The okuu *of 1804—probably Asiatic cholera—quite likely killed closer to 5,000 than the 175,000 which it's been credited.*

The *Okuu*–Hawaii's Greatest Epidemic

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HISTORIANS HAVE for many years described the *okuu* as Hawaii's greatest epidemic This disease, thought by some authorities to have been cholera, struck Oahu around 1804. Over one-half of the population of the kingdom, perhaps as many as 175,000 persons, were said to have died from it. Mortality of such magnitude would make the *okuu* the most catastrophic event in Island history, far surpassing all other disasters of recorded history, and leaving lasting scars on the social, political, demographic, and economic character of the archipelago. In spite of its apparent importance, it has surprisingly rated only a few lines in most general histories, and no systematic analysis of its reported mortality has so far appeared in print. The present paper is accordingly concerned with this question: How many persons did the *okuu* kill?

Many writers have contended that one-half, or even a majority, of the population died in this epidemic, but others have been more conservative. Some applied these rates to the entire kingdom, while a few limited them to Oahu. One source confined mortality to two-thirds of an army of 8,000, another gave it as one-eighth of the total population, and a third suggested annual crude death rates of either 441 or 482 per 1,000 inhabitants in the year of the plague. A few have proposed absolute figures: 22,000 (on "Oahu alone"); 112,000-128,000 (net decline for all islands); and 175,000. Others have been satisfied with broad descriptive terms, such as "a vast number," "multitudes," or "dreadful havoc." One skeptic attributed the higher figures to "legendary exaggeration," and many later writers have remained cautiously noncommittal. General agreement as to the great severity of the epidemic has thus been accompanied by widely varying opinions in respect to actual mortality levels.

This lack of consensus extends to the Hawaiian name, diagnosis, origin, geographic extent, and year of the *okuu*. Initially referred to simply as "a disease," "plague," or "epidemic," it eventually was described by a number of Hawaiian names: *ikipuahola, po'okole, mai ahulau, kauokuu, mai okuu, ahulau okuu,* or, most commonly, *okuu*. Most authorities have identified it as cholera or possibly bubonic plague, but two of the earliest described it as yellow fever and some of the most recent have suggested dysentery, typhoid fever, or a "vomiting illness." A contemporary observer reported that the *okuu* was brought by an American ship, a later student blamed Krusenstern's ships, and a third suggested that its origin was China by way of the sandalwood trade. Considerable dispute is evident as to whether the epidemic was confined to Oahu or spread throughout the kingdom. Although most historians have dated its onset as 1804, at least one writer can be found in favor of each of the years from 1802 to 1807.

The sources for these statements differ widely in credibility. The chief contemporary reference was based on hearsay. The most frequently cited descriptions were not put into writing before 1835, or even the 1860's. The recollections of unnamed oldsters were usually the basis for these accounts. Like earlier tales of Hawaiian battlefield mortality, the estimates of the *okuu* toll seemed to grow with every passing year.

The earliest recorded reference to the *okuu* was that of Urey Lisiansky, who visited Kealakekua, Hawaii, and Waimea, Kauai, in June, 1804. Under date of June 18, Lisiansky wrote:

> On leaving Carracacoa [Kealakekua], I proposed making for the island of Wahoo, to see the king of Owhyhee, who was there with his army. . . . Learning, however, that a species of epidemic disease was raging in that island, I relinquished my intention, and took my course for Otooway [Kauai].[1]

The following day he wrote: "I informed him [Tamoory (Kamualii), ruler of Kauai] that the king was at present on the island of Wahoo; and that he would have been at Otooway long ago, but for an epidemic disease, which had spread amongst his troops, and would perhaps oblige him to relinquish his conquests, and return home."[2] Lisiansky later noted: "By Mr. Young's account, the forces of Hamamea now consist of about seven thousand natives and fifty Europeans."[3]

William Mariner was the second person to record the *okuu*. On October 10, 1806 his ship

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"came to an anchor in Anahooroo Bay. Whilst waiting for an opportunity to enter the close harbour, the inhabitants came on board and traded. In the mean time, the chief of the island, hearing that they had a sick man on board, refused them permission to enter the close harbour, being afraid of introducing disease into the country, which calamity had happened on a former occasion, from an American ship."[4] It is not clear whether this account, written sometime after 1811 and published in 1817, was based on notes made during Mariner's voyage or on his later recollections.

