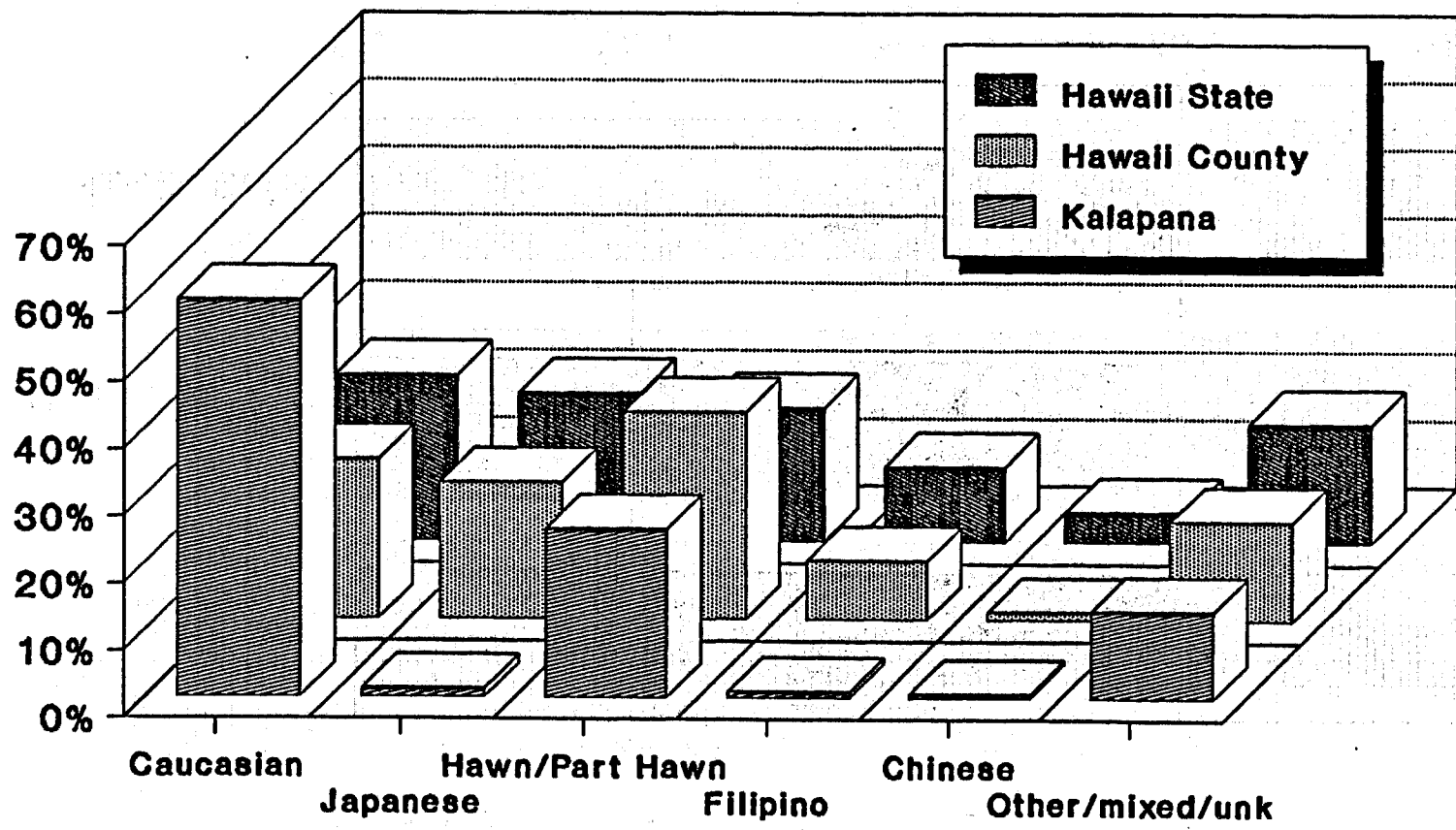


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 2

ETHNICITY

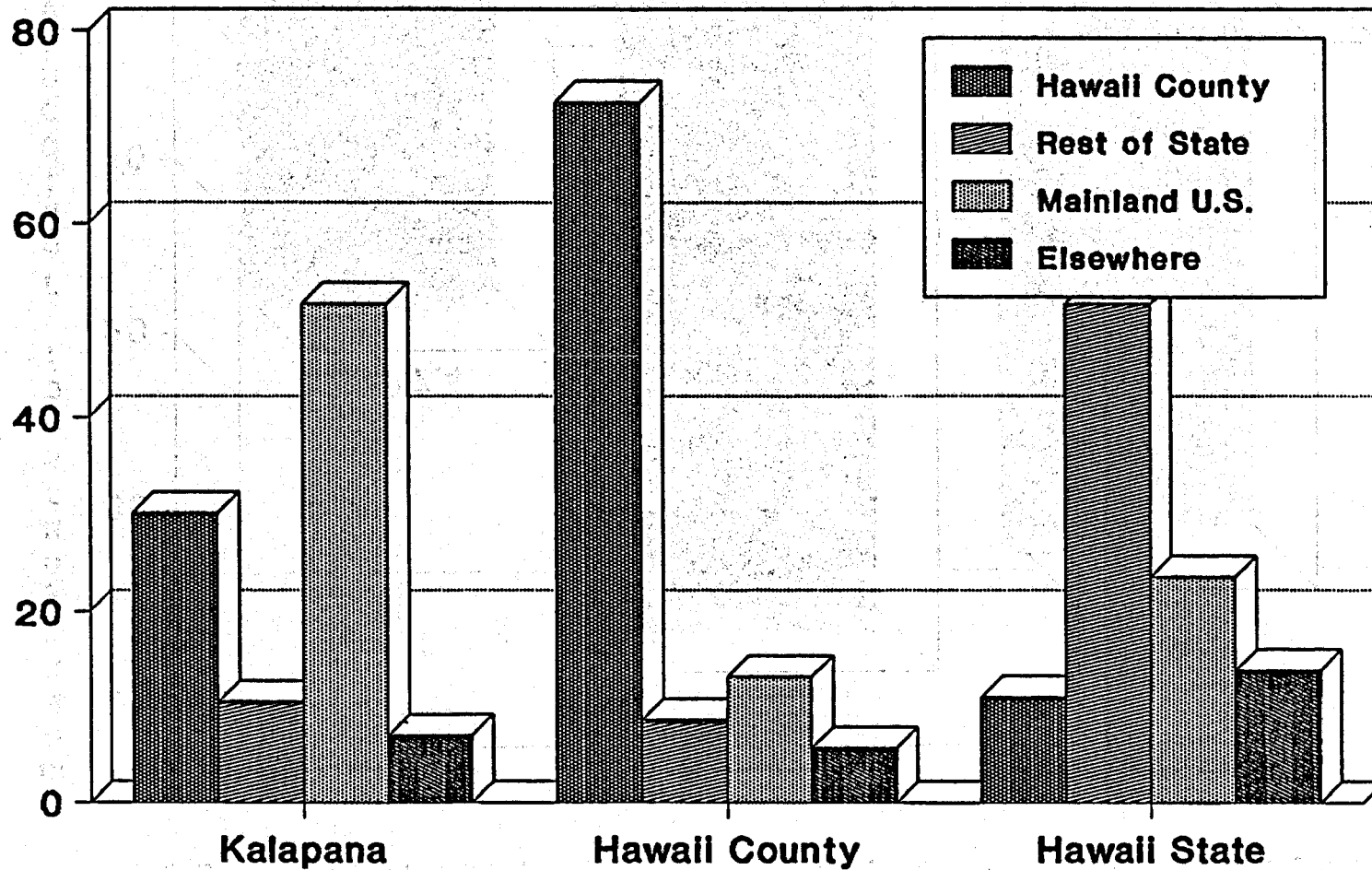
DISTRIBUTION OF ETHNIC GROUPS



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 3

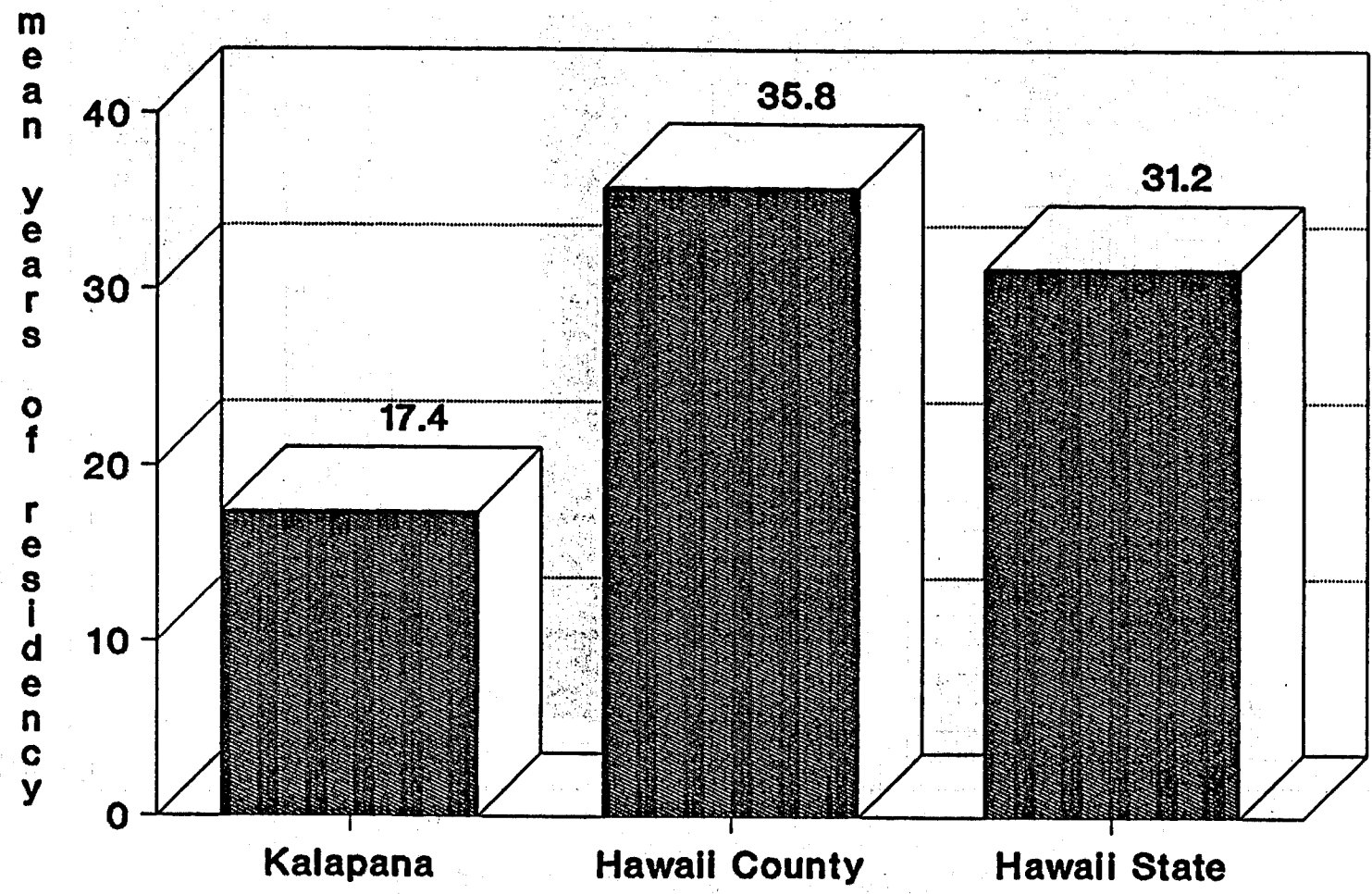
Place of Birth



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 4

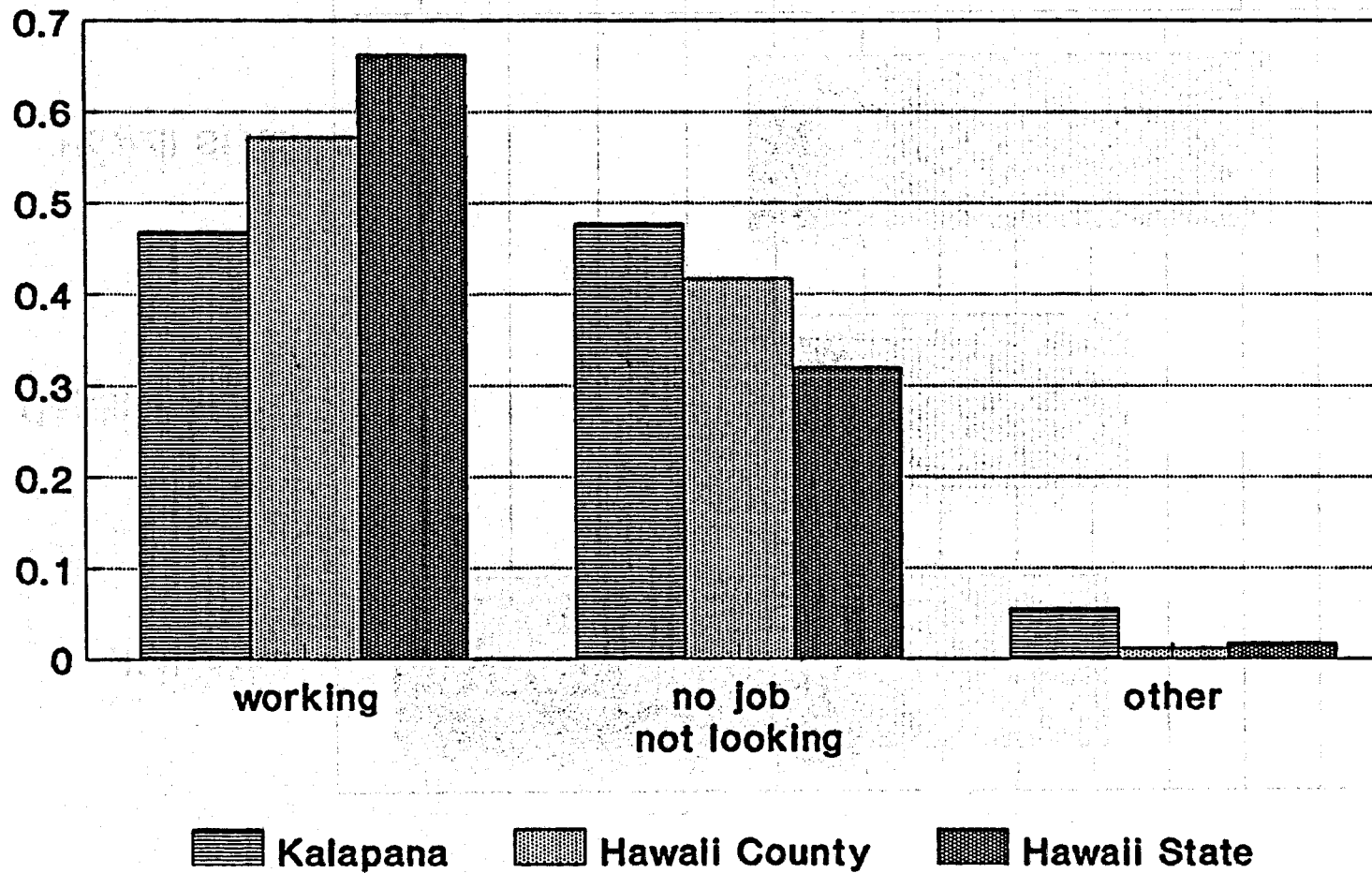
Length of Residency in Hawaii



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 5

Employment

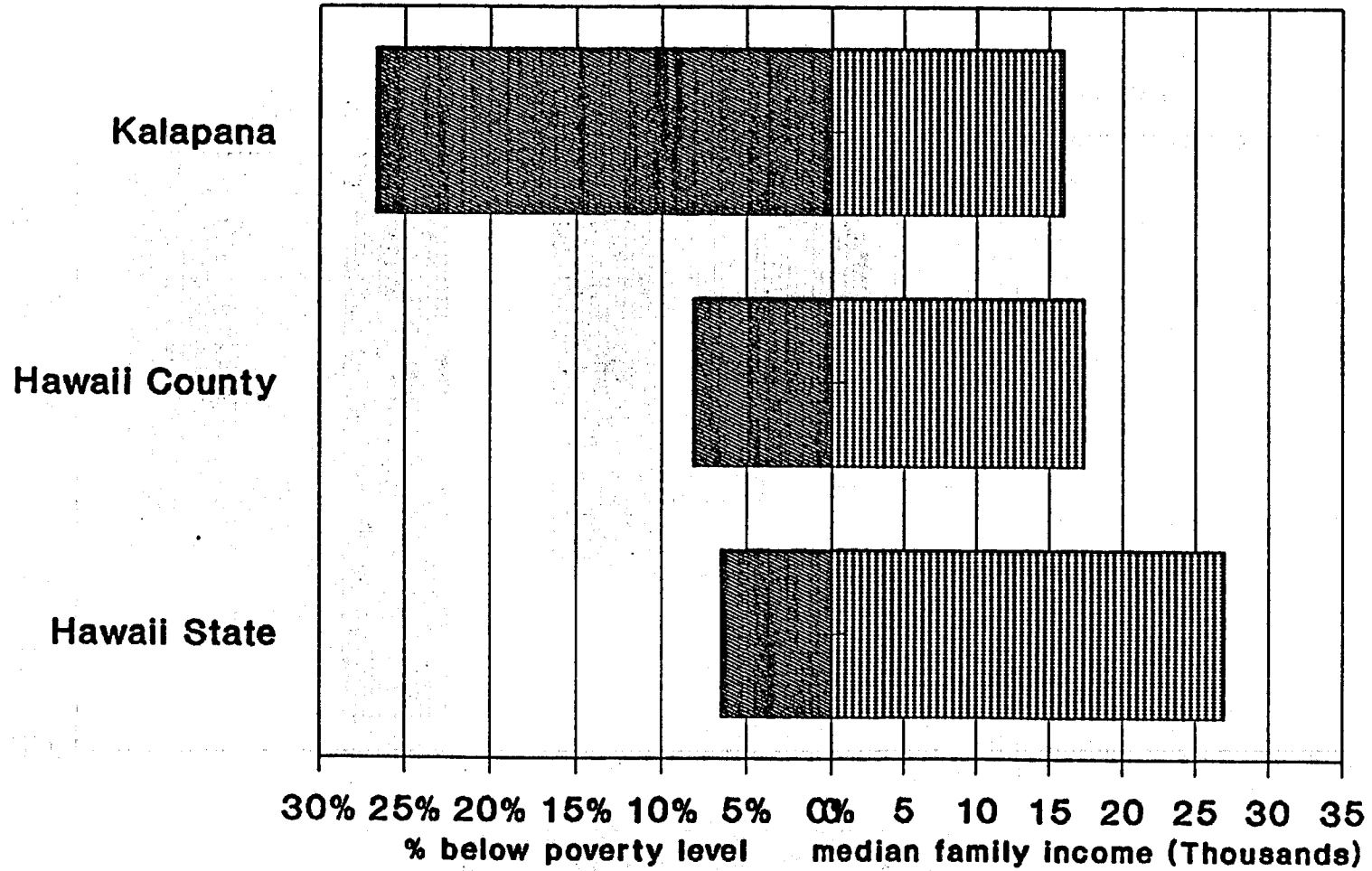


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 6

61

Family Income



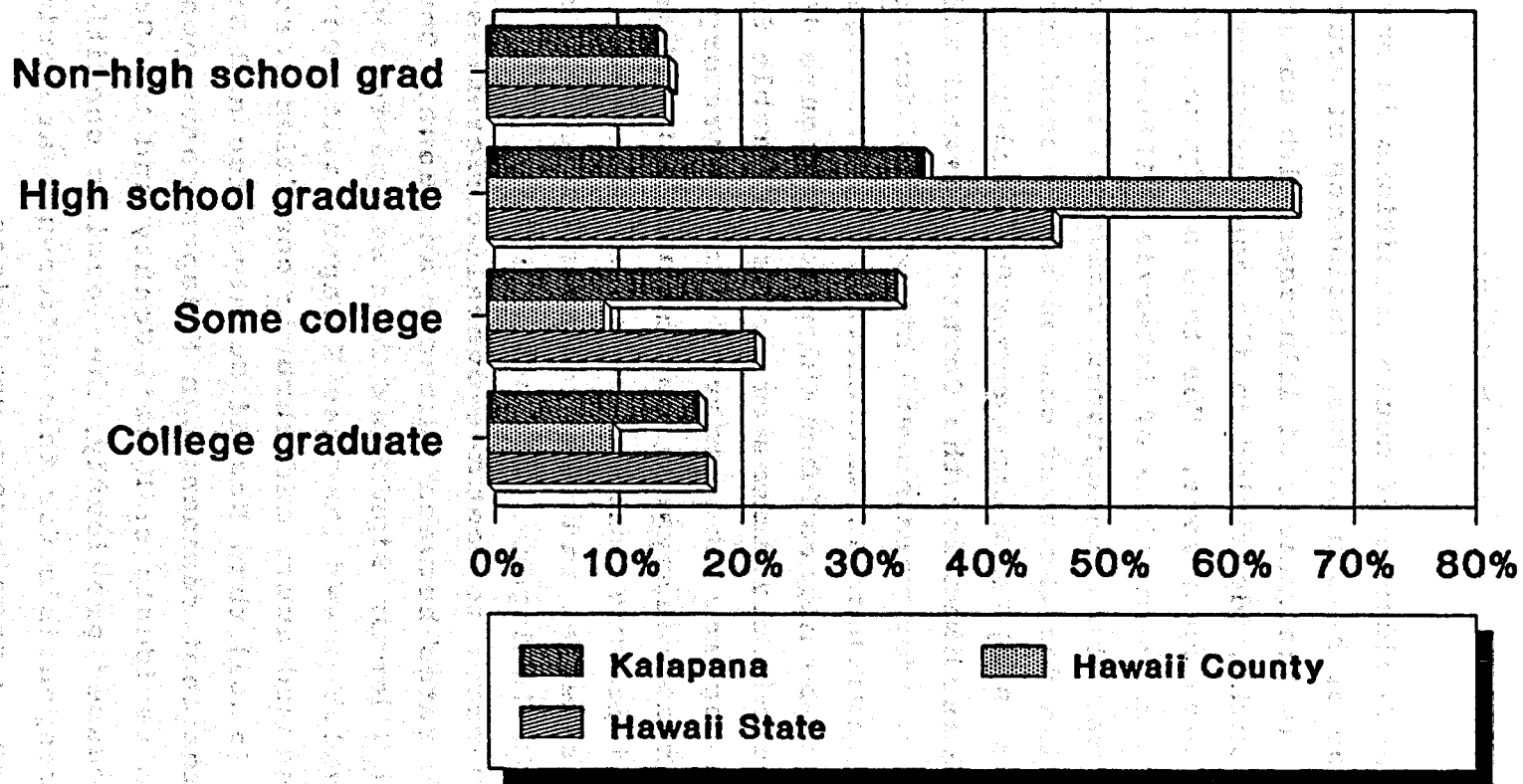
Source: Health Surveillance Program
Hawaii State Dept. Of Health

NOTE: 1986 Poverty level is \$10,690 per 3 person family plus \$2,190 per person/year.

Figure 7

Education

Adult population (18 and over)



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 8

Health Status

The incidence of acute conditions is one important indicator of health status. Incidence of acute conditions is defined as the number of illnesses with onset during the past three months, identified in the population over a specific time period such as a year. For this study the time period is the year prior to the date of interview, 1986-87. Table 5A illustrates the age-adjusted incidence rates per hundred population for the most common acute conditions. (Figures 9-1 and 9-2) Kalapana rates for respiratory conditions are much higher than for the County of Hawaii and for the State. Also, rates for sprains and strains and for acute diseases of the ear, musculoskeletal, circulatory and digestive diseases appear to be highest for Kalapana. (Figure 10)

Chronic conditions are shown in Table 5B. Rates for Kalapana appear to be higher for respiratory conditions, such as bronchitis, emphysema, asthma and sinusitis. In addition, chronic digestive conditions, kidney disease, arthritis, musculoskeletal and infective/parasitic diseases appear to be highest in Kalapana. (Figures 11-14)

In order to test the overall differences in acute and chronic rates between Kalapana and Hawaii County and the State a Wilcoxin Sign Rank Test was performed (Snedecor, 1978) which shows that the Kalapana rates per 1000 of age-adjusted acute and chronic conditions are significantly higher ($p < .01$) than Hawaii County rates and State rates. This indicates that residents in Kalapana have poorer health status than do residents of Hawaii County and the State of Hawaii. As discussed previously, the specific conditions which appear to be responsible for this difference are primarily the acute and chronic respiratory conditions.

In spite of the overall higher levels of acute and chronic conditions in Kalapana, there are some specific acute and chronic conditions which have the same or lower prevalence in Kalapana than in Hawaii County or the State as a whole. For example, malignant neoplasms, heart disease and peptic ulcers are at about the same level in Kalapana as for Hawaii County and for the State. Hypertension, benign neoplasms, thyroid disease, cerebrovascular disease and hearing impairments are less prevalent in Kalapana than in Hawaii County or the State. (Table 5B)

In addition to a consideration of the incidence and prevalence of acute and chronic illnesses, other important indicators of health status have to do with measures of impact of illness. These measures of impact include such measures as limitation of activity due to illness. Persons can be measured in terms of their self-reported ability to engage in their usual activities, whether they be working, housekeeping or going to school. Severe activity limitation is defined as limitation which prohibits the person from engaging in his or her usual activity at all. Moderate activity limitation is defined as limitation due to illness which allows the person to engage in their usual activity but restricts the amount or kind of that participation. Slight limitation is defined as some limitation but doesn't prohibit the amount or kind of participation (NCHS, Series 10, No 160, pp.138,139).

