REPORT NO 25
MARCH 1971

center for disease control

SHIGELLA

surveillance

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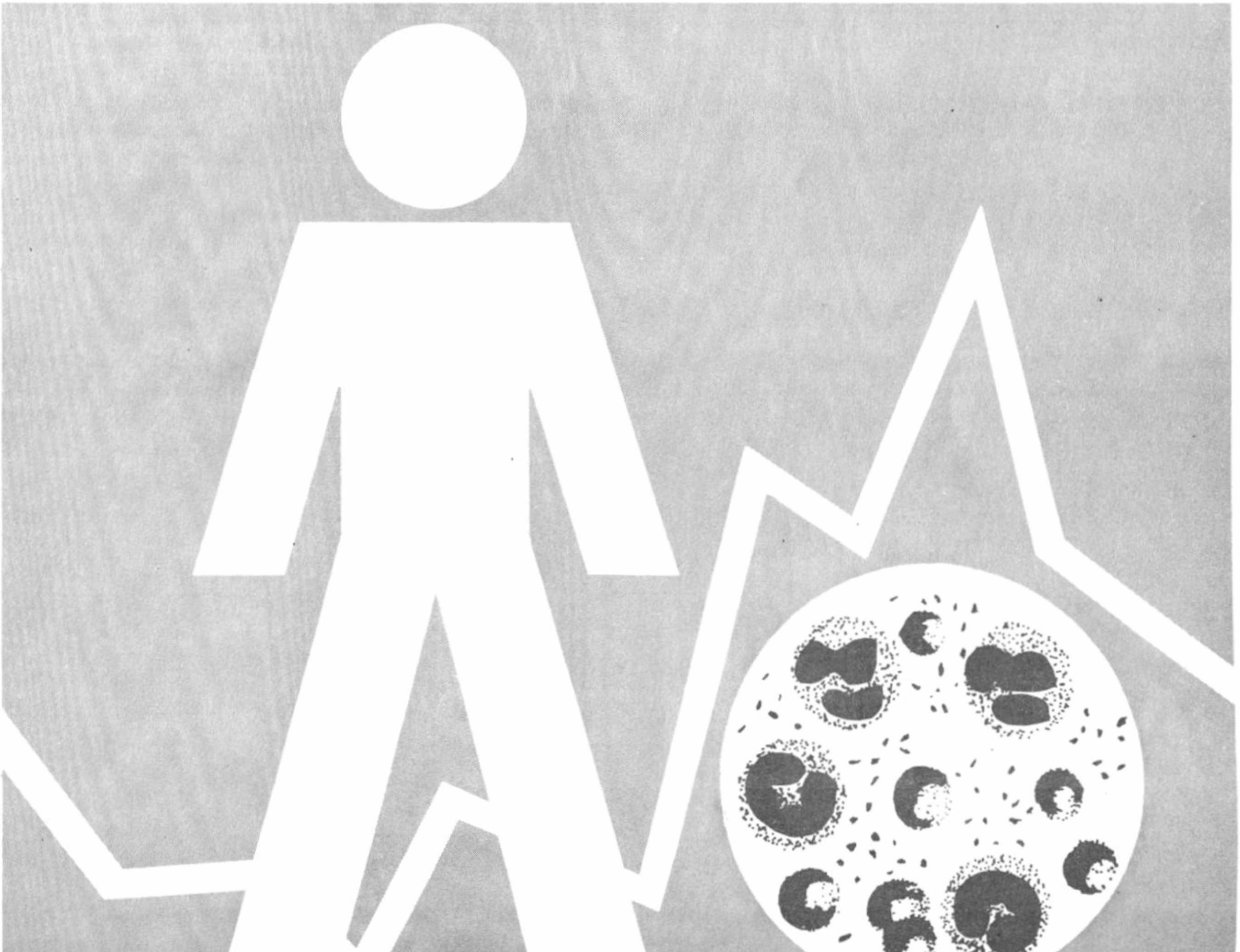
for the
Third Quarter 1970



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE : PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

PREFACE

This report summarizes data voluntarily reported from participating state, territorial, and city health departments. Much of the information is preliminary.

Contributions to the surveillance report are most welcome. Please address to:

Center for Disease Control
Attn: Shigella Surveillance Activity
Epidemiology Program
Atlanta, Georgia 30333

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I. Summary

In the third quarter of 1970, 3,098 isolations from humans were reported. This number represents an increase of 1,262 (68.7 percent) over the 1,836 isolations in the second quarter of 1970 and an increase of 599 (24.0 percent) over the 2,499 isolations in the third quarter of 1969 (Table I).*

II. Reported Isolations

A. Human

1. General Incidence

During the third quarter of 1970, 61.4 percent of isolations were from children under 10 years of age (Table II); this is consistent with previous quarters. The highest attack rate was in the age group 1-4 years.