The third published reference to an epidemic at this time was made by Isaac Iselin. While visiting Kealakekua on May 22 ,1807, Iselin wrote "The depopulation is evident and may, in some manner, be accounted for, by the absence of the chiefs and warriors, and still more for a kind of epidemic or yellow fever, said to have been brought to these Islands a few years ago, and which makes dreadful havoc amongst the natives."[5]

Other visitors during this period surprisingly failed to mention the epidemic. Among this group were Richard J. Cleveland, a visitor to Hawaii, Maui and Oahu during the summer of 1803; G. H. Von Langsdorff, on the Big Island in June 1804; William Shaler, on Hawaii, Oahu and Kauai from August 19 to October 27, 1805; Samuel Patterson, who reached the Big Island in December 1805; an unnamed sea captain, a visitor sometime before August 1806; Amasa Delano, on Oahu in September 1806; and "a respectable American" who was living on Maui during the catastrophic drought and famine of 1806-1807.[6] Shaler, incidentally, observed only "700 men under arms" but was told by Kamehameha that "if I would agree to wait a few days, he would assemble ten times the number."[7]

No further mention of the *okuu* appears in the literature until April 20, 1822, when Tyerman and Bennet, then visiting Oahu, briefly referred to it:

> In the year 1804, when the late king, Tamehameha, was on his way from Hawaii, to invade Tauai, he halted with an army of eight thousand men at Oahu. The yellow fever broke out among the troops, and in the course of a few days swept away more than two thirds of them.[8]

The toll thus indicated soon began to grow. Ellis, a resident during 1822 and 1823, attributed "the rapid depopulation which has most certainly taken place within the last fifty years" in part to "the ravages of a pestilence brought in the first instance by foreign vessels, which has twice, during the above period, swept through the islands."[9] After a tour "a few miles east of Honoruru" in February 1828, Levi Chamberlain wrote:

> The land all around for several miles has the appearance of having been once under cultivation. I entered into conversation with the natives respecting its present neglected state. They ascribed it to the decrease of population. There have been two seasons of destructive sickness, both within the period of thirty years, by which, according to the account of the natives, more than one half of the population of the island was swept away. The united testimony of all of whom I have ever made any inquiry respecting the sickness, has been that, "Greater was the number of the dead, than of the living."[10]

The first native description of this disease was that written by some of the older students at Lahainaluna about 1835-1836.[11] They stated that Kamehameha moved to Oahu around 1802, "where he was seized by a malignant epidemic, then common, from which he recovered, but which proved fatal to a multitude of his subjects, and by which his remaining counsellors were cut down."[12] They added that "the majority of the inhabitants [were] cut down by it. No proper care could be taken of the sick. Men perfectly well in the morning were dead in the evening. . . . This sickness, called *kauokuu*, greatly diminished the population."[13]

David Malo later elaborated on this account. In an article, published in 1839, he wrote: "In the reign of Kamehameha, from the time I was born (1793) until I was nine years old, the pestilence, (*mai ahulau,*) visited the Hawaiian islands, and the majority (*ka pau nui ana*) of the people from Hawaii to Niihau, died."[14] In a much longer work prepared about 1840, Malo added:

> During Waia's reign [in ancient times] Hawaii nei was visited by a pestilence, *mai ahulau,* which resulted in a great mortality among the people. Only twenty-six persons were left alive, and these were saved and cured by the use of two remedies, *pilikai* and *loloi.*
>
> This pestilence was called *ikipuahola* by the ancients.
>
> Kama, the Hawaiian medicine-man *(kahuna-lapaau),* gave it as his opinion that the *ikipuahola* was of the same nature as the *okuu,* the pestilence which appeared in 1804 in the reign of Kamehameha I.
>
> Kama made this statement to his grandson Kuauau, and one year before the appearance of this pestilence Kama foretold its arrival. The circumstances were as follows:
>
> Kamehameha was at Kawaihae, making preparations for his *peleleu* expedition to Oahu. At that time Kama was taken sick unto death, when he made the following statement to Kuauau.
>
> "I am about to die, but you will witness a great pestilence that is soon to make its appearance among us. You will doubtless be weary and worn out with your labors as a physician, because this is the same disease as that which raged in the time of Waia. . . ."
>
> "How do you know that this disease is the same as *ikipuahola?*" asked Kuauau. To this Kama answered,

"My instructor once told me that if a distemper associated with buboes *(hahai)* and a skin eruption *(meeau)* were to show itself, a short time thereafter this disease would make its appearance. So the ancients told him, and so my preceptor Kalua told me."

After that Kamehameha sailed for Oahu and the pestilence in truth made its appearance, raging from Hawaii to Kauai. A vast number of people died and the name *okuu* was applied to it.

After Waia's time another pestilence called *hai-lepo* invaded the land and caused the death of a large number of the people. Only sixteen recovered, being saved by the use of a medicine which was composed of some kind of earth *(lepo)*.[15]

Jarves reported that "the great pestilence of 1803 destroyed multitudes, and has been supposed to have partaken of the character of the Asiatic Cholera."[16] He asserted that it spread from Kamehameha's army to the rest of Oahu, and added: "Three hundred dead bodies are said to have been carried out to sea from Waikiki in one day."[17]

Still another description appeared in a long article in the *Pacific Commercial Advertiser* on November 6, 1862: "The old natives on Hawaii still speak of it with a kind of horror and dread, and describe it as the most terrible scourge that ever visited the group, causing wailing in every house. . . . From the descriptions which have been given by those who witnessed it, physicians believe it to have been the *Asiatic cholera* . . . The most reliable accounts and verbal traditions state that the plague took off more than *one-half of the population* . . . [and] the population was reduced in two years from 350,000 to 175,000 . . ."

The next contribution was made by W. Kahala, a resident of Kekaha, Puna, Hawaii. On January 31, 1863, Mr. Kahala wrote to *Ka Nupepa Kuokoa* that he had "inquired of an ancient man of the reign of Kamehameha I, regarding a disease called *Okuu*" and had received the following reply:

The Okuu was the pestilence which had claimed the lives of many men, women and children and it also took the majority of the population in death. There was no other disease equal to this one.

The number of deaths daily from here and there in these islands was 40 in some places, 80 in other places, 120 in some parts, 400 in still other parts and there were less than 40 deaths in some places. The death toll was greater where there were more people.

The length of time in which this epidemic devastated the population was probably almost three months or more with many deaths occurring from day to day.[18]

Lorrin Andrews' *Dictionary*, published in 1865, said that the *okuu* was so called "because the people okuu wale aku no i ka uhane, i.e., dismissed freely their souls and died." Andrews dated the epidemic in 1807.[19]

Additional clinical details were provided by Samuel Kamakau in 1867: "It was a very virulent pestilence, and those who contracted it died quickly. A person on the highway would die before he could reach home. . . . The body turned black at death. A few died a lingering death, but never longer than twenty-four hours; if they were able to hold out for a day they had a fair chance to live. Those who lived generally lost their hair, hence the illness was called 'Head stripped bare' (*po'o-kole*)."[20] Kamakau added that this disease—he thought it was cholera—was brought to Oahu by foreign ships in 1804.[21]

John Papa Ii, writing at the same time as Kamakau, put the *okuu* in 1806, at least two years later than Kamehameha's illness, which Ii failed to identify.[22]

In 1897 Thomas G. Thrum recalled "a well known old time resident of Kauai once speaking of it having been described to him by natives of his district as very much resembling the black plague. . . . It probably had its origin by contagion from China through the sandal wood trade then opening up between the two countries."[23]