Table 3A illustrates the extent of activity limitation on residents of Kalapana and compares them with residents of Hawaii County and the State. It can be seen, that regardless of which area one considers, the older ages tend to have higher percentages of overall activity limitation, with higher percentages having severe limitation of activity. Males appear to have higher activity limitation than females. Caucasians and Hawaiians have higher percentages in the more severe

levels of activity limitation than do other groups. These same patterns hold for both Kalapana and Hawaii County. Both of these areas have about the same magnitude of activity limitation. The State has somewhat lower activity limitation overall, with lower percentages in the higher levels of limitation than does Kalapana and Hawaii County. This would not be expected since the population in Kalapana and in Hawaii County is somewhat younger than the State average age, and age is an important factor in activity limitation.

An additional indicator of health status is restricted activity. This is defined as the number of days one must remain home from work or school or must stay in bed all or most of a day due to illness or injury (NCHS, Series 10, No. 160, p.139). Again, as with activity limitation, this is a measure of the impact of illness, and where the incidence and/or prevalence of illness is higher one would expect that the impact would be greater.

Table 4 illustrates the amount of restricted activity for Kalapana compared with Hawaii County and the State. As with activity limitation, males have higher numbers of days of restricted activity than females and older people have higher numbers of days than younger people. This is due primarily to the fact that males have more chronic and acute illnesses and older people tend to have more chronic illnesses than do younger people.

In comparing Kalapana with Hawaii County and the State, as expected, Kalapana has much higher levels of restricted activity. Comparisons by age, sex, race, years in Hawaii and place of birth show similar patterns with those found when looking at activity limitations and levels of morbidity. (Table 4A-D and Figures 15 and 16)

24

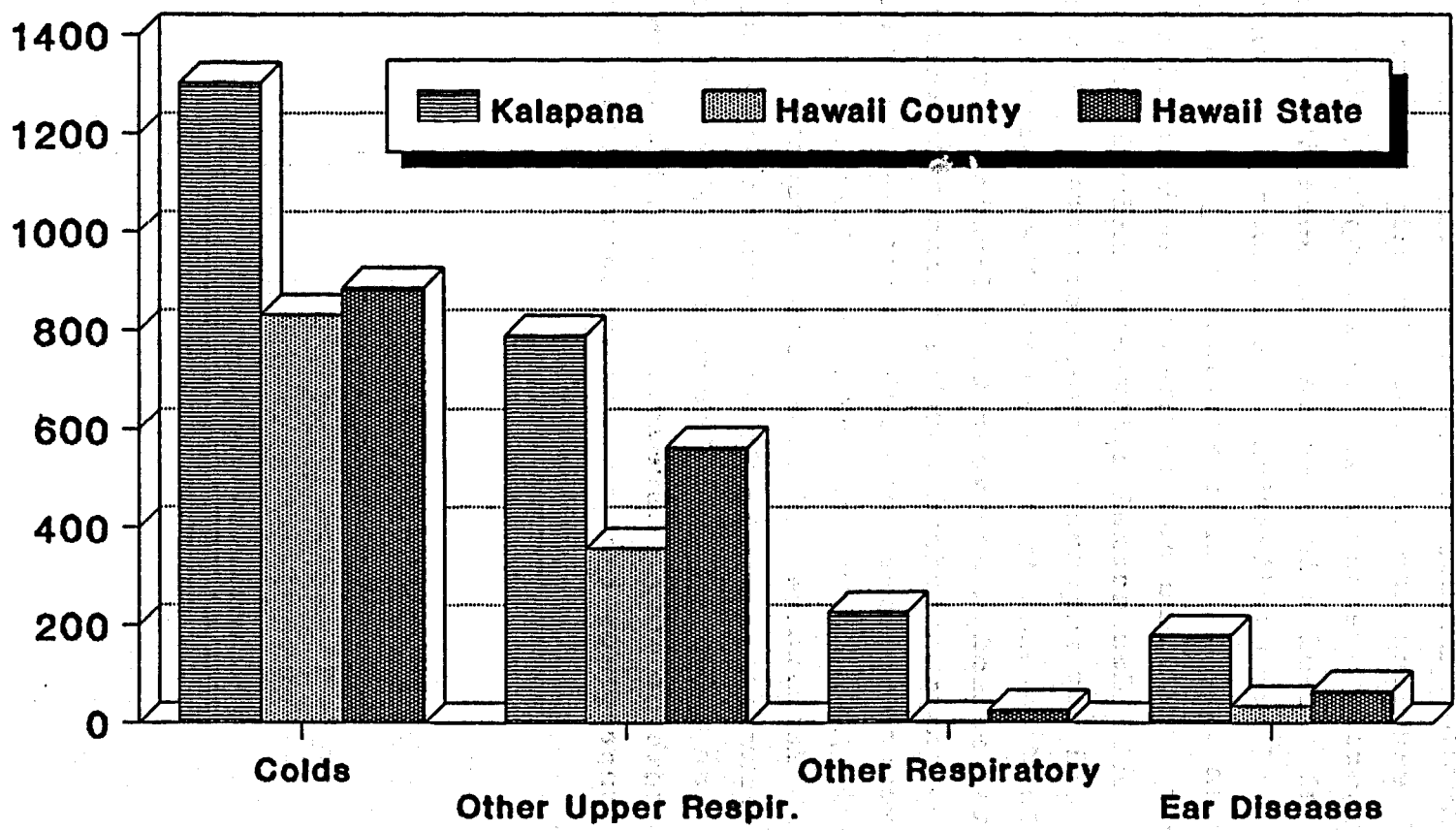
Another measure of health status is the extent to which health services are utilized. Usually the most severe illnesses and injuries are cared for in a hospital, thus the number of hospital episodes is a measure of severity of illness. The number of hospitalizations and number of hospital nights are shown in Table 4. This excludes long term hospital stays where persons are not counted as members of the household and it excludes normal deliveries and visits to a hospital which did not require an overnight stay. (Figure 17)

In Kalapana, it can be seen that males have fewer hospital episodes per year than females. But males stay longer for each episode, which means that their illnesses, are more severe, or have progressed further than those of females. Generally, males are admitted more frequently at older ages, whereas females are admitted most frequently during their child bearing years. Kalapana compares favorably with Hawaii County and the State, with similar numbers of hospitalizations and lengths of stay. However, males in Kalapana appear to have longer stays than males in Hawaii County or in the State.

20

Selected Acute Conditions

Age-adjusted rates per 1,000 population

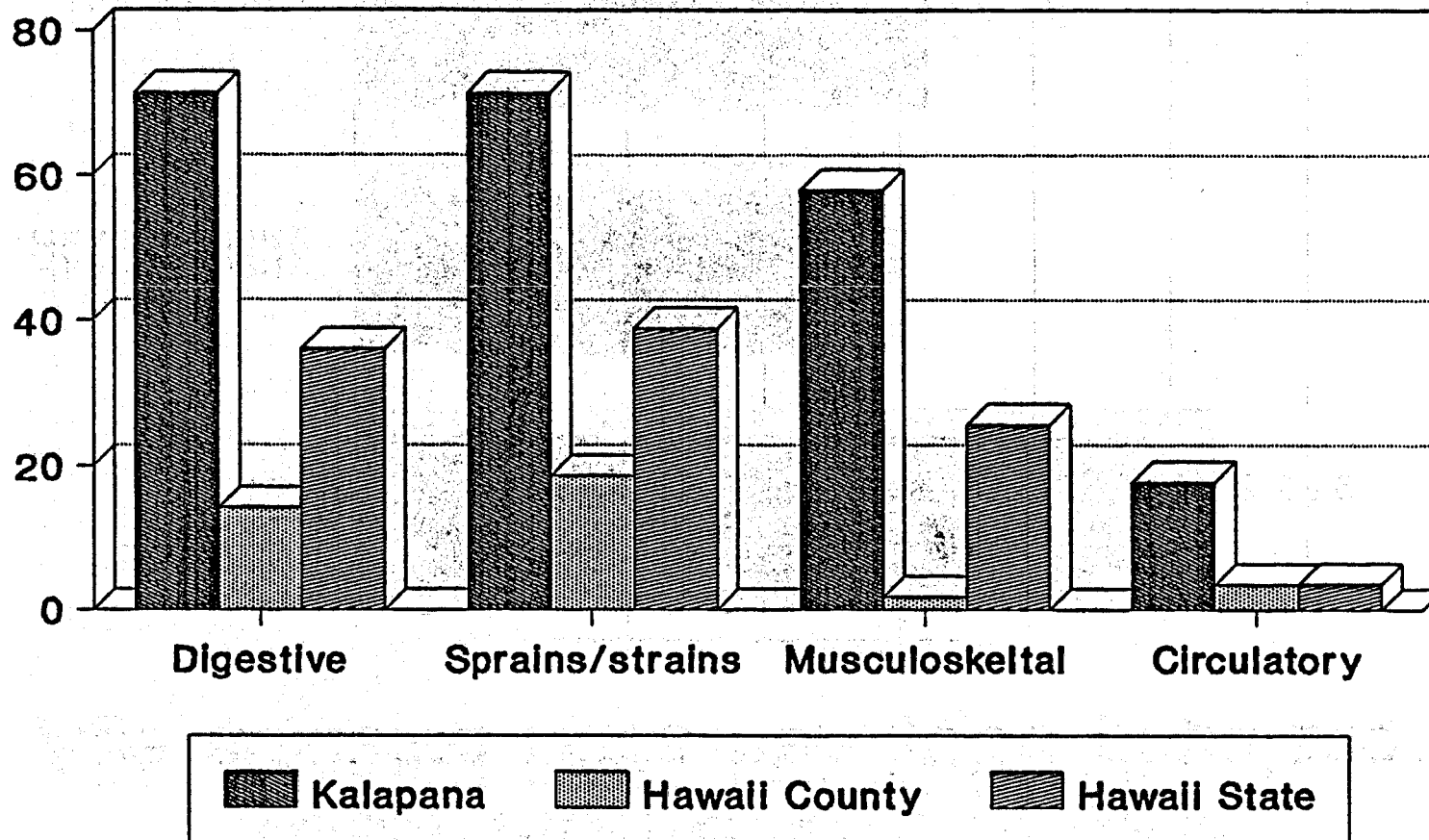


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 9-1

Selected Acute Conditions #2

Rate per 1,000 population



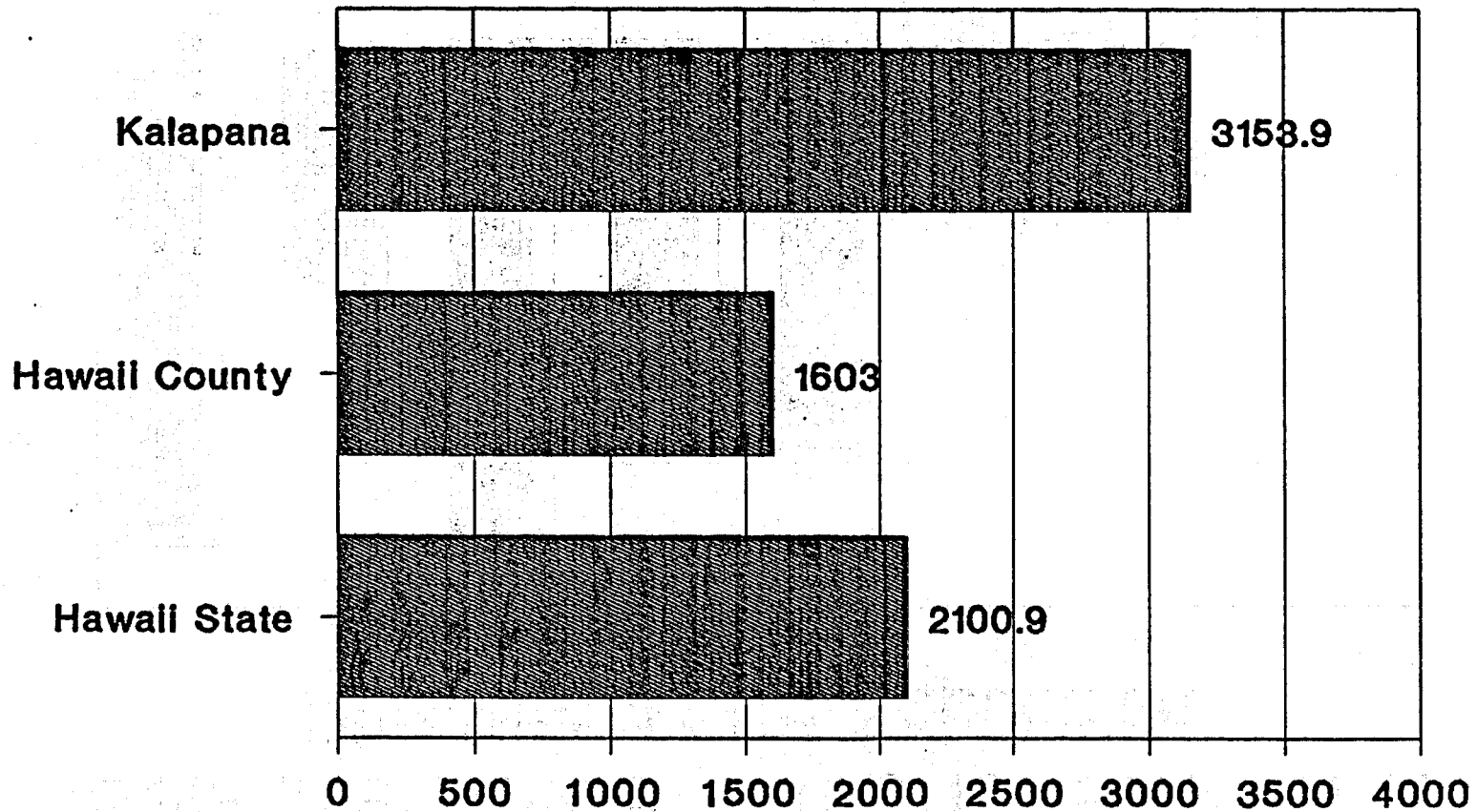
Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 9-2