The most detailed description of the *okuu* was one published in 1935 by Arthur A. St. Maur Mouritz, a physician who had settled in Hawaii in 1883. This citationless account of "a mysterious malady which ravaged Hawaii in the year 1804, and named by the Hawaiian people the Ahulau Okuu" mentioned "intense pains in their bellies and cramps in their legs" and continued: ". . . thin discharges like sour starch water flowed frequently from the bowels; some vomited continuously; their faces and bodies became blue and cold like the dead, their eyes grew small and sank into the head . . ." Identifying this disease as malignant Asiatic Cholera, Mouritz asserted that it "caused 22,000 deaths on the island of Oahu alone," and speculated that it may have reached Hawaii in bilge water pumped from Krusenstern's ships into Honolulu Harbor.[24] Characteristically, Mouritz provided no clues to his sources for this wealth of detail.

In an untitled, undated and unpublished manuscript, Romanzo Adams, the pioneer Hawaiian demographer, attempted to estimate population and vital rates for this period. He explained: "I have credited Malo's estimate as not far from correct, but have estimated the loss a little lower than he did." In one draft, Adams showed a population decline of 112,000 between 1803 and 1804, based on a crude birth rate of 20 per 1,000 inhabitants and a crude death rate of 441. In another draft, Adams gave the net decline (between 1804 and 1805 this time) as 128,000, with a birth rate of 25 and death rate of 482.[25]

Recent writers have continued to speculate

about this mystery. Kuykendall (1938) referred to the epidemic as the *mai okuu* and surmised that it may have been cholera or bubonic plague.[26] Hormann (1949) dubbed it "the vomiting sickness."[27] Taff (1949) mentioned the possibility that the *okuu* was dysentery, noted that "estimates of the dead were as high as one-eighth of the population," and concluded that "it was second only to a later epidemic in fatality."[28] Halford (1954) reported its date as 1805.[29] Daws (1968) wrote that the epidemic "was probably cholera or typhoid fever."[30]

What is probably the most authoritative analysis of the *okuu* to date was offered by Dr. Walter B. Quisenberry, Director of Health for the State of Hawaii, after reading an earlier draft of this article:

> I have had the doctors in the Communicable Disease Division and Epidemiology Branch review your paper and they also showed great interest in the historical aspect but were hard put to come to any definite conclusion as to the nature or size of the *okuu* epidemic.
>
> The reference which you quote reflects considerable disagreement as to the size of the epidemic. This question probably will never be completely settled. However, from an epidemiologic and clinical point of view, the contradictions in the material do not seem to be so great that a fairly accurate "epidemiologic guess" cannot be made. The characteristics of the disease are sketchy but sufficient to describe the basic nature of the disease and to provide an interesting exercise in running down the clues as they are introduced and can be fitted together as one would a picture puzzle or a detective story. Considered together, the information available seems to permit the exclusion of all diseases except one with a fairly high probability of accuracy.
>
> As described, the epidemic of 1803 was characterized by its explosive nature, therefore probably not vectorborne; by its high fatality rate with rapid (1-2 day) course; and by being a diarrheal, wasting disease without skin eruption. This would rule out most of the severe epidemic diseases, except cholera, which has been present in Asia continuously and was known to have reached California in the early 1800's.[31]

What conclusions can be drawn from this wide range of materials?

The literature reveals considerable disagreement. Historians differ on the Hawaiian name, diagnosis, origin, geographic extent, year, and death toll of the epidemic. The estimates of mortality—the primary concern of this paper—are especially divergent.

First-hand evidence is totally lacking. Lisiansky was visiting another island at the time and heard about the epidemic from others. Mariner and Iselin arrived two or three years too late to witness the disease directly. Tyerman and Bennet did not learn of it until 1822, and Malo's descriptions first appeared after 1835. Five original accounts were initially reduced to writing in the 1860's. Few of these writers bothered to credit their sources, although many seemed to rely on native informants of advanced years.

These accounts grew appreciably in wealth of detail and degree of horror with the passing years. Early references to the epidemic were brief and subdued. After mid-century, however, descriptions were longer and more gruesome, and estimates of the death toll were as high as 175,000. In this respect stories of the *okuu* followed the pattern of accounts of Hawaiian battle mortality, which seemed to grow in bloodshed with every telling. Stokes has traced a number of these stories; the defenders of Oahu in 1795, for example, lost only 300 men according to contemporary sources, 3,000 in an 1854 account, and 10,000 by 1914.[32] Evaluating statements that epidemic mortality carried off more than half of the population, Chamberlain made "due allowance for the hyperbolical manner in which the natives sometimes express themselves," and Kuykendall suspected "legendary exaggeration."[33]

The failure of several persons who visited Hawaii during or soon after the *okuu* to make any reference to it may be especially significant. Kuykendall observed that "Shaler, who was at the islands in 1803 and 1805, makes no mention of the epidemic in his journal . . ., which he certainly would have done if the deaths had been as numerous as the native accounts indicate."[34] Cleveland, Von Langsdorff, Patterson, Delano, a "respectable American" living on Maui, and an unidentified sea captain, likewise omitted any reference to the disease in their otherwise detailed notes.[35]

Some of the credence accorded to the higher death figures appears to have stemmed from the obvious disparity between King's well-publicized population estimates for 1779 and the numbers estimated by the missionaries in 1823. Captain King wrote that the Sandwich Islands had approximately 400,000 inhabitants (including 60,000 on Oahu) at the time of Cook's visit, but Ellis and Stewart found only about 140,000 (20,000 of them on Oahu) forty-four years later.[36] Such apparent decline was often explained by postulating heavy epidemic mortality. It is now evident, however, that King greatly overestimated the population of the Islands. What decline did take place after first contact can readily be attributed to other factors, such as famine, warfare, infanticide, and sharp reduction in fertility caused by venereal disease.

Early visitors similarly saw evidence of vast depopulation (and, inferentially, epidemic mortality) in the numerous deserted villages and fields that dotted the landscape.[37] They failed to recognize that these abandoned settlements resulted

more from migration than from mortality. One of the more perceptive visitors, William Shaler, wrote in 1805: "In the true spirit of despotism, it is well understood that no chief of the least consequence can reside any where but near the person of the monarch, and, as he migrates through his dominions, he draws after him a train more destructive than locusts. Everything is abandoned to follow the sovereign, and the country being deserted by all who have an interest in its cultivation and improvement of the lands, they are of course neglected."[38]

The foregoing evidence makes it almost impossible to escape the conclusion that the *okuu* has been greatly exaggerated. If, as seems likely, the epidemic was limited to Oahu, the death toll was probably well under 15,000 (out of perhaps 35,000 or 40,000 on the Island at the time.) If only Kamehameha's troops suffered, the mortality was considerably less, certainly not over 5,000. Such death totals are still high by anyone's standards, but they hardly compare to some of the astronomical figures found in the literature.

One point remains: How does the *okuu* rank in mortality among other great Hawaiian epidemics?

Statistics are unfortunately lacking before 1848. One exception is the "catarrhs and fevers" which struck Oahu in November 1818; on December 1 Marin "calculated . . . that the deaths amount to 60 from the commencement of the disease."[39] Marin also noted "many deaths & many coughs" in May and June, 1824.[40] In 1825 Kotzebue reported that "an epidemic disease prevailed this year throughout the Sandwich Islands. It produced a great mortality, death generally following the attack within a few days."[41] A year later, in 1826, "thousands died, especially in the country districts, of an epidemic of 'cough, congested lungs, and sore throat,' " according to Kamakau.[42] A net population loss of 22,000 between 1832 and 1836 has been attributed to whooping cough, measles, or social disorganization, depending on the source.[43] Mumps caused the deaths of "great numbers" in 1839.[44]

A series of epidemics swept the kingdom during the last four months of 1848. Measles and whooping cough struck almost simultaneously, followed by diarrhea and finally influenza. "Ten thousand would probably be a low estimate for 1848 and 1849, which those epidemics took away," reported *The Friend* (although the official total for all causes of death combined was only 12,263 during this two-year period).[45] Missionary doctors estimated epidemic mortality at "not less than one-tenth of the inhabitants." The death toll was especially high among infants (from whooping cough) and the aged.[46]