427

Total Acute Conditions

Age adjusted rates per 1,000 population

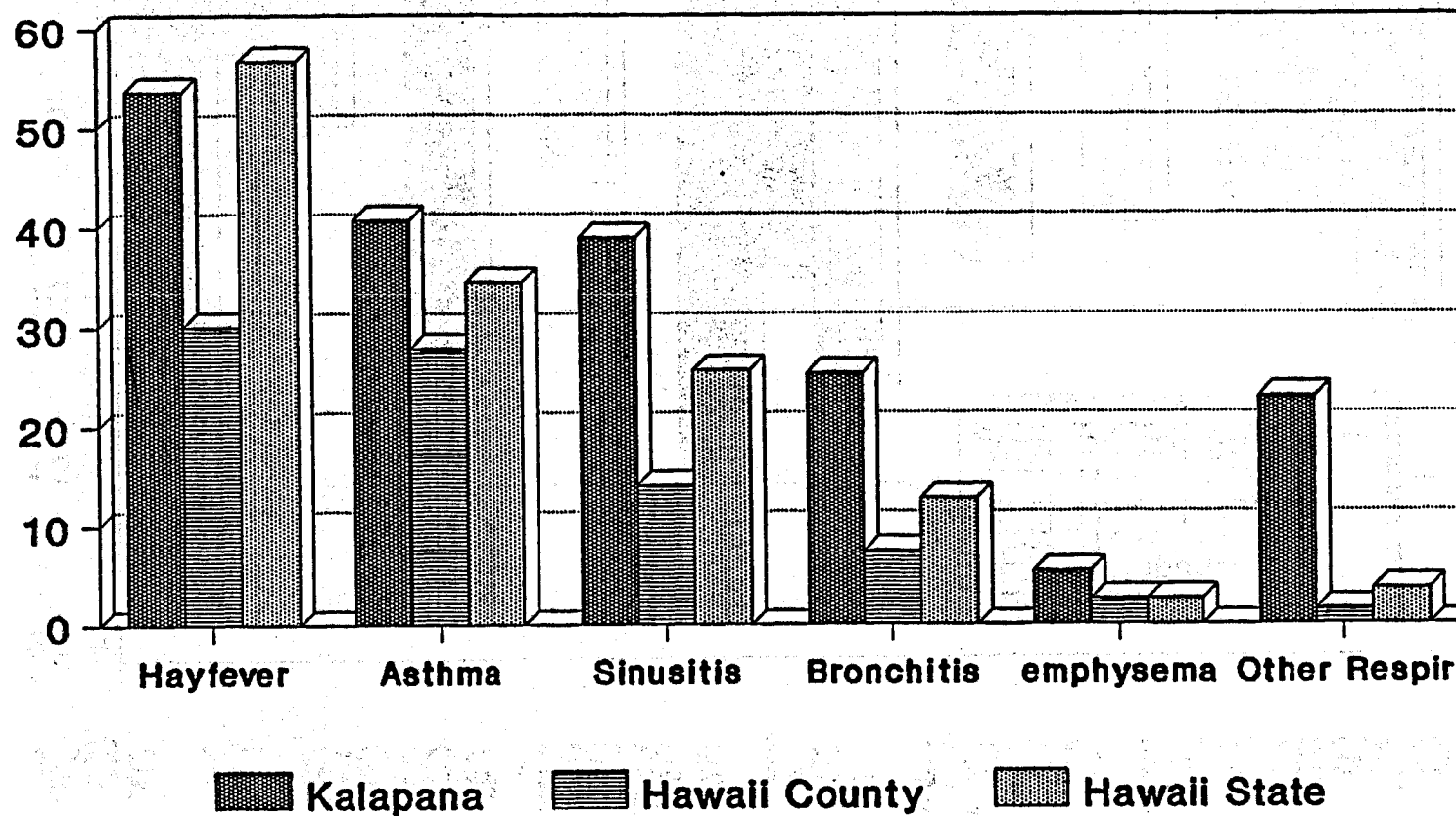


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 10

Chronic Respiratory Conditions

Age adjusted rates per 1,000 population



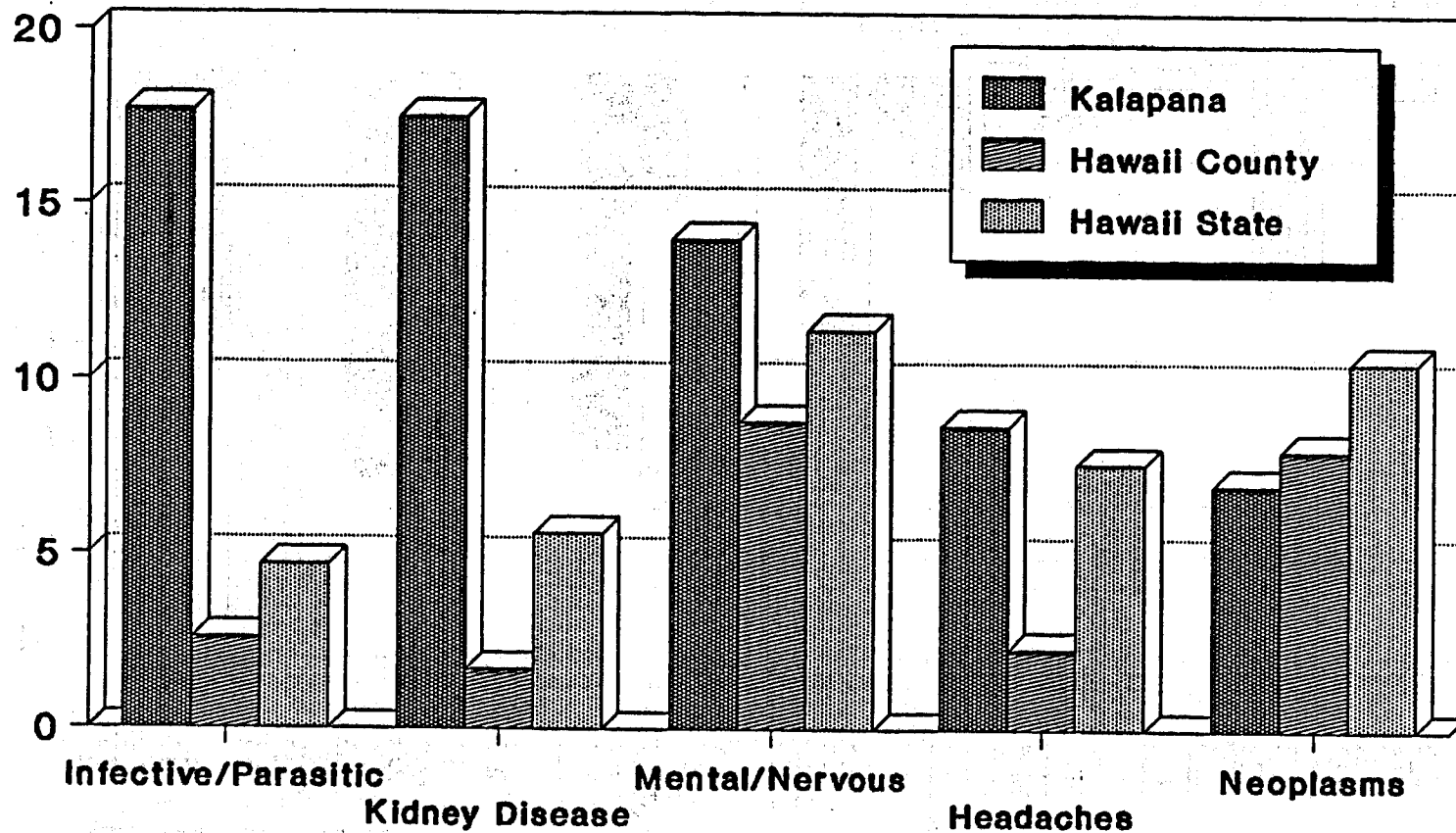
Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 11