The smallpox epidemics of 1853 caused between 5,000 and 6,000 deaths, according to a report by the Minister of Public Instruction, although the official tally was only 2,485 and estimates went as high as 15,000.[47]

A number of less catastrophic epidemics struck Hawaii between 1853 and 1918. In 1857, according to Kamakau, "many died of an epidemic of colds, dull headache, sore throat, and deafness," although contemporary newspapers, describing the illness as "two-thirds influenza with an occasional touch of boohoo [dengue—ED.] fever," found it to be "comparatively harmless."[48] "Coughing, chills, fever, vomiting, bleeding at the nose, giddiness, and general debility" brought death in 1866.[49] Scarlet fever was prevalent in 1870 and 1871, especially on Maui, where it caused "great mortality."[50] Smallpox returned in 1872 but killed only eleven.[51] Whooping cough took the lives of 68 Honolulu residents during a two-year span ended in March 1880.[52] Still another bout with smallpox took place early in 1881, when the disease killed 282.[53] Whooping cough returned late in 1888 and brought death to 104 in Honolulu alone.[54] Measles and dysentery resulted in "many deaths" (at least 26 of them in Honolulu) in 1889-1890.[55] Asiatic cholera took 64 lives in Honolulu in the summer and fall of 1895.[56] Sixty-one died from bubonic plague in Honolulu between December 12, 1899 and the end of April 1900.[57]

Influenza raged in Hawaii from October 1918 to April 1920, reaching a peak in late February 1920. Deaths from this cause totalled 1,700, including 612 during the 12-month period ended June 30, 1919 and 1,088 during the following year.[58]

Since 1920, only two epidemics causing noteworthy mortality have occurred in the Islands. Cerebrospinal meningitis was brought from the Orient in September 1928 and reached its peak in late March 1929; deaths during the fiscal year numbered 68.[59] An epidemic of measles began in September 1936 and peaked in January 1937; fatal cases eventually totalled 205.[60]

The *okuu* thus appears to have been one of the three greatest epidemics in Hawaiian history, a distinction shared only by the outbreaks of 1848 and 1853. Mortality from the *okuu,* according to the evidence reviewed earlier, was probably less than 15,000 and perhaps under 5,000. The combination of diseases that struck the Islands during the last four months of 1848 reportedly killed about 10,000. Smallpox probably took 5,000 or 6,000 lives in 1853. The influenza epidemic of 1918-1920 was responsible for 1,700 deaths, thus ranking fourth. No estimate is possible for a number of epidemics prior to 1848, but some may have rivalled the 1918-1920 outbreak in fatalities.

The exact *okuu* death toll must forever remain a mystery. It seems clear, however, that it was by no means as cataclysmic as many historians have reported.