067

Selected Chronic Conditions

Age Adjusted Rates per 1,000 Population

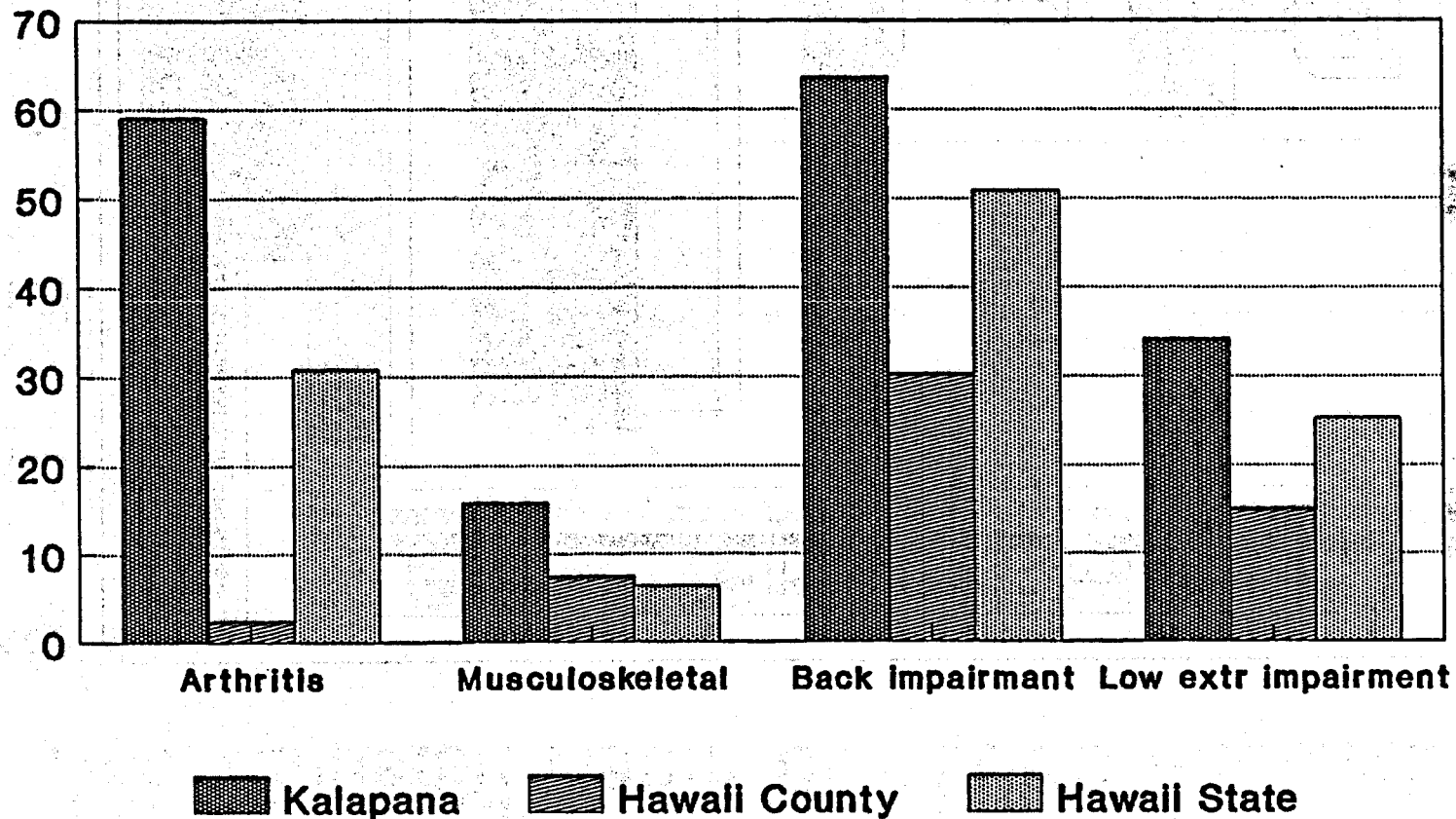


Source: Hawaii Surveillance Program
Hawaii State Dept. of Health

Figure 12-1

Selected Chronic conditions

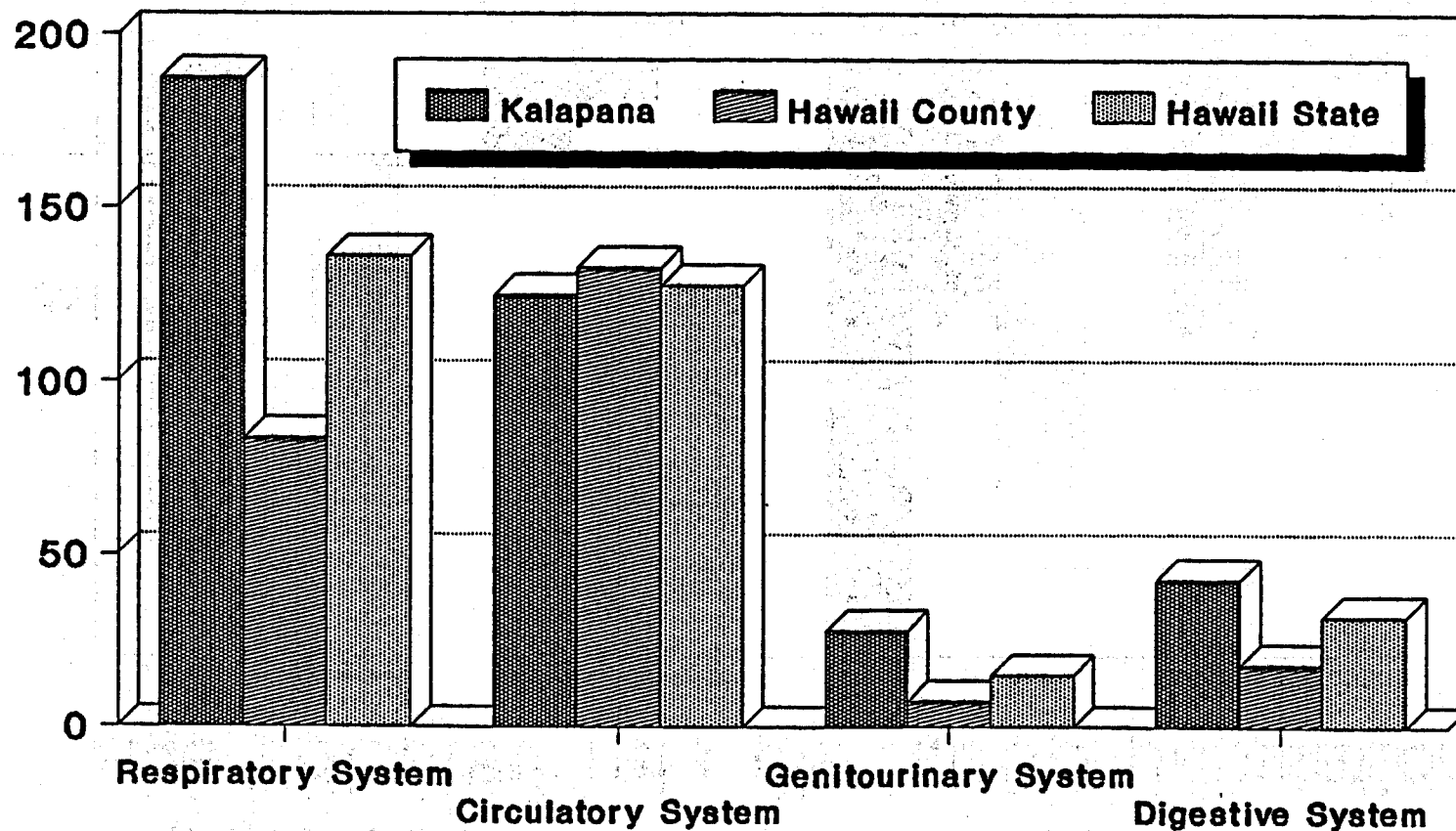
Age adjusted rate per 1,000 population



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 12-2

Aggregated Chronic Conditions Age Adjusted Rates per 1,000 Population



Source: Health Surveillance Program
Hawaii State Dept. of Health

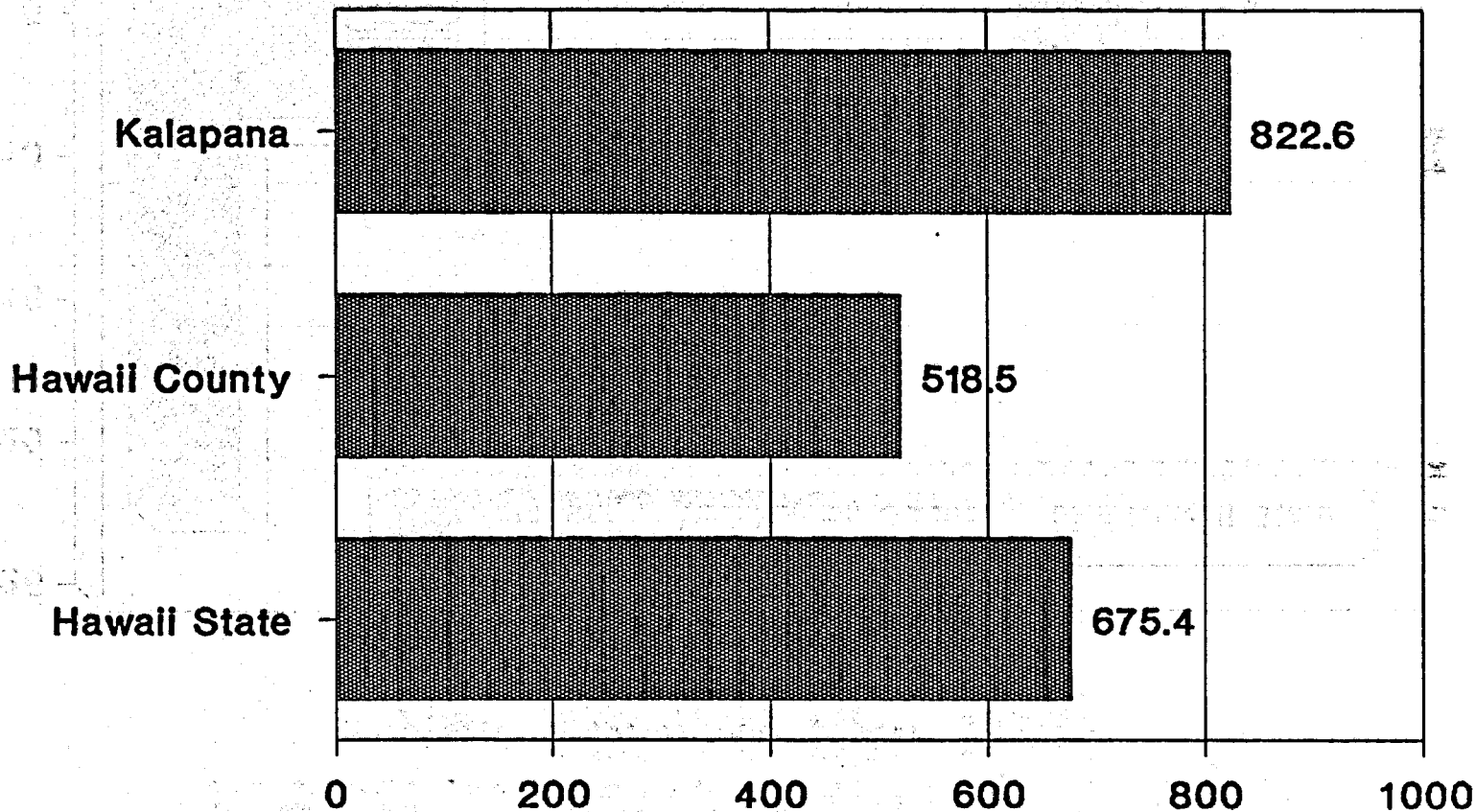
Figure 13

1970-1971 DEPT. OF HEALTH
STATISTICS

Figure 12

Total Chronic Conditions

Age adjusted Rates per 1,000 population

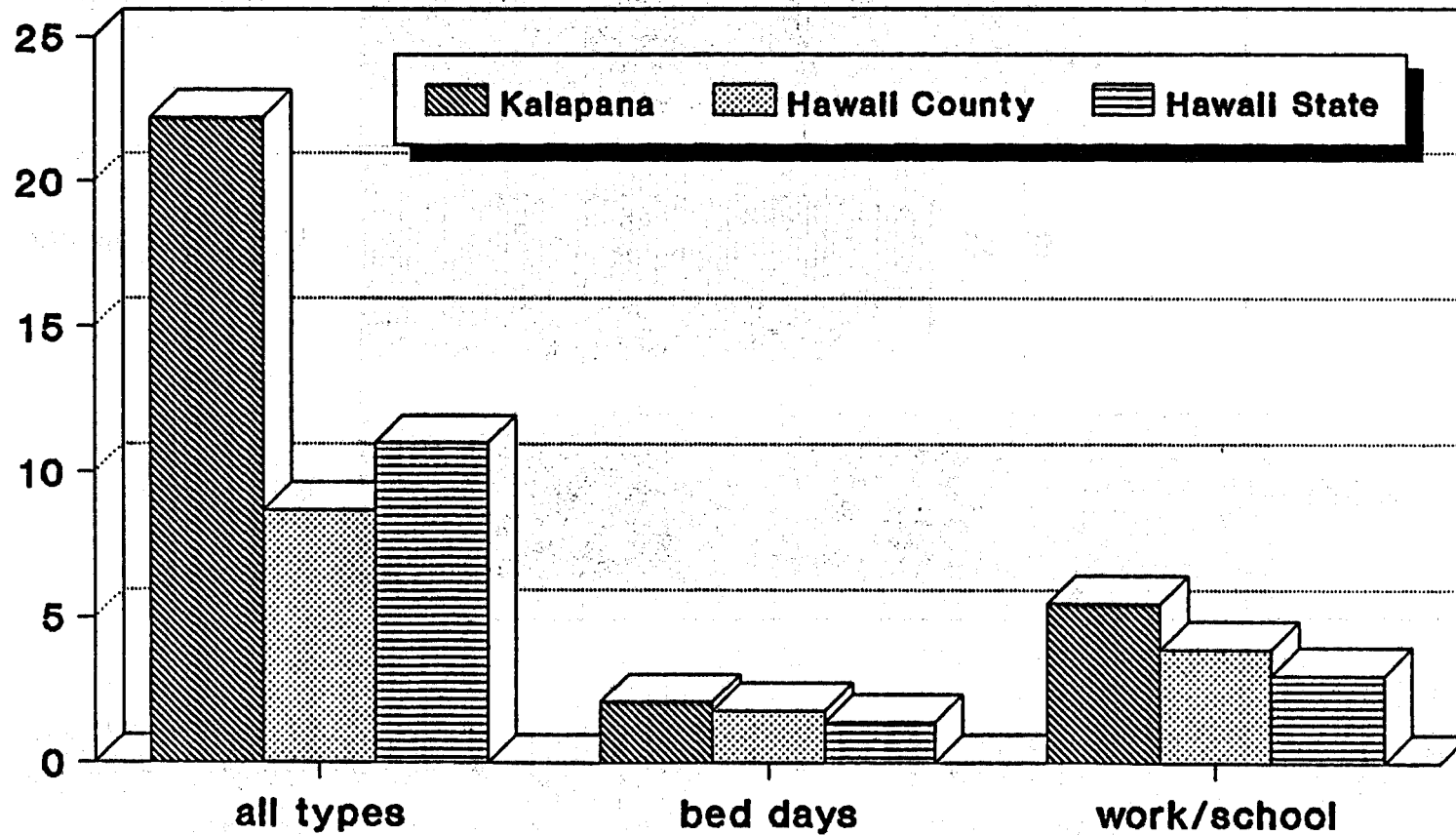


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 14

914

Restricted Activity Days per person per year

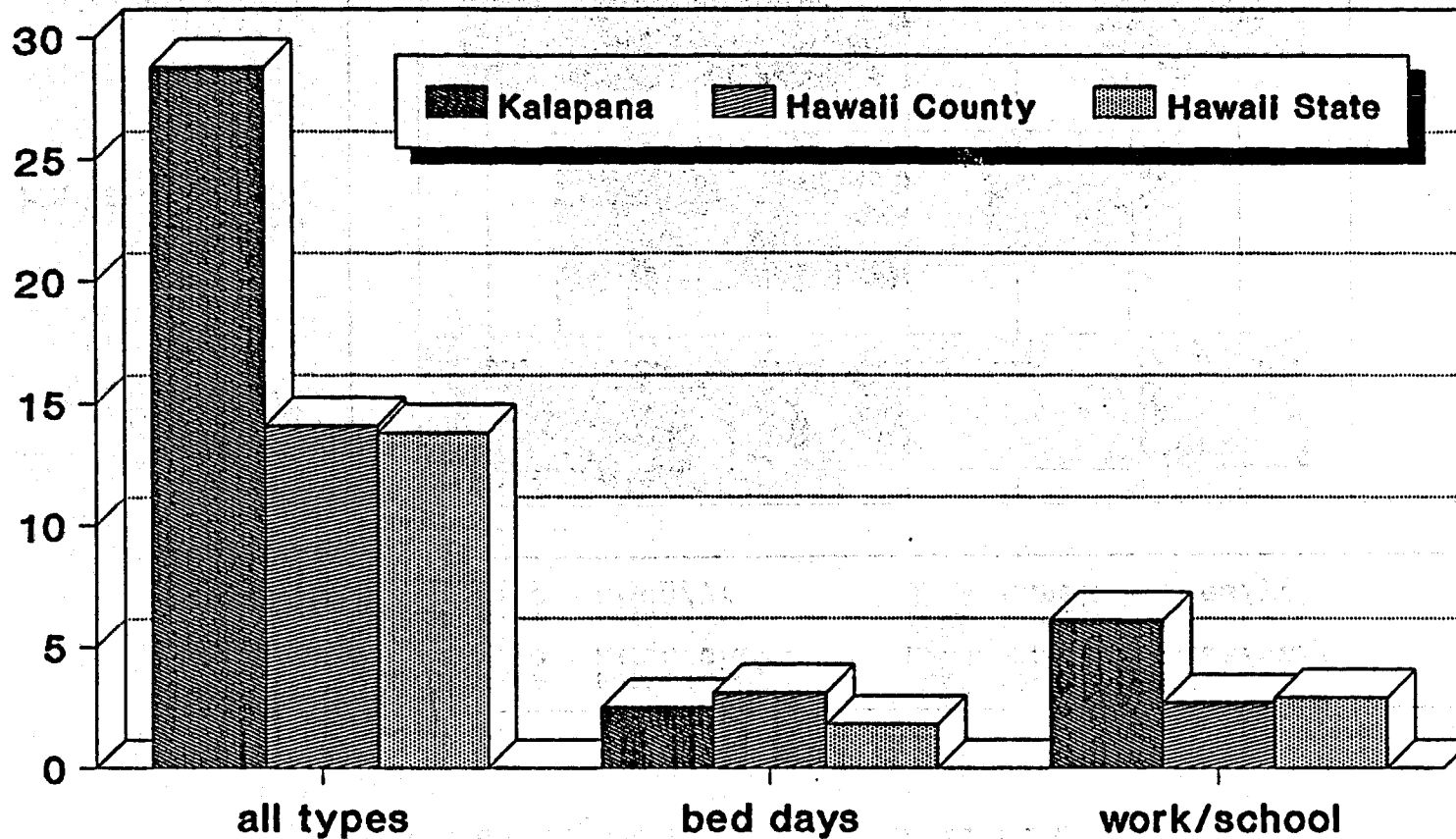


Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 15

Restricted Activity Days

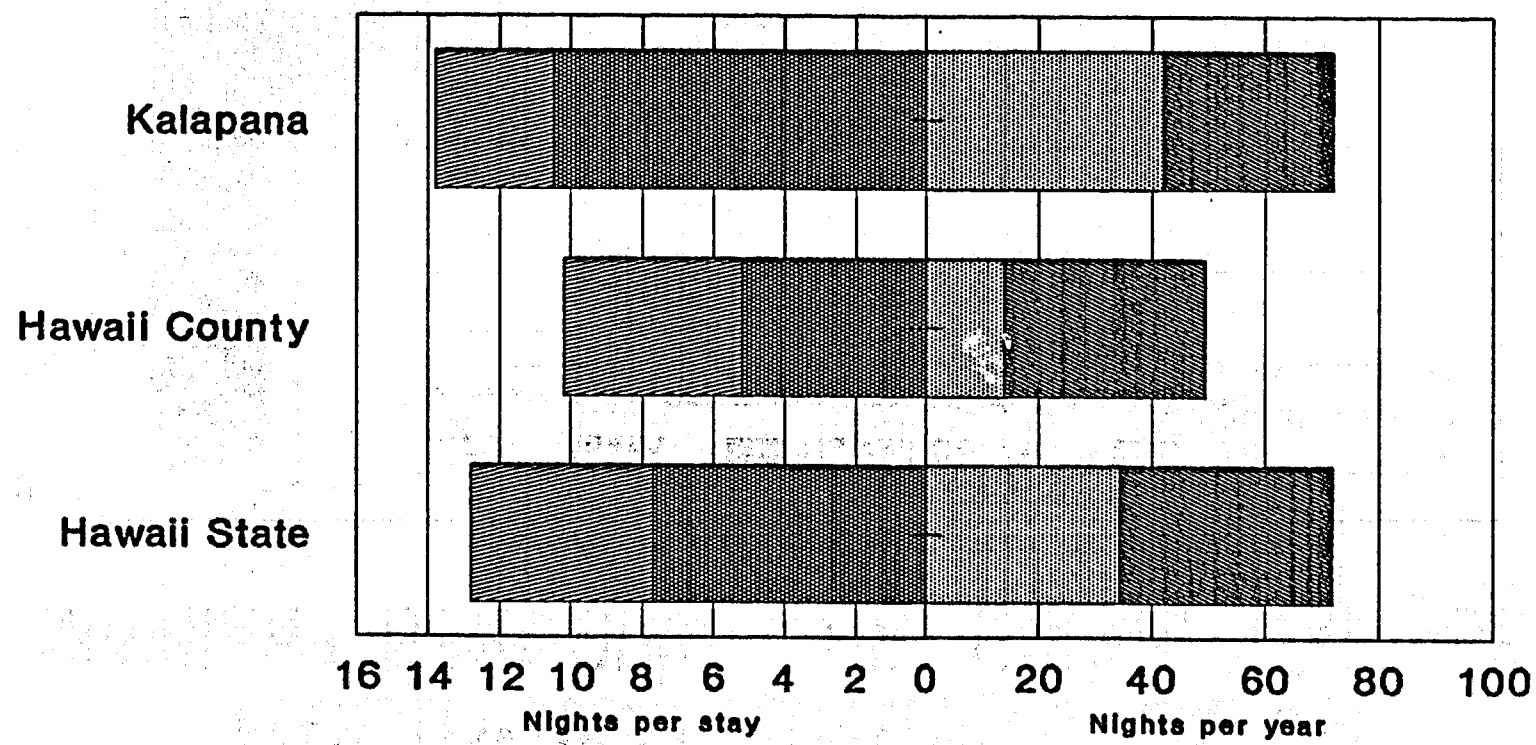
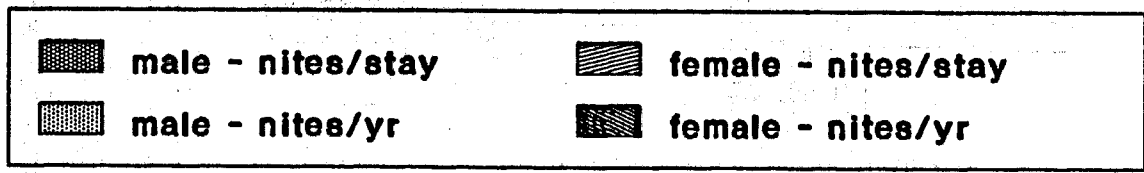
Mainland born only - per person per year



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 16

Hospitalizations



Source: Health Surveillance Program
Hawaii State Dept. of Health

Figure 17

Ambient Air Monitoring

The ambient air monitoring was conducted at the Kaohe Station during the second week of March 1987 (See Table B for a description of the location of the air monitoring stations). The winds in this area are from the north and north-west during the early hours of the day and shift direction during the remainder of the day, coming from the north-east and south-east. The average velocity during the study period was 5.34 knots per hour. Hydrogen sulfide (H_2S) averaged some four parts per billion (ppb) with a high of 19 ppb. Atmospheric radiation (radon) averaged some 58.95 pico curies per cubic meter, with a high of some 111.76 for the study period.

The second area to be monitored was Opihikao, it was measured during the third week of March 1987. The wind direction in that area comes from the north during the early morning hours and fluctuates from the north-east and south-east during the remainder of the day. The average wind velocity was 5.42 knots per hour. H_2S averaged one ppb with a high of four ppb. Radon (atmospheric radiation) averaged 50.54 pico curies per cubic meter with a high of 62.84. (See Table 1)

The Black Sands Station was in operation during the fourth week of March 1987. The wind direction was from the north-east and south-east with a velocity of 5.34 knots per hour. Hydrogen sulfide averaged one ppb with a high of five ppb atmospheric radiation (radon). Radon averaged 67.04 pico curies per cubic meter, with a high of 67.69.

The Kalapana Station was in operation during the first week of April 1987. The wind direction shifted from the south east to the north east with an average velocity of 3.44 knots. Hydrogen sulfide averaged two ppb with a high of five

ppb. Atmospheric radiation (radon) averaged 69.94 pico curies per cubic meter with a high of 71.29.

The report to the Department of Health by Mid-Pacific Geothermal, Inc. (Alpha Microsystems, 1987) summarized the findings thusly:

"Essentially, the amount of monitoring performed at each site allows comparisons with the data collected from permanent stations maintained by the Research Corporation of the University of Hawaii (R.C.U.H.) and by Thermal Power. The Base Line studies performed by N.E.A. Corp. also present a valid data base from which assumptions can be made.

The wind direction average at the monitoring sites seems to have been somewhat more Easterly than that reported at the permanent stations at the Thermal Power Drill Site and Woods Station near Pohoiki. The wind speed was quite consistent with data reported at the permanent stations.

The atmospheric radon (alpha) was measured in units of pico-curies per cubic meter. The maximum permissible by National Health Standards is 4,000 pico-curies per cubic meter."

The highest levels recorded during this survey was 111.76 pico-curies in a 24 hour period which is less than three percent of the allowable level. These readings are also consistent with readings taken at permanent stations.

The hydrogen sulfide data collected were very much as expected from every station except for the Kaohe site. At Kaohe, readings far exceeded H₂S levels expected. The levels reported here at times approached readings to be expected near the HGP-A plant site. Prevailing winds during the times of high readings (late morning and early afternoon) and also distance make it very improbable for the readings to be Plant connected. "None of the residents of that area who were interviewed remembered noticing unusual odors. Schroeders Station, a continuously monitored site for RCUH experiences (sic) similar circumstances at various times."

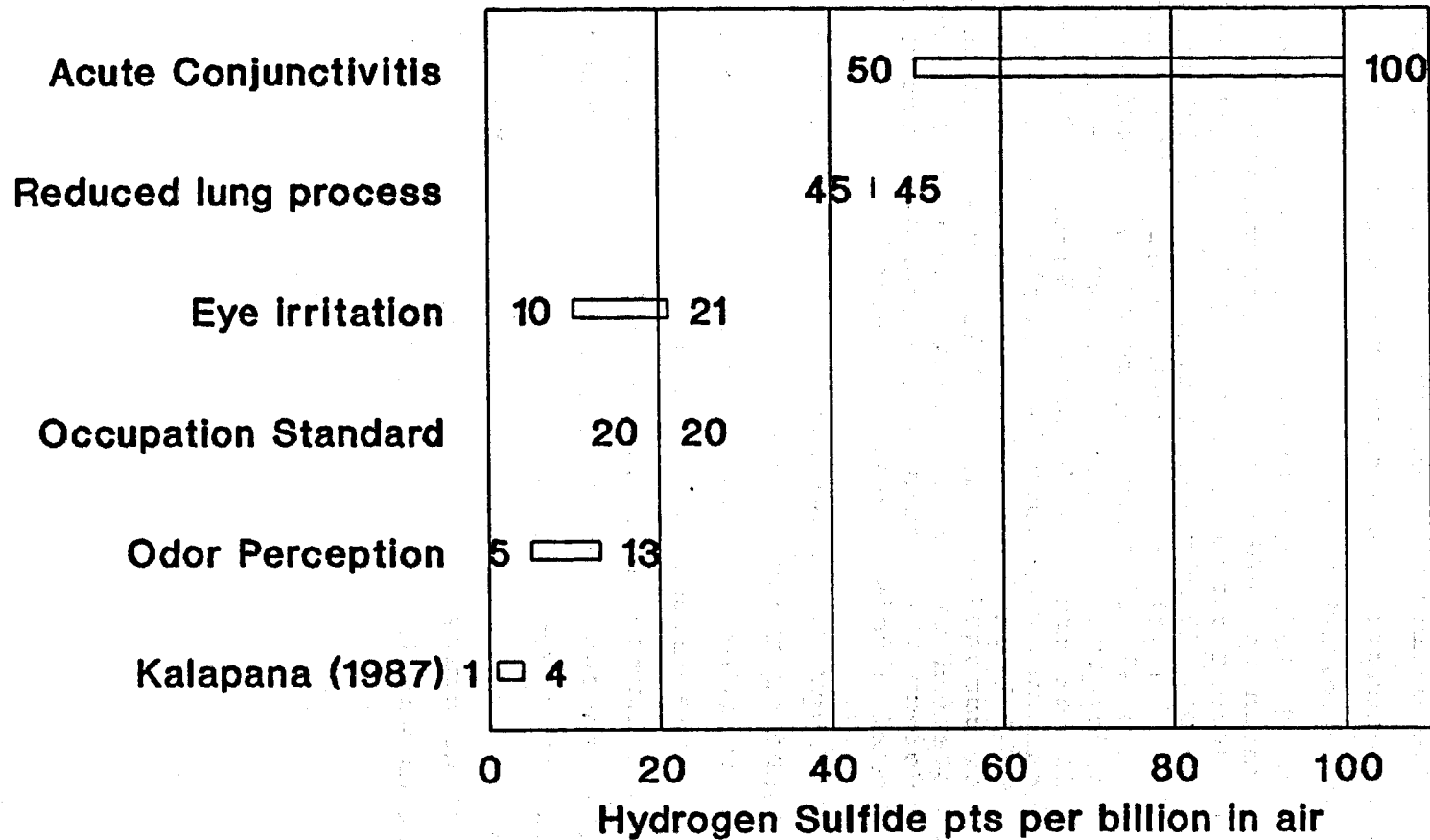
These findings compare with those reported in the Puna Study conducted some three years earlier (R & S, 1987) where it was reported that:

"... it is difficult to determine the exact extent to which the HGP-A well is contributing to the ambient concentrations of H_2S in Leilani Estates. As previously mentioned, Leilani Estates is located on the Kilauea East Rift Zone where venting from natural volcanic fumaroles is contributing an indeterminate amount of H_2S to the ambient air in the area. In Hawaiian Beaches Estates, maximum one-hour H_2S levels during the months of February 1984 never exceed five ppb. By way of comparison, the H_2S levels at Schroeder station in Leilani Estates ranged from non-detectible levels to six ppb and averaged 2.5 ppb during this one-month period."

By way of explanation, Leilani Estates is close to and downwind of the geothermal wells in that area. It appears that the ambient air monitoring in the present study does not exceed the levels of hydrogen sulfide and, in fact, is on the average lower than those levels reported in the earlier study which was conducted several miles to the north and east of Kalapana. The only exception to this are the levels of H_2S measured at Kahe which is closer to the area covered by the previous study, and which is believed to be affected by the natural venting of the volcanic fumaroles in that area.

07

Effects of Hydrogen Sulfide Threshold Ranges



Source: Hawaii State Dept. of Health
R & S Report # 56, Table 1, p.13

Figure 18

DISCUSSION

This investigation is primarily for the purpose of providing base-line data with which future information on health status can be compared in order to evaluate the extent and nature of changes, which may assess the result of geothermal development. In order to understand the health status of Kalapana residents prior to geothermal development there have been comparisons of the health status of Kalapana residents with the residents of Hawaii County and with the residents of the State. It can be concluded that chronic and acute illnesses are more prevalent, and their effects are more serious in Kalapana than in Hawaii County and in the State. This finding is consistent with the 1984 study conducted in Puna, where "higher rates of all chronic respiratory conditions (i.e., 'bronchitis/emphysema', 'asthma', 'hay fever', 'sinusitis' and 'other respiratory system diseases') were found both in Leilani Estates and Hawaiian Beaches Estates than Hawaii County or Hawaii statewide rates during the study period." (R & S, 1987).

During that study, air quality monitoring in Volcano National Park indicated that "total suspended particulates (sic) (TSP), SO₂, H₂S, and chlorine levels are normally below those which have been associated with adverse health effects, but during periods of volcanic eruptions SO₂ levels have exceeded state ambient air quality standards." It was concluded that "natural volcanic emissions may exacerbate existing chronic respiratory conditions."

Since Kalapana is located in the East Rift zone of Kilauea Volcano, and a series of eruptions occurred during and for several years prior to this study, it no doubt has considerable impact on the quality of ambient air in the study area. According to the ambient air monitoring report (Alpha Microsystems, 1987 and R & S, 1987) there appears to be

considerable natural venting of gases into the air, particularly in Kaohe and Pahoa. While the levels of hydrogen sulfide gas and atmospheric radiation do not approach levels considered unsafe (Figure 18), it is believed that overall ambient air quality in the entire study area is affected and may indeed be associated with the higher prevalence of morbidity and disability in the area as compared to other areas with less exposure to these pollutants.

It is important that in the future, measurements taken of the health status of Kalapana residents take into account the quality of ambient air in Kalapana during and prior to the study, in an attempt to separate the effects of natural volcanic emissions from those resulting from geothermal development. This study will provide a basis for comparing the ambient air quality prior to geothermal development, and hence the health status of Kalapana residents without the effects of geothermal emissions.

In addition, this study provides a basis for comparison of the health status of the Kalapana residents with residents of Hawaii County and the State. These comparisons can provide control populations with which the Kalapana community can be compared, in order to evaluate any changes and in order to assess the causes of any such changes.

42'

Summary and Conclusions

- Residents of Kalapana are more likely to be born out of State, and have shorter duration of residence than is typical for residents in Hawaii County and the State as a whole.
- Residents of Kalapana are younger than the average for the County and the State.
- Based upon their demographic characteristics, Kalapana residents would not be expected to have higher morbidity, disability and activity limitation compared to residents of Hawaii County and the State.
- Residents of Kalapana have overall higher incidence and prevalence of morbidity than do residents of Hawaii County and the State.
- Residents of Kalapana have higher levels of disability than do residents of Hawaii County and the State.
- Levels of hydrogen sulfide and atmospheric radiation in Kalapana do not even approach levels believed to be dangerous to human health.

- Ambient air quality in the study area is not affected by existing geothermal wells located near Pahoa.

- Ambient air quality is, however, affected by natural volcanic ventilation, particularly in the Kaohe area.

- Determination of the effects of future geothermal development near the study area must take into account the levels of natural volcanic ventilation.

- Any evaluation of the health status in Kalapana in the future must consider the baseline health status indicators presented in this study for Kalapana, Hawaii County and the State.

44

ACKNOWLEDGEMENTS

The preparation of this report and the conduct of the study was financed through a contract by True/Mid-Pacific Geothermal Company with the Hawaii State Department of Health.

The authors wish to acknowledge the assistance Dr. L. J. Kirkham, M.D., Chief of the Research and Statistics Office and Dr. Bruce Anderson, Deputy Director of the Department of Health for their direction of the project and review of the report.

The authors also wish to acknowledge the assistance of all of the Health Surveillance Office Staff: Mrs. Laverne Fukata, Ms. Leonora Borowitz and others as well as the various members of the field staff who assisted in the collection, coding, editing and data entry. Special consultation from Mr. Neil Oyama and Mrs. Amy Sears was appreciated. The assistance of Janice Hongo with the graphics and final editing is especially appreciated.

REFERENCES

Alpha Microsystems. April 11, 1987. Report of The Environmental Monitoring for Mid-Pacific Geothermal.

Anderson, Bruce S., and Oyama, N. February 1987. A Study of The Health Status of Residents In Puna, Hawaii Exposed To Low Levels of Hydrogen Sulfide. R & S Report No. 56. Research and Statistics Office, Hawaii State Department of Health.

Anspaugh, L.R. and Hahn, J.L.: Human Health Implications of Geothermal Energy, in Health Implications of New Energy Technologies, W.N. Rom and V.E. Archer, Eds. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1980.

National Center for Health Statistics (NCHS). September 1986. Current Estimates From the National Health Interview Survey. United States 1985: Series 10, No. 160.

National Center for Health Statistics (NCHS). April 1975. Health Interview Survey Procedure, 1957-1974: Series 1, Number 11.

National Institute for Occupational Safety and Health (NIOSH). 1979. A Recommended Standard for Occupational Exposure to Hydrogen Sulfide, DHEW (NIOSH): Pub. No. 657-012/335.

Nesswetha, W. 1969. Eye Lesions Caused By Sulfur Compounds, in Arbeitsmed. Socialmed. Arbeitshyg. NIOSH, 1977: 4:288-290.

Oyama, N., and Johnson, D.B. May 1986. Health Surveillance Program Survey Methods and Procedures. R & S Report No. 54. Research and Statistics Office, Hawaii State Department of Health.

Rogers, R.E., and Ferin, J. 1981. Effects of H₂S on Bacterial Inactivation in the Rat Lung. Archive of Environmental Health 36(5):261-264.

Snedcore, George W., and Cochran, William G. Statistical Methods. 6th ed. Ames, Iowa: Iowa State University Press.

Yant, W.P. 1930. Hydrogen Sulfide in Industry. Occurrence, Effects and Treatment. American Journal of Public Health 20:598-608.

FIGURES

- 1 MAP OF STUDY AREA, KALAPANA, HAWAII
- 2 AGE DISTRIBUTION
- 3 ETHNICITY
- 4 PLACE OF BIRTH
- 5 LENGTH OF RESIDENCY IN HAWAII
- 6 EMPLOYMENT
- 7 FAMILY INCOME
- 8 EDUCATION
- 9-1,2 SELECTED ACUTE CONDITIONS
- 10 TOTAL ACUTE CONDITIONS
- 11 CHRONIC RESPIRATORY CONDITIONS
- 12-1,2 SELECTED CHRONIC CONDITIONS
- 13 AGGREGATED CHRONIC CONDITIONS
- 14 TOTAL CHRONIC CONDITIONS
- 15 RESTRICTED ACTIVITY DAYS
- 16 RESTRICTED ACTIVITY DAYS (MAINLAND BORN)
- 17 HOSPITALIZATIONS
- 18 EFFECTS OF HYDROGEN SULFIDE

TABLES

1. AMBIENT AIR MONITORING RESULTS

2. DEMOGRAPHIC CHARACTERISTICS:

- A. AGE AND SEX
- B. RACE
- C. EDUCATION (AGE 18+)
- D. MARITAL STATUS (AGE 18+)
- E. CURRENT ACTIVITY (18+)
- F. USUAL ACTIVITY
- G. FAMILY INCOME
- H. POVERTY LEVEL, AVERAGE HOUSEHOLD SIZE,
MEDIAN INCOME, AVERAGE AGE, AVERAGE YEARS
OF RESIDENCE
- J. TIME IN HAWAII
- K. PLACE OF BIRTH
- L. INDUSTRY
- M. OCCUPATION

3. ACTIVITY LIMITATION

- A. AGE AND SEX
- B. RACE

4. RESTRICTED ACTIVITY AND HOSPITALIZATIONS

- A. AGE AND SEX
- B. RACE
- C. YEARS IN HAWAII
- D. PLACE OF BIRTH

5. MORBIDITY RATES

- A. AGE-ADJUSTED ACUTE INCIDENCE RATES BY AREA
- B. AGE-ADJUSTED CHRONIC PREVALENCE RATES BY
AREA
- C. AGE-SPECIFIC ACUTE INCIDENCE RATES BY AREA
- D. AGE-SPECIFIC CHRONIC PREVALENCE RATES BY
AREA

TABLE 1: AMBIENT AIR MONITORING RESULTS

STATIONS:	KAHOE (1)	OPIHIKAO (2)	BLACK SANDS (3)	KALAPANA (4)
DATES:	March 10-18	March 18-25	Mar 25-Apr 1	April 1-8
TOTAL HOURS:	211	167	168	160
WIND SPEED(Knots/Hr):				
Average:	5.34	5.42	5.34	3.44
Maximum:	14	11	12	9
WIND DIRECTION:	Early AM: NW Other: NE/SE	Early AM: N Other: NE/SE	NE/SE	SE/NE
HYDROGEN SULFIDE (ppb):				
Average:	4	1	1	2
Maximum:	19	4	5	5
RADON (Pico Curies/CM):				
Average:	58.95	50.54	67.04	69.94
Maximum:	111.76	62.84	67.69	71.29

- 1-Kahoe Station was located 3 Mi. SW of Pahoa at 1200 ft. elev.
 2-Opihikao Station was located 4 mi. S/SE of Pahoa at 500 ft. elev.
 3-Black Sands Station was located 6 mi. south of Pahoa at 800 ft. elev.
 4-Kalapana Station was located 9 mi. south of Pahoa at 20 ft. elev.

DEMOGRAPHIC CHARACTERISTICS, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

TABLE 2A
GENDER BY AGE BY AREA

		KALAPANA		HAWAII COUNTY		HAWAII STATE	
		NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
M and F	TOTAL	676	100.1	112630	100.1	1034560	100.0
	Under 6	83	12.3	14867	13.2	105973	10.2
	6-17 Yrs	137	20.3	25069	22.3	208915	20.2
	18-24 Yrs	45	6.7	10269	9.1	123864	12.0
	25-34 Yrs	148	21.9	19154	17.0	195477	18.9
	35-44 Yrs	147	21.7	11905	10.6	123026	11.9
	45-54 Yrs	36	5.3	10479	9.3	102361	9.9
	55-64 Yrs	39	5.8	10423	9.3	93055	9.0
	65 + Yrs	41	6.1	10464	9.3	81889	7.9
MALE	TOTAL	360	100.1	57233	99.9	517568	100.0
	Under 6	38	10.6	7764	13.6	55170	10.7
	6-17 Yrs	73	20.3	12761	22.3	106564	20.6
	18-24 Yrs	23	6.4	4534	7.9	58408	11.3
	25-34 Yrs	77	21.4	9846	17.2	98726	19.1
	35-44 Yrs	88	24.4	6205	10.8	62015	12.0
	45-54 Yrs	19	5.3	5174	9.0	48764	9.4
	55-64 Yrs	18	5.0	5235	9.1	45795	8.8
	65 + Yrs	24	6.7	5714	10.0	42126	8.1
FEMALE	TOTAL	316	100.1	55397	100.1	516992	100.0
	Under 6	45	14.2	7103	12.8	50803	9.8
	6-17 Yrs	64	20.3	12307	22.2	102351	19.8
	18-24 Yrs	22	7.0	5736	10.4	65456	12.7
	25-34 Yrs	71	22.5	9308	16.8	96751	18.7
	35-44 Yrs	59	18.7	5700	10.3	61011	11.8
	45-54 Yrs	17	5.4	5305	9.6	53597	10.4
	55-64 Yrs	21	6.6	5188	9.4	47260	9.1
	65 + Yrs	17	5.4	4750	8.6	39763	7.7

TABLE 2B ALL RACES

	ALL RACES	676	99.9	112630	99.9	1034560	99.9
	Caucasian	399	59.0	26767	23.8	254904	24.6
	Japanese	9	1.3	22980	20.4	228033	22.0
	Filipino	6	0.9	9957	8.8	115556	11.2
	Chinese	4	0.6	1332	1.2	46705	4.5
	Black	8	1.2	269	0.2	30334	2.9
	HawPtHaw	170	25.1	34847	30.9	206283	19.9
	OthMixJhk	80	11.8	16478	14.6	152745	14.8

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

DEMOGRAPHIC CHARACTERISTICS, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

TABLE 2C AREA:	KALAPANA		HAWAII COUNTY		HAWAII STATE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
COMPLETED ED (18+)	456	99.9	69720	100.0	627497	100.1
0-11 Years	63	13.8	10309	14.8	90290	14.4
High School Grad	163	35.7	45798	65.7	289415	46.1
Some Coll/Bus/Trd	152	33.3	6569	9.4	136552	21.8
Coll Graduate	51	11.2	3911	5.6	88854	14.2
Graduate Work	27	5.9	3133	4.5	22386	3.6
TABLE 2D MAR STATUS (18+):	456	100.0	71557	100.0	709695	100.1
Married	247	54.2	40753	57.0	461159	65.0
Widowed	13	2.9	5937	8.3	35311	5.0
Never Married	132	28.9	19479	27.2	171569	24.2
Divorced/Separated	64	14.0	5388	7.5	41656	5.9
TABLE 2E CURRENT ACT (18+):	456	100.0	72695	100.0	717355	99.9
Working	213	46.7	41593	57.2	475560	66.3
Has Job, Not Work	6	1.3	257	0.4	5240	0.7
No Job, Not Look	218	47.8	30276	41.6	229105	31.9
No Job, Looking	19	4.2	569	0.8	7450	1.0
TABLE 2F USUAL ACTIVITY:	676	100.0	112629	100.1	1034560	100.1
Working	231	34.2	42109	37.4	464360	44.9
Keeping house	80	11.8	12461	11.1	96761	9.4
Retired	60	8.9	9753	8.7	84906	8.2
Going to School	172	25.4	30749	27.3	266406	25.8
Other/Unknown	133	19.7	17557	15.6	122127	11.8
TABLE 2G FAMILY INCOME:	676	99.9	112630	99.9	1034560	100.0
Under \$ 5,000	82	12.1	3241	2.9	18255	1.8
\$ 5,000-\$ 9,999	101	14.9	10494	9.3	38615	3.7
\$10,000-\$14,999	80	11.8	8923	7.9	76813	7.4
\$15,000-\$19,999	93	13.8	11796	10.5	89244	8.6
\$20,000-\$24,999	24	3.6	10249	9.1	103537	10.0
\$25,000-\$29,999	32	4.7	6474	5.7	91620	8.9
\$30,000-\$34,999	17	2.5	6190	5.5	93993	9.1
\$35,000-\$39,999	7	1.0	1941	1.7	66186	6.4
\$40,000 and Over	33	4.9	8928	7.9	285602	27.6
Unknown	207	30.6	44394	39.4	170695	16.5

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

DEMOGRAPHIC CHARACTERISTICS, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

	KALAPANA	HAWAII CNTY	HAWAII STATE
TABLE 2H PERCENT W/POVERTY LEVEL	26.7%	8.1%	* 6.5%
AVERAGE NUMBER PERSONS/HH	2.6	2.5	* 3.0
MEDIAN FAMILY INCOME	\$15,978	\$17,333	* \$26,971
AVERAGE AGE (YEARS)	29.3	43.2	41.2
AVERAGE YEARS IN HAWAII	17.4	35.8	31.2

AREA:	KALAPANA		HAWAII COUNTY		HAWAII STATE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
TABLE 2J TIME IN HI (18+):	456	100.0	72250	100.1	698574	99.9
Under one year	25	5.5	124	0.2	5163	0.7
1-9 Years	226	49.6	7505	10.4	145153	20.8
10-19 Years	82	18.0	8231	11.4	100604	14.4
20-29 Years	38	8.3	16110	22.3	128660	18.4
30-39 Years	40	8.8	11184	15.5	88752	12.7
40-49 Years	17	3.7	8351	11.6	67140	9.6
50 Years and Over	28	6.1	20745	28.7	163102	23.3

TABLE 2K PLACE OF BIRTH:	KALAPANA	HAWAII COUNTY	HAWAII STATE
	676	112630	1034560
Hawaii County	203	81814	113131
Honolulu Bal-		7864	419528
Maui County ance	69	1235	68077
Kauai County of		253	38420
Hawaii Other State		216	4399
Mainland U.S.	340	14810	241142
Elsewhere	46	6437	141770
Unknown	18	1	8093

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health
 * 1980 Census for State of Hawaii was 7.8% Poverty, 3.59 persons/family, \$22,750 Median family income.