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35. See footnote 6.
36. For a description of these estimates and others made during the same period, see Schmitt, *op. cit.*, pp. 14-28, 41 and 42.
37. See, for example, [GW Bates], *Sandwich Island Notes. By a Hauole.* (New York: Harper & Brothers, 1854), pp. 335-336, 341, 350, and 358; Ellis, *loc. cit.*; Iselin, *op. cit.*, pp. 67-68 and 73; John B. Whitman, *op. cit.*; and *The Missionary Herald, loc. cit.*
38. Shaler, *op. cit.*, p. 163. For another example, see Schmitt, *op. cit.*, p. 30. For the effects of the sandlewood trade and "idleness and dissipation" on cultivation, see Otto Von Kotzebue, *A Voyage of Discovery Into the South Sea and Beering's Straits . . . 1815-1818* (London: Longman, Hurst, Rees, Orme, and Brown, 1821), Vol. II, p. 200, and the same author's *A New Voyage Round the World in the Years 1823, 24, 25, and 26* London: Henry Colburn and Richard Bentley, 1830), Vol. II, p. 219.
39. Photostatic copy of RC Wyllie's translation of excerpts from the journals of Don Francisco de Paula Marin, filed in the Archives of Hawaii.
40. *Ibid.*
41. Otto Von Kotzebue, *A New Voyage . . . , op, cit.*, Vol. II, pp. 243-244. See also Marin, *op. cit.*, entries for January and February 1825.
42. Kamakau, *op. cit.*, p. 236. See also a letter sent by Levi Chamberlain to Rufus Anderson on April 28, 1826, in the Hawaiian Mission Children's Society Library, *Missionary Letters* (typescript), Vol. 2, pp. 463-464, and the entries for April 22 and May 5, 1826 in Marin, *op. cit.*
43. *The Pacific Commercial Advertiser*, November 6, 1862 (whooping cough); Rufus Anderson DD, *The Hawaiian Islands: Their Progress and Condition Under Missionary Labors* (Boston: Gould and Lincoln, 1864), p. 275 (whooping cough and measles); Adams, *op. cit.*, and Hörmann, *Extinction and Survival, op. cit.*, p. 228 (social disorganization). The reports of the Sandwich Islands Mission published in *Report of the American Board of Commissioners for Foreign Missions* for these years failed to mention any epidemics. Anderson, referring to the series of epidemics experienced during the 19th century, added: "The epidemics spent themselves chiefly on the most decayed portion of the people, and had the singular effect, on the whole, considerably to raise the national tone of morals. They were like the amputation of diseased members of the body." (p. 276)
44. *The Missionary Herald*, Vol. XXXVI, No. 7, July 1840, p. 241.
45. *The Friend*, Vol. 7, No. 10, November 15, 1849, p. 79; Schmitt, *op. cit.*, pp. 44 and 165.
46. *The Missionary Herald*, Vol. XLV, No. 10, October 1849, pp. 359-361. For other estimates see *Report of the ABCFM . . . 1849* (Boston, 1849), p. 187 (one-twelfth of the population); Taff, *loc. cit.* (one-fourth from measles alone); Kamakau, *op. cit.*, pp. 236-237 ("a third") and pp. 410-411 ("several thousand").
47. Richard A Greer, "Oahu's Ordeal: The Smallpox Epidemic of 1853—Part II," *Hawaii Historical Review*, Vol. II, No. 1, October 1965, pp. 260-261; Stanley D Porteus, *A Century of Social Thinking in Hawaii* (Palo Alto: Pacific Books, 1962), pp. 34 and 354; *The Pacific Commercial Advertiser*, November 6, 1862; Kamakau, *op. cit.*, p. 418.
48. Kamakau, *op. cit.*, p. 237; *Polynesian*, July 18, 1857, p. 88, and August 1, 1857, p. 101.
49. "Extracts from a letter of Rev. Titus Coan," *The Sailors' Magazine, and Seamen's Friend*, Vol. 39, No. 7, March 1867, p. 213.
50. Halford, *op. cit.*, p. 308; *Report of the Board of Health* for 1870, pp. 12, 13 and 15, and 1872, p. 11.
51. Halford, *op. cit.*, p. 223; *Report of the Board of Health . . . 1874*, pp. 1-2.
52. *Report of the Board of Health . . . 1880*, pp. 55 and 57.
53. Thrum, *op. cit.*, p. 100. For a somewhat different total, see *Board of Health Report . . . 1882*, pp. 91 and 93.
54. *Biennial Report of the President of the Board of Health . . . 1890*, p. 23 and tables after p. 68.
55. *Ibid.*, pp. 20-21 and tables after p. 68.
56. *Report of the President of the Board of Health . . . 1895*, p. 1 and table after p. 14.
57. Lana Iwamoto, "The Plague and Fire of 1899-1900 in Honolulu," *Hawaii Historical Review*, Vol. II, No. 8, July 1967, pp. 379-382.
58. *Report of the President of the Board of Health* for 1919, pp. 3, 7 and 13, and 1920, pp. 8 and 14.
59. *Annual Report of the President of the Board of Health . . . 1929*, p. 3.
60. *Annual Report of the President of the Board of Health . . . 1937*, pp. 12-13, 49 and 105-106.