DEMOGRAPHIC CHARACTERISTICS, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

AREA:	KALAPANA		HAWAII COUNTY		HAWAII STATE	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
TABLE 2L INDUSTRY:	676	99.9	112630	100.2	1034560	99.9
Ag, Forest, Fishing	62	9.2	7140	6.3	20177	2.0
Construction	41	6.1	2559	2.3	28003	2.7
Manufacturing	10	1.5	3210	2.9	22638	2.2
Trans, Comm, Utility	8	1.2	2814	2.5	37599	3.6
Wholesale Trade	11	1.6	857	0.8	13183	1.3
Retail Trade	46	6.8	7174	6.4	88180	8.5
Fin, Ins, Real Est	11	1.6	2341	2.1	35241	3.4
Bus & Repair Svc	7	1.0	1987	1.8	24024	2.3
Personal Service	7	1.0	5314	4.7	36571	3.5
Enter/Rec Svc	1	0.1	272	0.2	5570	0.5
Prof & Rel Svc	30	4.4	6449	5.7	84161	8.1
Govt(Civilian)	12	1.8	2088	1.9	51495	5.0
Military Svc	0	0.0	184	0.2	46471	4.5
Unk/Hswf/Schl/Ret	430	63.6	70241	62.4	541247	52.3
TABLE 2M OCCUPATION:	676	99.8	112630	100.1	1034560	100.0
Exec, Admin, Manag	26	3.8	1343	1.2	31252	3.0
Management Related	4	0.6	538	0.5	19133	1.8
Professional/Spec	23	3.4	3551	3.2	57433	5.6
Technical/Rel Supp	2	0.3	788	0.7	13199	1.3
Sales	24	3.6	5378	4.8	60028	5.8
Admin Support	15	2.2	6044	5.4	82056	7.9
Private Household	1	0.1	156	0.1	1584	0.2
Protect Service	3	0.4	731	0.6	8820	0.9
Service Occupation	25	3.7	6369	5.7	65938	6.4
Farm, Agri, Related	44	6.5	5351	4.8	16893	1.6
Forestry Occ	1	0.1	77	0.1	135	0.0
Fish, Hunt, Trap	11	1.6	283	0.3	1306	0.1
Mech & Repair	9	1.3	2260	2.0	17600	1.7
Construction	34	5.0	1964	1.7	21855	2.1
Extractive	0	0.0	31	0.0	143	0.0
Military *	0	0.0	184	0.2	46471	4.5
Precision Prod	2	0.3	1327	1.2	10518	1.0
Oper, Inspect	6	0.9	1358	1.2	7509	0.7
Transp, Mat Mover	6	0.9	2617	2.3	17834	1.7
Handl, Clean, Labor	12	1.8	1839	1.6	13139	1.3
Unkwn, Retired, Schl	354	52.4	58245	51.7	450637	43.6
Housewife	74	10.9	12196	10.8	91077	8.8

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

* Includes active duty residents, excludes those living in barracks and ships.

NOTE: Occupations are usually spread across several industries, therefore it is rare to get exact matches of specific occupations within an industry

PERCENT BY ACTIVITY LIMITATION, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

TABLE 3A
KALAPANA, GENDER BY AGE

	NUMBER PERSONS	DEGREE OF ACTIVITY LIMITATION			
		SEVERE	MODERATE	SLIGHT	NO CHRONIC
M and F All Ages	250	4.4	8.8	6.4	80.4
Under 6	13	0.0	0.0	0.0	100.0
6-17 Yrs	31	0.0	0.0	0.0	100.0
18-24 Yrs	10	0.0	0.0	0.0	100.0
25-34 Yrs	57	1.8	7.0	1.8	89.5
35-44 Yrs	67	6.0	9.0	9.0	76.1
45-54 Yrs	12	0.0	16.7	8.3	75.0
55-64 Yrs	28	7.1	17.9	10.7	64.3
65 + Yrs	32	12.5	15.6	15.6	56.3
MALE All Ages	134	7.5	10.4	5.2	76.9
Under 6	7	0.0	0.0	0.0	100.0
6-17 Yrs	15	0.0	0.0	0.0	100.0
18-24 Yrs	3	0.0	0.0	0.0	100.0
25-34 Yrs	32	3.1	9.4	0.0	87.5
35-44 Yrs	38	7.9	7.9	10.5	73.7
45-54 Yrs	7	0.0	28.6	14.3	57.1
55-64 Yrs	13	15.4	15.4	7.7	61.5
65 + Yrs	19	21.1	21.1	5.3	52.6
FEMALE All Ages	116	0.9	6.9	7.8	84.5
Under 6	6	0.0	0.0	0.0	100.0
6-17 Yrs	16	0.0	0.0	0.0	100.0
18-24 Yrs	7	0.0	0.0	0.0	100.0
25-34 Yrs	25	0.0	4.0	4.0	92.0
35-44 Yrs	29	3.4	10.3	6.9	79.3
45-54 Yrs	5	0.0	0.0	0.0	100.0
55-64 Yrs	15	0.0	20.0	13.3	66.7
65 + Yrs	13	0.0	7.7	30.8	61.5

TABLE 3B	ALL RACES	NUMBER PERSONS	SEVERE	MODERATE	SLIGHT	NO CHRONIC
		249	4.4	8.8	6.4	80.3
	Caucasian	157	5.1	8.3	7.0	79.6
	Hawaiian	57	3.5	8.8	5.3	82.5
	Other	35	2.9	11.4	5.7	80.0

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Unknowns assumed to be distributed the same as knowns.

PERCENT BY ACTIVITY LIMITATION, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

TABLE 3A
HAWAII, GENDER BY AGE
COUNTY

	NUMBER PERSONS	DEGREE OF ACTIVITY LIMITATION			
		SEVERE	MODERATE	SLIGHT	NO CHRONIC
M and F All Ages	33038	5.9	4.2	7.7	82.2
Under 6	2423	14.7	20.8	16.0	48.5
6-17 Yrs	3986	2.4	2.1	6.3	89.2
18-24 Yrs	1154	0.0	1.8	14.2	84.0
25-34 Yrs	3820	2.0	2.7	4.1	91.2
35-44 Yrs	3594	3.0	3.2	12.7	81.1
45-54 Yrs	3768	5.7	4.2	7.4	82.7
55-64 Yrs	5724	0.2	1.6	7.3	90.9
65 + Yrs	8569	12.6	3.7	5.0	78.6
MALE All Ages	17233	5.2	1.8	9.5	83.5
Under 6	811	0.0	0.0	47.8	52.2
6-17 Yrs	1806	5.4	1.8	4.8	88.1
18-24 Yrs	556	0.0	0.0	19.8	80.2
25-34 Yrs	2325	3.2	3.1	4.1	89.5
35-44 Yrs	2140	2.5	3.5	17.1	76.9
45-54 Yrs	2026	10.6	1.4	3.8	84.3
55-64 Yrs	2981	0.4	0.8	10.2	88.6
65 + Yrs	4588	9.7	1.8	4.5	84.0
FEMALE All Ages	15805	6.6	6.8	5.8	80.8
Under 6	1612	22.1	31.2	0.0	46.7
6-17 Yrs	2180	0.0	2.4	7.5	90.1
18-24 Yrs	598	0.0	3.5	9.0	87.5
25-34 Yrs	1495	0.0	2.0	4.1	93.8
35-44 Yrs	1454	3.9	2.8	6.1	87.3
45-54 Yrs	1742	0.0	7.4	11.7	80.9
55-64 Yrs	2743	0.0	2.4	4.2	93.4
65 + Yrs	3981	16.0	5.9	5.6	72.5

TABLE 3B ALL RACES

ALL RACES	33039	5.9	4.2	7.7	82.2
Caucasian	10486	7.4	3.6	6.8	82.1
Hawaiian	7996	6.2	9.2	12.6	72.0
Other	14557	4.6	1.8	5.7	87.9

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health
NOTE: Unknowns assumed to be distributed the same as knowns.

PERCENT BY ACTIVITY LIMITATION, KALAPANA 1987, HAWAII COUNTY AND STATE, 1986

TABLE 3A		NUMBER PERSONS	DEGREE OF ACTIVITY LIMITATION			
HAWAII, STATE	GENDER BY AGE		SEVERE	MODERATE	SLIGHT	NO CHRONIC
M and F	All Ages	369493	2.9	5.1	7.1	84.9
	Under 6	16979	3.5	7.4	4.0	85.1
	6-17 Yrs	45354	1.0	2.7	4.7	91.6
	18-24 Yrs	32457	1.1	3.8	3.9	91.1
	25-34 Yrs	65672	1.0	3.2	5.3	90.5
	35-44 Yrs	48409	1.9	2.1	7.5	88.6
	45-54 Yrs	47958	2.4	5.1	8.0	84.6
	55-64 Yrs	53513	3.9	6.6	8.8	80.7
	65 + Yrs	59151	8.0	10.1	10.7	71.2
MALE	All Ages	184268	3.8	5.0	7.4	83.9
	Under 6	10045	0.0	5.7	5.9	88.4
	6-17 Yrs	25318	1.4	4.3	5.9	88.4
	18-24 Yrs	12743	1.9	3.7	7.6	86.8
	25-34 Yrs	31820	1.7	3.0	4.6	90.7
	35-44 Yrs	23172	3.0	2.5	8.9	85.6
	45-54 Yrs	23285	4.2	3.2	5.6	87.1
	55-64 Yrs	27496	5.7	7.4	9.9	77.0
	65 + Yrs	30389	8.3	9.0	10.1	72.7
FEMALE	All Ages	185225	2.1	5.2	6.7	85.9
	Under 6	6934	8.6	9.8	1.3	80.3
	6-17 Yrs	20036	0.5	0.7	3.1	95.6
	18-24 Yrs	19714	0.6	3.8	1.6	94.0
	25-34 Yrs	33852	0.2	3.4	6.0	90.4
	35-44 Yrs	25237	0.8	1.7	6.2	91.3
	45-54 Yrs	24673	0.6	6.9	10.3	82.2
	55-64 Yrs	26017	1.9	5.9	7.6	84.6
	65 + Yrs	28762	7.7	11.3	11.4	69.6
TABLE 3B	ALL RACES	369586	3.0	5.1	7.1	84.9
	Caucasian	113306	2.8	5.3	6.9	85.0
	Hawaiian	56959	3.1	5.7	7.8	83.4
	Other	199321	3.0	4.8	6.9	85.3

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Unknowns assumed to be distributed the same as knowns.

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

TABLE 4A KALAPANA	HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR			
	GENDER AND AGE	EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
M and F All Ages	7.0	37.0	5.3	22.2	2.1	5.5	
Under 6	1.0	1.0	1.0	18.5	0.0	4.8	
6-17 Yrs	3.0	14.0	4.7	7.4	0.3	7.3	
18-24 Yrs	9.0	16.0	1.8	9.8	0.3	2.4	
25-34 Yrs	9.0	26.0	2.9	23.4	1.7	7.0	
35-44 Yrs	7.0	51.0	7.3	30.2	5.6	6.2	
45-54 Yrs	3.0	39.0	13.0	48.0	0.8	1.0	
55-64 Yrs	18.0	179.0	9.9	46.8	4.1	7.1	
65 + Yrs	10.0	59.0	5.9	13.8	2.6	0.0	
MALE All Ages	4.0	42.0	10.5	25.0	2.7	8.0	
Under 6	0.0	0.0	*	15.8	0.1	7.9	
6-17 Yrs	3.0	21.0	7.0	10.1	0.4	9.0	
18-24 Yrs	0.0	0.0	*	18.8	0.6	4.7	
25-34 Yrs	1.0	9.0	9.0	28.3	0.5	8.9	
35-44 Yrs	6.0	66.0	11.0	31.8	7.4	9.6	
45-54 Yrs	0.0	0.0	*	45.5	0.0	1.9	
55-64 Yrs	28.0	283.0	10.1	57.4	8.3	15.4	
65 + Yrs	13.0	92.0	7.1	15.0	3.8	0.0	
FEMALE All Ages	9.0	30.0	3.3	19.1	1.4	2.8	
Under 6	2.0	2.0	1.0	20.8	0.0	2.2	
6-17 Yrs	3.0	6.0	2.0	4.6	0.1	5.3	
18-24 Yrs	18.0	32.0	1.8	0.6	0.1	0.0	
25-34 Yrs	18.0	45.0	2.5	17.9	3.0	4.9	
35-44 Yrs	8.0	29.0	3.6	28.1	2.9	1.4	
45-54 Yrs	6.0	82.0	13.7	50.9	1.8	0.0	
55-64 Yrs	10.0	90.0	9.0	37.7	0.5	0.0	
65 + Yrs	6.0	12.0	2.0	12.0	0.9	0.0	
TABLE 4B	RACE						
Caucasian	7.0	38.0	5.4	26.0	1.9	6.6	
Hawaiian	7.0	45.0	6.4	15.4	2.1	4.3	
Other	8.0	27.0	3.4	23.0	1.6	3.2	

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

* No cases

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

HAWAII COUNTY		HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR		
GENDER AND AGE		EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
M and F	All Ages	6.8	34.8	5.1	8.7	1.8	3.9
	Under 6	2.3	19.9	8.7	5.3	1.3	4.4
	6-17 Yrs	1.2	8.7	7.6	3.6	0.5	3.0
	18-24 Yrs	9.2	70.8	7.7	12.5	0.4	10.2
	25-34 Yrs	6.5	16.4	2.5	5.9	0.8	1.6
	35-44 Yrs	3.2	16.8	5.3	7.6	1.0	3.0
	45-54 Yrs	6.7	29.5	4.4	7.7	1.1	2.6
	55-64 Yrs	2.6	12.8	4.9	6.3	0.7	2.4
	65 + Yrs	12.2	54.9	4.5	31.9	12.4	0.2
MALE	All Ages	2.6	13.8	5.2	9.0	2.2	3.5
	Under 6	1.2	28.0	24.1	7.1	1.6	5.3
	6-17 Yrs	1.0	1.9	1.9	3.5	0.1	3.1
	18-24 Yrs	0.7	2.2	3.0	10.4	0.2	8.3
	25-34 Yrs	0.9	2.6	2.9	5.0	0.9	1.2
	35-44 Yrs	2.6	10.6	4.1	11.4	1.0	4.5
	45-54 Yrs	8.4	46.2	5.5	10.1	0.6	4.0
	55-64 Yrs	1.8	12.6	7.1	7.0	0.3	4.0
	65 + Yrs	8.5	25.7	3.0	28.9	16.8	0.4
FEMALE	All Ages	7.1	35.6	5.0	8.3	1.4	3.0
	Under 6	3.5	11.0	3.1	3.2	1.0	3.5
	6-17 Yrs	1.3	15.8	12.0	3.8	0.9	2.9
	18-24 Yrs	15.9	125.6	7.9	14.2	0.6	11.5
	25-34 Yrs	12.4	31.2	2.5	6.8	0.7	2.0
	35-44 Yrs	3.9	23.5	6.1	3.4	1.1	1.3
	45-54 Yrs	5.0	13.4	2.7	5.4	1.6	1.3
	55-64 Yrs	3.5	13.0	3.8	5.7	1.0	0.8
	65 + Yrs	16.6	89.0	5.4	35.7	6.8	0.0

TABLE 4B

RACE

Caucasian	10.0	52.6	5.3	15.2	2.1	2.7
Hawaiian	8.1	34.7	4.3	12.0	1.6	4.0
Other	5.5	47.7	8.7	10.4	1.6	2.8

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

* No cases

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

TABLE 4A HAWAII STATE		HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR		
GENDER AND AGE		EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
M and F	All Ages	5.9	35.8	6.1	11.0	1.4	3.0
	Under 6	4.5	28.3	6.2	9.6	0.8	2.1
	6-17 Yrs	1.5	9.3	6.1	7.4	0.5	3.4
	18-24 Yrs	8.6	33.8	3.9	9.0	0.7	4.2
	25-34 Yrs	7.3	33.3	4.6	9.5	0.9	2.7
	35-44 Yrs	5.1	29.9	5.9	10.5	1.1	3.1
	45-54 Yrs	5.0	28.4	5.7	13.2	1.5	4.0
	55-64 Yrs	6.9	53.6	7.8	15.4	3.0	2.8
	65 + Yrs	12.1	120.6	10.0	21.1	5.1	0.7
MALE	All Ages	4.4	34.1	7.7	11.3	1.5	3.1
	Under 6	4.9	36.2	7.4	10.6	0.7	2.1
	6-17 Yrs	1.7	11.0	6.5	8.8	0.6	3.5
	18-24 Yrs	4.3	27.4	6.4	8.6	0.7	4.5
	25-34 Yrs	2.2	10.1	4.6	8.5	0.8	2.7
	35-44 Yrs	3.4	25.3	7.5	9.9	1.3	2.8
	45-54 Yrs	4.8	18.8	3.9	15.1	1.6	3.9
	55-64 Yrs	8.1	76.3	9.4	17.4	3.7	4.0
	65 + Yrs	13.0	140.3	10.8	19.9	5.8	0.2
FEMALE	All Ages	7.3	37.6	5.1	10.6	1.2	2.9
	Under 6	4.2	19.8	4.7	8.5	0.8	2.2
	6-17 Yrs	1.3	7.5	5.6	5.9	0.4	3.3
	18-24 Yrs	12.5	39.4	3.2	9.4	0.6	3.8
	25-34 Yrs	12.6	57.2	4.6	10.6	1.0	2.6
	35-44 Yrs	6.9	34.7	5.0	11.1	1.0	3.3
	45-54 Yrs	5.2	37.1	7.1	11.5	1.4	4.2
	55-64 Yrs	5.8	31.7	5.5	13.4	2.3	1.6
	65 + Yrs	11.1	99.8	9.0	22.3	4.4	1.2

TABLE 4B

RACE

Caucasian	5.6	27.7	5.0	12.1	2.5	2.2
Hawaiian	9.6	40.2	4.2	6.9	1.0	2.0
Other	5.0	28.8	5.8	13.8	3.5	4.6

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

* No cases

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

KALAPANA TABLE 4C YEARS IN HAWAII	HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR		
	EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
Total	7.0	37.0	5.3	22.2	2.1	5.5
Und 1 Yr	*	*	*	26.5	0.0	1.8
1-10 Yr	6.0	40.0	6.7	26.2	2.1	8.4
11-20 Yrs	4.0	8.0	2.0	11.0	0.7	2.8
21-30 Yrs	11.0	16.0	1.5	15.8	0.1	1.0
31-40 Yrs	10.0	110.0	11.0	7.4	11.4	2.2
41-50 Yrs	6.0	82.0	13.7	21.1	0.0	1.4
51-60 Yrs	40.0	160.0	4.0	67.2	5.4	0.0
60 + Yrs	7.0	0.0	0.0	31.7	2.1	0.0

TABLE 4D PLACE OF BIRTH

Hawaii County	4.0	36.0	9.0	16.6	0.6	3.6
Balance of State	10.0	14.0	1.4	17.5	6.3	7.7
Mainland U.S.	7.0	44.0	6.3	28.8	2.5	6.8
Elsewhere	11.0	33.0	3.0	13.1	0.2	2.9

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

* No cases

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

HAWAII COUNTY TABLE 4C YEARS IN HAWAII	HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR		
	EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
Total	6.8	34.8	5.1	8.7	1.8	3.9
Und 1 Yr	10.0	24.7	2.5	0.0	0.5	0.0
1- 4 Yrs	3.6	11.7	3.2	4.4	1.0	1.0
5- 9 Yrs	4.2	21.1	5.0	8.5	1.4	7.0
10-19 Yrs	1.9	10.0	5.2	4.3	1.3	2.1
20-29 Yrs	8.6	51.0	5.9	12.7	0.8	7.9
30-39 Yrs	3.7	17.9	4.8	4.5	0.7	1.3
40-49 Yrs	3.5	6.1	1.7	5.2	0.2	2.8
50 + Yrs	7.4	42.0	5.7	16.9	5.1	1.3

TABLE 4D PLACE OF BIRTH

Hawaii County	5.3	29.1	5.5	7.7	0.9	3.2
Balance of State	7.3	45.0	6.2	11.8	2.0	3.9
Mainland U.S.	7.2	26.8	3.7	14.1	3.1	2.7
Elsewhere	13.3	39.8	3.0	32.1	14.5	1.8

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

HOSPITAL EPISODES AND NIGHTS, RESTRICTED ACTIVITY, KALAPANA 1987, HAWAII COUNTY & STATE, 1986

HAWAII STATE TABLE 4C YEARS IN HAWAII	HOSPITALIZATIONS PER 100 PERSONS			RESTRICTED ACTIVITY DAYS/PERSON/YEAR		
	EPISODES PER YEAR	NIGHTS PER YEAR	NIGHTS PER STAY	ALL TYPES	BED DAYS	WORK OR SCHOOL
Total	6.8	34.8	5.1	8.7	1.8	3.9
Und 1 Yr	10.0	24.7	2.5	0.0	0.5	0.0
1- 4 Yrs	3.6	11.7	3.2	4.4	1.0	1.0
5- 9 Yrs	4.2	21.1	5.0	8.5	1.4	7.0
10-19 Yrs	1.9	10.0	5.2	4.3	1.3	2.1
20-29 Yrs	8.6	51.0	5.9	12.7	0.8	7.9
30-39 Yrs	3.7	17.9	4.8	4.5	0.7	1.3
40-49 Yrs	3.5	6.1	1.7	5.2	0.2	2.8
50 + Yrs	7.4	42.0	5.7	16.9	5.1	1.3

TABLE 4D PLACE OF BIRTH

Hawaii County	6.1	35.7	5.9	9.4	1.4	3.6
Balance of State	6.5	42.3	6.6	12.6	1.7	3.2
Mainland U.S.	10.0	51.7	5.2	13.8	1.8	2.9
Elsewhere	6.4	47.8	7.5	10.7	1.8	2.2

SOURCE: Health Surveillance Program, R & S Office, Hawaii Dept of Health

NOTE: Hospital episodes exclude normal deliveries, episodes ending in death, and long term care stays.

TABLE 5A: COMPARISON OF AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

ACUTE CONDITIONS:	KALAPANA	HAWAII COUNTY	STATE
MEASLES	0.0	0.0	0.8
RUBELLA	0.0	0.0	2.0
CHICKEN POX/MUMPS	0.0	4.8	5.9
VIRUS, NEC	0.0	28.4	34.9
OTHER INFECT/PARASITIC	85.4	28.3	95.3
COLD	1301.8	830.7	886.5
OTHER UPPER RESPIRATORY	788.6	357.4	562.5
OTHER RESPIRATORY	227.4	2.0	25.4
DENTAL CONDITION	0.0	2.0	10.4
DIGESTIVE CONDITION	71.5	14.2	36.1
FRACTURE/DISLOCATION	68.5	80.5	35.7
SPRAINS/STRAINS	71.5	18.6	38.9
OPEN WOUNDS/LACERATIONS	19.4	35.8	45.9
CONTUSIONS/SUPERFICIAL INJ	27.4	6.9	17.4
OTHER CURRENT INJURIES	42.7	68.2	46.7
EYE DISEASES	27.7	1.7	19.9
EAR DISEASES	179.8	35.4	66.0
HEADACHES	0.0	12.1	11.1
GENITO-URINARY	0.0	11.8	21.7
COMPLICATIONS PREG/BIRTH	0.0	17.0	30.9
SKIN DISEASES	15.3	13.7	40.4
MUSCULOSKELITAL	58.0	1.8	25.7
CIRCULATORY DISEASES	17.7	3.5	3.8
OTHER ACUTE CONDITIONS	151.2	28.2	36.8
TOTAL	3153.9	1603.0	2100.9

TABLE 5B: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

CHRONIC CONDITIONS	KALAPANA	HAWAII COUNTY	STATE
TUBERCULOSIS	3.2	0.0	1.4
TUBERCULOSIS, INACTIVE	1.5	0.4	3.4
INFECTIVE/PARASITIC	17.7	2.6	4.7
MALIGNANT NEOPLASM	6.2	6.9	6.4
BENIGN NEOPLASM	0.8	2.1	4.1
THYROID DISEASE	5.1	5.5	7.8
DIABETES	26.5	24.9	18.2
ANEMIA	0.0	0.3	0.6
OTHER BLOOD DISEASES	0.0	0.4	1.3
HEADACHES	8.7	2.3	7.6
MENTAL/NERVOUS	14.0	8.8	11.4
RHEUMATIC FEVER, INACTIVE	7.1	0.3	2.8
RHEUMATIC FEVER	1.9	0.5	2.1
HEART DISEASE	16.7	17.1	19.6
CEREBROVASCULAR	0.8	3.5	4.4
HYPERTENSION	55.2	95.0	77.1
VARICOSE VEINS	14.7	5.1	6.9
HEMORROIDS	18.2	8.5	11.1
OTHER CIRCULATORY SYSTEM	10.3	2.8	3.6
BRONCHITIS	25.4	7.5	12.8
EMPHYSEMA	5.4	2.6	2.6
ASTHMA	40.8	27.9	34.5
HAYFEVER	53.7	30.1	56.8
SINUSITIS	39.0	14.1	25.7
OTHER RESPIRATORY	23.0	1.5	3.6

TABLE 5B: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

CHRONIC CONDITIONS (CONT.)	KALAPANA	HAWAII COUNTY	STATE
PEPTIC ULCER	6.3	5.6	5.8
HERNIA	0.8	1.6	4.4
GALLBLADDER	10.2	4.7	8.5
OTHER DIGESTIVE	25.6	6.2	13.3
ABNORMAL MENSTRATION	0.0	0.0	0.7
MENOPAUSAL CONDITION	0.0	0.6	1.4
KIDNEY DISEASE	17.5	1.7	5.6
OTHER URINARY DISEASE	0.0	1.1	1.6
GENITAL DISORDERS	10.6	4.1	5.8
SKIN DISORDERS	45.6	21.0	43.6
ARTHRITIS	59.1	29.4	30.8
MUSCULOSKETAL	15.3	7.5	6.4
FRACTURES/INJURIES	1.6	0.0	0.1
BLIND(TOTAL)	4.7	0.4	0.3
VISUAL IMPAIRMENT	18.8	7.6	10.9
HEARING IMPAIRMENT	29.1	32.4	34.0
SPEECH/INTELLECT IMPAIRMENT	0.0	3.2	3.9
PARALYSIS	0.8	4.4	5.8
ABSENCE OF EXTREMITIES	5.5	3.7	2.9
BACK/SPINE IMPAIRMENTS	63.6	30.3	50.9
UPPER EXTREMITY IMPAIRMENTS	11.3	5.6	10.9
LOWER EXTREMITY IMPAIRMENTS	34.2	15.0	25.3
OTHER IMPAIRMENTS	2.7	16.1	12.1
OTHER CHRONIC	63.3	45.6	62.6
TOTAL	822.6	518.5	678.4

TABLE 5C: AGE SPECIFIC AND AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

ACUTE CONDITIONS:	AGE:								TOTAL	AGE ADJUSTED TOTAL
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
MEASLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RUBELLA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHICKEN POX/MUMPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VIRUS, NEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER INFECT/PARASITIC	0.0	175.2	0.0	162.2	163.3	0.0	0.0	0.0	106.5	85.4
COLD	2891.6	1401.5	1333.3	1459.5	734.7	666.7	1230.8	292.7	1331.4	1301.8
OTHER UPPER RESPIRATORY	1156.6	700.7	800.0	810.8	979.6	666.7	307.7	878.0	834.3	788.6
OTHER RESPIRATORY	433.7	438.0	0.0	243.2	408.2	0.0	0.0	0.0	284.0	227.4
DENTAL CONDITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DIGESTIVE CONDITION	0.0	0.0	0.0	81.1	0.0	333.3	0.0	292.7	53.3	71.5
FRACTURE/DISLOCATION	0.0	87.6	0.0	0.0	0.0	0.0	307.7	292.7	53.3	68.5
SPRAINS/STRAINS	0.0	0.0	0.0	81.1	0.0	333.3	0.0	292.7	53.3	71.5
OPEN WOUNDS/LACERATIONS	0.0	0.0	0.0	0.0	163.3	0.0	0.0	0.0	35.5	19.4
CONTUSIONS/SUPERFICIAL INJ	0.0	87.6	0.0	0.0	81.6	0.0	0.0	0.0	35.5	27.4
OTHER CURRENT INJURIES	0.0	87.6	0.0	81.1	81.6	0.0	0.0	0.0	53.3	42.7
EYE DISEASES	0.0	0.0	0.0	0.0	0.0	0.0	307.7	0.0	17.8	27.7
EAR DISEASES	722.9	262.8	0.0	81.1	81.6	0.0	307.7	0.0	195.3	179.8
HEADACHES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GENITO-URINARY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMPLICATIONS PREG/BIRTH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SKIN DISEASES	0.0	0.0	0.0	81.1	0.0	0.0	0.0	0.0	17.8	15.3
MUSCULOSKELITAL	0.0	87.6	0.0	162.2	81.6	0.0	0.0	0.0	71.0	58.0
CIRCULATORY DISEASES	0.0	87.6	0.0	0.0	0.0	0.0	0.0	0.0	17.8	17.7
OTHER ACUTE CONDITIONS	144.6	175.2	266.7	243.2	0.0	0.0	0.0	292.7	142.0	151.2
TOTAL	5349.4	3591.2	2400.0	3486.5	2775.5	2000.0	2461.5	2341.5	3301.8	3153.9

TABLE 5C: AGE SPECIFIC AND AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

HAWAII COUNTY ACUTE CONDITIONS:	A G E:								TOTAL	AGE ADJUSTED
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
MEASLES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RUBELLA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHICKEN POX/MUMPS	30.2	8.5	0.0	0.0	0.0	0.0	0.0	0.0	5.9	4.8
VIRUS, NEC	47.8	24.9	0.0	77.3	17.6	0.0	0.0	22.5	29.0	28.4
OTHER INFECT/PARASITIC	36.8	27.5	0.0	76.0	38.8	0.0	0.0	0.0	28.0	28.3
COLD	2835.4	693.4	242.7	494.8	353.4	379.7	797.6	1085.7	926.8	830.7
OTHER UPPER RESPIRATORY	173.2	366.4	168.6	417.6	439.5	504.0	244.8	536.5	356.6	357.4
OTHER RESPIRATORY	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.0
DENTAL CONDITION	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.0
DIGESTIVE CONDITION	59.1	0.0	29.3	13.4	0.0	0.0	0.0	27.1	15.3	14.2
FRACTURE/DISLOCATION	22.7	34.1	299.8	0.0	178.3	0.0	0.0	179.9	73.5	80.5
SPRAINS/STRAINS	0.0	72.0	0.0	0.0	0.0	0.0	19.8	28.3	20.5	18.6
OPEN WOUNDS/LACERATIONS	0.0	12.1	81.9	20.3	21.0	30.0	158.6	0.0	33.3	35.8
CONTUSIONS/SUPERFICIAL INJ	16.0	17.4	0.0	0.0	0.0	0.0	19.8	0.0	7.8	6.9
OTHER CURRENT INJURIES	124.9	43.7	103.4	47.8	69.2	45.6	89.4	55.7	68.8	68.2
EYE DISEASES	0.0	0.0	0.0	0.0	14.4	0.0	0.0	0.0	1.5	1.7
EAR DISEASES	133.6	30.7	40.1	15.4	14.3	52.5	10.4	0.0	38.1	35.4
HEADACHES	16.0	0.0	32.0	0.0	14.1	16.9	18.2	20.3	11.7	12.1
GENITO-URINARY	0.0	15.4	24.3	18.9	0.0	22.5	0.0	0.0	10.9	11.8
COMPLICATIONS PREG/BIRTH	0.0	0.0	98.9	27.2	0.0	0.0	0.0	0.0	13.6	17.0
SKIN DISEASES	19.1	10.5	0.0	30.0	33.2	0.0	0.0	0.0	13.5	13.7
MUSCULOSKELITAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.5	2.1	1.8
CIRCULATORY DISEASES	0.0	0.0	0.0	0.0	0.0	35.5	0.0	0.0	3.3	3.5
OTHER ACUTE CONDITIONS	38.0	25.1	0.0	42.4	31.7	0.0	0.0	93.9	29.9	28.2
TOTAL	3591.0	1581.7	1121.0	1281.1	1225.5	1086.6	1358.5	2072.4	1695.0	1603.0

TABLE 5C: AGE SPECIFIC AND AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

STATE OF HAWAII ACUTE CONDITIONS:	A G E:								TOTAL ADJUSTED	AGE
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
MEASLES	4.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
RUBELLA	19.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0
CHICKEN POX/MUMPS	23.1	17.3	0.0	0.0	0.0	0.0	0.0	0.0	5.9	5.9
VIRUS, NEC	96.6	29.3	52.9	22.7	25.3	42.1	11.7	2.9	34.9	34.9
OTHER INFECT/PARASITIC	152.8	193.3	87.3	62.6	92.5	49.7	25.9	1.6	95.4	95.3
COLD	2377.0	983.2	637.6	732.3	667.6	602.5	534.0	540.1	886.5	886.5
OTHER UPPER RESPIRATORY	688.8	651.2	638.2	559.6	519.4	578.5	439.2	250.2	562.5	562.5
OTHER RESPIRATORY	88.8	12.8	53.8	1.8	21.3	19.2	12.4	18.0	25.4	25.4
DENTAL CONDITION	4.9	1.4	31.9	14.5	14.2	13.7	0.0	0.0	10.4	10.4
DIGESTIVE CONDITION	65.1	12.6	18.6	29.8	43.6	42.2	37.3	80.3	36.1	36.1
FRACTURE/DISLOCATION	6.9	50.1	52.7	19.8	32.6	31.4	31.9	62.5	35.7	35.7
SPRAINS/STRAINS	1.5	54.5	42.9	62.4	49.6	29.6	16.7	5.5	38.9	38.9
OPEN WOUNDS/LACERATIONS	81.5	36.1	67.4	26.3	35.2	59.2	76.1	4.8	45.9	45.9
CONTUSIONS/SUPERFICIAL INJ	25.7	14.6	20.1	5.0	21.2	43.0	17.4	1.3	17.4	17.4
OTHER CURRENT INJURIES	76.4	32.8	51.2	62.4	32.0	51.3	32.7	31.5	46.7	46.7
EYE DISEASES	48.6	41.0	18.1	6.0	5.9	2.4	17.0	11.3	19.9	19.9
EAR DISEASES	288.5	83.6	40.2	9.2	26.3	28.0	48.6	35.1	66.0	66.0
HEADACHES	2.2	8.4	6.3	13.6	6.6	32.2	10.3	11.7	11.1	11.1
GENITO-URINARY	23.6	1.8	23.3	36.9	20.5	53.8	12.6	3.1	21.7	21.7
COMPLICATIONS PREG/BIRTH	0.0	14.2	99.1	70.2	23.2	0.0	0.0	2.0	30.9	30.9
SKIN DISEASES	95.5	35.7	38.4	24.8	78.2	28.3	13.2	11.2	40.4	40.4
MUSCULOSKELITAL	0.0	4.7	15.8	29.2	51.1	56.8	27.1	40.3	25.7	25.7
CIRCULATORY DISEASES	0.0	5.1	0.0	5.3	9.8	3.6	0.0	3.5	3.8	3.8
OTHER ACUTE CONDITIONS	77.0	7.4	14.6	46.7	32.1	25.9	31.0	96.5	36.8	36.8
TOTAL	4249.4	2292.7	2010.3	1841.2	1808.3	1793.5	1395.3	1213.5	2100.9	2100.9

68

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

KALAPANA, HAWAII CHRONIC CONDITIONS	A G E:								TOTAL	AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
TUBERCULOSIS	0.0	0.0	0.0	6.8	0.0	0.0	0.0	24.4	3.0	3.2
TUBERCULOSIS, INACTIVE	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5
INFECTIVE/PARASITIC	12.0	14.6	0.0	40.5	13.6	0.0	25.6	24.4	19.2	17.7
MALIGNANT NEOPLASM	0.0	0.0	0.0	0.0	13.6	0.0	51.3	0.0	5.9	6.2
BENIGN NEOPLASM	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.5	0.8
THYROID DISEASE	0.0	0.0	0.0	6.8	0.0	0.0	0.0	48.8	4.4	5.1
DIABETES	0.0	0.0	22.2	6.8	0.0	83.3	51.3	122.0	17.8	26.5
ANEMIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER BLOOD DISEASES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEADACHES	0.0	7.3	0.0	6.8	27.2	27.8	0.0	0.0	10.4	8.7
MENTAL/NERVOUS	0.0	0.0	0.0	20.3	27.2	0.0	76.9	0.0	14.8	14.0
RHEUMATIC FEVER, INACTIVE	0.0	0.0	0.0	6.8	0.0	0.0	0.0	73.2	5.9	7.1
RHEUMATIC FEVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.4	1.5	1.9
HEART DISEASE	12.0	0.0	0.0	0.0	6.8	0.0	76.9	97.6	13.3	16.7
CEREBROVASCULAR	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.5	0.8
HYPERTENSION	0.0	0.0	22.2	13.5	20.4	83.3	179.5	292.7	41.4	55.2
VARICOSE VEINS	0.0	0.0	0.0	20.3	20.4	0.0	51.3	48.8	14.8	14.7
HEMORROIDS	0.0	0.0	0.0	20.3	27.2	0.0	102.6	24.4	17.8	18.2
OTHER CIRCULATORY SYSTEM	0.0	0.0	0.0	6.8	20.4	0.0	51.3	24.4	10.4	10.3
BRONCHITIS	12.0	36.5	0.0	27.0	20.4	27.8	51.3	24.4	25.1	25.4
EMPHYSEMA	0.0	0.0	0.0	0.0	6.8	0.0	51.3	0.0	4.4	5.4
ASTHMA	48.2	36.5	44.4	33.8	27.2	27.8	76.9	48.8	38.5	40.8
HAYFEVER	0.0	73.0	0.0	67.6	61.2	27.8	51.3	146.3	56.2	53.7
SINUSITIS	36.1	43.8	0.0	60.8	47.6	27.8	51.3	24.4	42.9	39.0
OTHER RESPIRATORY	24.1	21.9	0.0	13.5	13.6	27.8	102.6	0.0	20.7	23.0

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

KALAPANA, HAWAII CHRONIC CONDITIONS (CONT.)	A G E:								TOTAL	AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
PEPTIC ULCER	0.0	0.0	0.0	20.3	20.4	0.0	0.0	0.0	8.9	6.3
HERNIA	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.5	0.8
GALLBLADDER	0.0	0.0	0.0	6.8	6.8	0.0	25.6	73.2	8.9	10.2
OTHER DIGESTIVE	12.0	14.6	0.0	33.8	47.6	55.6	0.0	48.8	28.1	25.6
ABNORMAL MENSTRUATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MENOPAUSAL CONDITION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KIDNEY DISEASE	0.0	0.0	0.0	20.3	20.4	27.8	51.3	48.8	16.3	17.5
OTHER URINARY DISEASE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GENITAL DISORDERS	0.0	0.0	0.0	6.8	6.8	0.0	51.3	48.8	8.9	10.6
SKIN DISORDERS	12.0	36.5	44.4	27.0	40.8	111.1	76.9	48.8	39.9	45.6
ARTHRITIS	12.0	0.0	22.2	20.3	20.4	0.0	307.7	268.3	45.9	59.1
MUSCULOSKETAL	0.0	0.0	0.0	20.3	47.6	0.0	0.0	73.2	19.2	15.3
FRACTURES/INJURIES	0.0	0.0	0.0	0.0	13.6	0.0	0.0	0.0	3.0	1.6
BLIND(TOTAL)	0.0	0.0	0.0	0.0	0.0	27.8	0.0	24.4	3.0	4.7
VISUAL IMPAIRMENT	0.0	0.0	0.0	6.8	13.6	55.6	51.3	73.2	14.8	18.8
HEARING IMPAIRMENT	0.0	0.0	0.0	20.3	34.0	27.8	76.9	146.3	26.6	29.1
SPEECH/INTELLECT IMPAIRMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PARALYSIS	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	1.5	0.8
ABSENCE OF EXTREMITIES	0.0	7.3	0.0	6.8	0.0	27.8	0.0	0.0	4.4	5.5
BACK/SPINE IMPAIRMENTS	0.0	0.0	88.9	81.1	88.4	83.3	102.6	122.0	60.7	63.6
UPPER EXTREMITY IMPAIRMENTS	0.0	0.0	22.2	20.3	40.8	0.0	0.0	0.0	14.8	11.3
LOWER EXTREMITY IMPAIRMENTS	0.0	14.6	22.2	47.3	54.4	27.8	51.3	73.2	35.5	34.2
OTHER IMPAIRMENTS	0.0	0.0	0.0	0.0	6.8	0.0	0.0	24.4	3.0	2.7
OTHER CHRONIC	24.1	14.6	22.2	33.8	95.2	83.3	153.8	195.1	60.7	63.3
TOTAL	204.8	328.5	311.1	729.7	938.8	861.1	2000.0	2317.1	778.1	822.6

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

HAWAII COUNTY CHRONIC CONDITIONS:	A G E:									AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +	TOTAL	
TUBERCULOSIS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TUBERCULOSIS, INACTIVE	0.0	0.0	0.0	0.0	0.0	0.0	1.6	3.2	0.4	0.4
INFECTIVE/PARASITIC	1.4	5.2	0.0	2.4	2.7	3.0	1.6	2.0	2.6	2.6
MALIGNANT NEOPLASM	0.0	0.0	0.0	1.6	5.3	3.2	3.3	67.2	7.7	6.9
BENIGN NEOPLASM	0.0	0.0	2.1	1.3	2.7	5.7	1.2	7.5	2.0	2.1
THYROID DISEASE	0.0	1.0	3.0	4.9	8.6	8.9	11.3	13.4	5.3	5.5
DIABETES	0.0	0.0	0.0	12.1	12.0	49.4	59.7	137.9	26.3	24.9
ANEMIA	0.0	0.0	0.0	0.0	1.2	0.0	1.2	0.0	0.2	0.3
OTHER BLOOD DISEASES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.4	0.4
HEADACHES	0.0	3.2	2.5	3.2	1.4	2.8	0.0	4.2	2.3	2.3
MENTAL/NERVOUS	0.0	1.3	5.5	6.3	21.5	25.4	12.1	6.4	8.2	8.8
RHEUMATIC FEVER, INACTIVE	0.0	0.0	0.0	0.9	0.0	0.0	0.0	1.6	0.3	0.3
RHEUMATIC FEVER	0.0	0.7	0.0	0.0	0.0	3.8	0.0	0.0	0.5	0.5
HEART DISEASE	2.2	1.5	7.8	3.1	10.5	24.7	39.2	99.3	18.1	17.1
CEREBROVASCULAR	0.0	0.0	0.0	0.0	0.0	0.0	4.6	39.6	4.1	3.5
HYPERTENSION	0.0	1.1	5.5	21.6	53.4	146.7	351.1	474.5	100.3	95.0
VARICOSE VEINS	0.0	0.0	0.0	4.7	6.0	6.9	17.2	16.3	5.2	5.1
HEMORROIDS	0.0	0.5	5.3	6.0	17.8	24.4	20.3	3.8	8.0	8.5
OTHER CIRCULATORY SYSTEM	0.0	0.7	0.0	0.0	1.8	3.2	4.3	22.1	3.1	2.8
BRONCHITIS	9.4	9.0	7.3	9.6	2.1	6.1	7.7	5.6	7.6	7.5
EMPHYSEMA	0.0	0.0	0.0	0.0	0.0	3.2	12.6	14.7	2.8	2.6
ASTHMA	65.9	30.7	17.5	18.3	38.9	17.7	20.1	15.9	29.3	27.9
HAYFEVER	6.0	53.4	13.5	39.7	38.4	24.4	16.0	14.5	29.8	30.1
SINUSITIS	2.5	11.1	14.7	16.2	21.5	15.9	23.8	6.1	13.4	14.1
OTHER RESPIRATORY	0.0	0.0	0.0	1.4	0.0	7.0	3.9	2.7	1.5	1.5

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

HAWAII COUNTY CHRONIC CONDITIONS (CONT.)	A G E:									AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +	TOTAL	
PEPTIC ULCER	0.0	1.0	4.8	3.7	5.9	14.7	11.1	12.3	5.5	5.6
HERNIA	0.0	0.0	0.0	1.1	1.2	4.0	1.9	8.7	1.7	1.6
GALLBLADDER	0.0	0.0	3.0	1.1	2.5	14.3	15.6	12.5	4.6	4.7
OTHER DIGESTIVE	1.6	1.3	5.5	6.4	10.0	5.0	10.9	15.5	6.1	6.2
ABNORMAL MENSTRUATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MENAPAUSSAL CONDITIONS	0.0	0.0	0.0	0.0	0.0	0.0	6.4	0.0	0.6	0.6
KIDNEY DISEASE	0.0	0.0	1.3	1.5	2.9	4.3	1.5	4.9	1.7	1.7
OTHER URINARY DISEASE	0.0	0.0	2.5	0.0	1.2	1.4	0.0	6.9	1.1	1.1
GENITAL DISORDERS	0.0	1.3	3.2	3.8	3.8	5.0	3.7	18.3	4.2	4.1
SKIN DISORDERS	34.1	12.5	25.3	22.1	21.9	11.4	26.0	21.4	21.1	21.0
ARTHRITIS	1.6	1.8	0.0	4.0	17.9	48.8	87.4	168.0	31.4	29.4
MUSCULOSKETAL	0.0	0.0	8.9	2.8	4.2	12.8	15.7	34.1	7.5	7.5
FRACTURES/INJURIES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLIND(TOTAL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.5	0.4
VISUAL IMPAIRMENT	0.0	2.9	0.0	0.0	2.6	6.6	12.4	62.2	8.5	7.6
HEARING IMPAIRMENT	1.0	7.3	6.9	16.1	25.4	58.2	50.2	173.1	34.0	32.4
SPEECH/INTELLECT IMPAIRMENT	3.5	2.6	6.9	1.3	1.6	9.3	0.0	1.7	3.1	3.2
PARALYSIS	1.4	0.0	0.0	1.3	8.4	0.0	0.0	38.3	4.8	4.4
ABSENCE OF EXTREMITIES	0.0	0.4	3.1	3.6	1.6	9.3	7.3	10.7	3.7	3.7
BACK/SPINE IMPAIRMENTS	0.0	2.2	23.7	39.8	61.8	43.3	48.9	44.0	28.6	30.3
UPPER EXTREMITY IMPAIRMENTS	1.4	2.0	2.9	6.3	10.1	2.5	7.0	18.6	5.6	5.6
LOWER EXTREMITY IMPAIRMENTS	1.6	11.8	8.0	15.0	24.4	11.8	18.2	37.3	14.9	15.0
OTHER IMPAIRMENTS	30.8	16.3	0.0	28.9	12.6	11.9	10.6	7.5	16.7	16.1
OTHER CHRONIC	10.4	25.2	21.9	20.3	55.7	39.7	77.2	195.9	47.4	45.6
TOTAL	174.7	207.8	212.2	332.3	521.7	696.5	1024.5	1861.0	532.8	518.5

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

HAWAII STATE CHRONIC CONDITIONS:	A G E:								TOTAL	AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
TUBERCULOSIS	0.0	0.7	0.2	1.3	1.9	2.8	4.0	2.0	1.4	1.4
TUBERCULOSIS, INACTIVE	0.0	0.9	4.4	2.3	2.3	2.8	7.2	13.8	3.4	3.4
INFECTIVE/PARASITIC	7.8	2.9	4.3	7.6	4.5	2.6	2.1	5.1	4.7	4.7
MALIGNANT NEOPLASM	0.0	1.8	3.1	1.3	3.4	10.0	16.1	32.7	6.4	6.4
BENIGN NEOPLASM	0.0	1.6	4.1	2.3	6.7	6.9	8.5	7.9	4.1	4.1
THYROID DISEASE	2.7	0.3	1.9	5.1	18.6	11.0	17.3	18.1	7.8	7.8
DIABETES	0.0	1.8	0.4	6.0	13.5	28.4	56.1	90.5	18.2	18.2
ANEMIA	0.0	0.7	0.9	0.7	0.8	0.1	0.1	1.5	0.6	0.6
OTHER BLOOD DISEASES	0.3	0.1	0.6	0.8	0.0	1.5	5.9	4.2	1.3	1.3
HEADACHES	0.0	5.3	11.6	11.5	13.1	9.4	2.5	2.6	7.5	7.6
MENTAL/NERVOUS	2.1	4.7	12.6	15.3	16.2	17.1	12.6	13.6	11.4	11.4
RHEUMATIC FEVER, INACTIVE	0.0	1.0	2.9	2.7	5.2	3.5	3.2	6.1	2.8	2.8
RHEUMATIC FEVER	0.0	0.9	1.0	1.5	3.2	6.4	3.3	2.3	2.1	2.1
HEART DISEASE	3.1	1.8	8.0	5.9	12.5	24.7	50.3	105.8	19.6	19.6
CEREBROVASCULAR	0.8	0.8	0.0	0.6	0.5	3.5	10.3	34.3	4.4	4.4
HYPERTENSION	0.3	0.1	4.7	19.2	59.1	156.6	267.9	330.9	77.1	77.1
VARICOSE VEINS	0.0	0.0	1.7	5.3	8.0	13.5	21.7	18.7	6.9	6.9
HEMORRHOIDS	0.0	1.1	4.0	15.0	22.3	19.7	19.1	15.6	11.1	11.1
OTHER CIRCULATORY SYSTEM	1.1	0.6	1.7	0.8	2.7	5.5	10.3	14.9	3.5	3.6
BRONCHITIS	13.0	10.9	9.5	14.3	14.9	14.0	11.0	16.3	12.8	12.8
EMPHYSEMA	0.0	0.4	0.0	0.0	2.2	1.3	10.0	15.1	2.6	2.6
ASTHMA	44.3	57.0	28.9	28.1	26.4	24.9	19.3	29.3	34.5	34.5
HAYFEVER	18.6	60.0	63.9	73.9	69.5	64.8	41.1	34.8	56.8	56.8
SINUSITIS	2.4	15.5	22.8	46.0	47.9	23.2	19.2	15.4	25.7	25.7
OTHER RESPIRATORY	4.9	2.8	1.3	3.1	4.5	2.5	5.8	6.3	3.6	3.6

TABLE 5D: AGE ADJUSTED RATES PER 1000 POPULATION BY AREA, HAWAII 1986

HAWAII STATE CHRONIC CONDITIONS (CONT.)	A G E:								TOTAL	AGE ADJUSTED RATES
	UNDER 6	6-17	18-24	25-34	35-44	45-54	55-64	65 +		
PEPTIC ULCER	0.0	0.8	1.0	8.1	8.2	10.0	11.0	13.7	5.8	5.8
HERNIA	1.4	0.8	0.9	4.2	5.9	5.1	10.2	13.9	4.4	4.4
GALLBLADDER	0.0	0.0	1.5	4.4	6.5	17.1	31.5	28.3	8.5	8.5
OTHER DIGESTIVE	6.4	1.6	11.1	14.3	13.3	16.8	25.7	34.0	13.3	13.3
ABNORMAL MENSTRUATION	0.0	0.0	1.4	1.6	1.1	0.9	0.0	0.0	0.7	0.7
MENOPAUSAL CONDITIONS	0.0	0.0	0.0	0.0	0.2	8.5	4.9	0.6	1.4	1.4
KIDNEY DISEASE	1.4	1.0	5.6	3.0	6.4	12.1	12.6	11.6	5.6	5.6
OTHER URINARY DISEASE	0.0	1.1	3.4	0.4	2.2	0.9	1.0	6.1	1.6	1.6
GENITAL DISORDERS	0.0	0.9	3.9	8.2	4.7	8.0	10.7	16.9	5.9	5.8
SKIN DISORDERS	34.4	39.2	55.9	48.5	42.1	48.0	31.8	47.2	43.6	43.6
ARTHRITIS	0.2	0.8	5.3	11.4	25.1	42.1	89.3	160.4	30.8	30.8
MUSCULOSKETAL	0.0	1.2	1.6	4.0	7.6	12.7	13.9	22.9	6.4	6.4
FRACTURES/INJURIES	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.1
BLIND(TOTAL)	0.0	0.0	0.3	0.0	0.0	0.0	2.5	1.1	0.3	0.3
VISUAL IMPAIRMENT	0.8	2.2	2.4	4.8	6.7	11.7	18.5	70.6	10.9	10.9
HEARING IMPAIRMENT	4.0	9.3	10.3	12.7	23.7	46.4	74.9	176.3	34.0	34.0
SPEECH/INTELLECT IMPAIRMENT	8.3	6.2	1.9	1.1	0.9	4.8	5.3	3.6	3.9	3.9
PARALYSIS	3.8	2.4	2.5	1.3	3.1	6.2	14.5	27.0	5.8	5.8
ABSENCE OF EXTREMITIES	0.0	0.2	2.5	1.7	2.9	3.6	6.1	11.9	2.9	2.9
BACK/SPINE IMPAIRMENTS	1.4	8.0	35.7	66.7	81.4	86.8	80.4	85.0	50.9	50.9
UPPER EXTREMITY IMPAIRMENTS	0.2	4.8	5.6	13.7	13.1	16.4	20.7	20.4	10.9	10.9
LOWER EXTREMITY IMPAIRMENTS	0.9	9.8	23.6	29.6	31.5	31.4	41.6	53.8	25.4	25.3
OTHER IMPAIRMENTS	10.5	11.8	8.7	10.4	8.2	8.9	13.7	31.7	12.1	12.1
OTHER CHRONIC	34.6	27.5	29.3	42.6	65.6	75.5	104.8	218.3	62.6	62.6
TOTAL	210.1	303.1	409.8	563.5	720.6	930.7	1250.5	1893.5	678.4	678.4