2. Serotype Frequencies

Fifty-one of the 54 reporting centers participating in the Shigella Surveillance Program reported isolations of shigella. Twenty-one different serotypes were reported (Table I). The relative frequencies of these serotypes are shown in Table III. The isolations in each of the unspecified categories are distributed in their subgroups in the same proportions as the completely specified isolations of that group. The resulting distribution in the tables is called the "calculated number," and from this is derived a "calculated percent" for each serotype. These provide approximate indices of the relative frequencies of the more common shigella serotypes in the United States. *Shigella sonnei* now accounts for approximately two-thirds of all isolations, and *Shigella flexneri* 2a and 2b combined account for about one-fifth of of all isolations. The six most frequently reported serotypes during the 3-month period were the following:

Table 1

Rank	Serotype	Reported	Calculated Number*	Calculated Percent*	Rank Last Quarter
1	*S. sonnei*	2,032	2,046	66.0	1
2	*S. flexneri* 2a	170	395	12.8	2
3	*S. flexneri* 3a	112	233	7.5	4
4	*S. flexneri* 6	106	135	4.4	3
5	*S. flexneri* 4a	49	103	3.3	6
6	*S. flexneri* 2b	29	67	2.2	5
Subtotal		2,498	2,979	96.2	
Total (all serotypes)		3,098	3,098		

*From Table III

Table IV shows the distribution of shigella serotypes reported from mental institutions.

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*No laboratory reports were received from California and the Virgin Islands.

3. Geographical and Seasonal Observations

There were more reported isolations of S. sonnei than S. flexneri in every region of the United States except for the State of Alaska which had only seven isolations of S. flexneri (Figure 1). The seasonal distribution is depicted in Figure 2. Figure 3 shows the number of reported isolations per million population by state for July-September, utilizing population estimates for July 1, 1969. Approximately 15.2 isolations per million population were reported during the third quarter of 1970. Table V shows the residence of those patients from whom shigellae were isolated.

Figure 1 PERCENTAGE *S. flexneri* AND *S. sonnei* OF TOTAL SHIGELLA ISOLATIONS REPORTED FROM INDICATED REGIONS UNITED STATES, JULY - SEPTEMBER, 1970

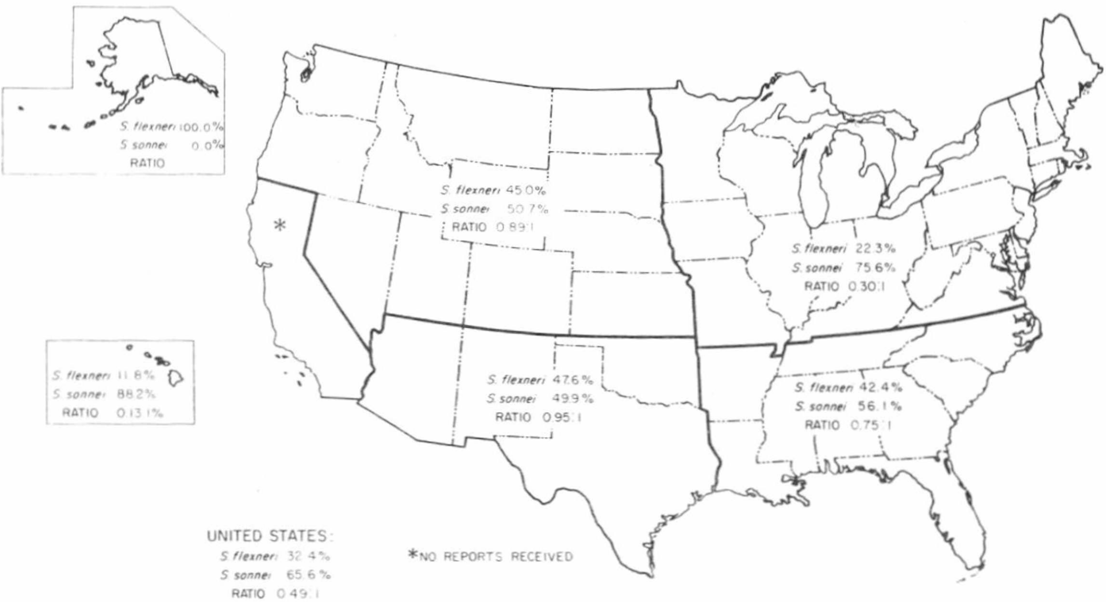


Figure 2 REPORTED ISOLATIONS OF SHIGELLA IN THE UNITED STATES

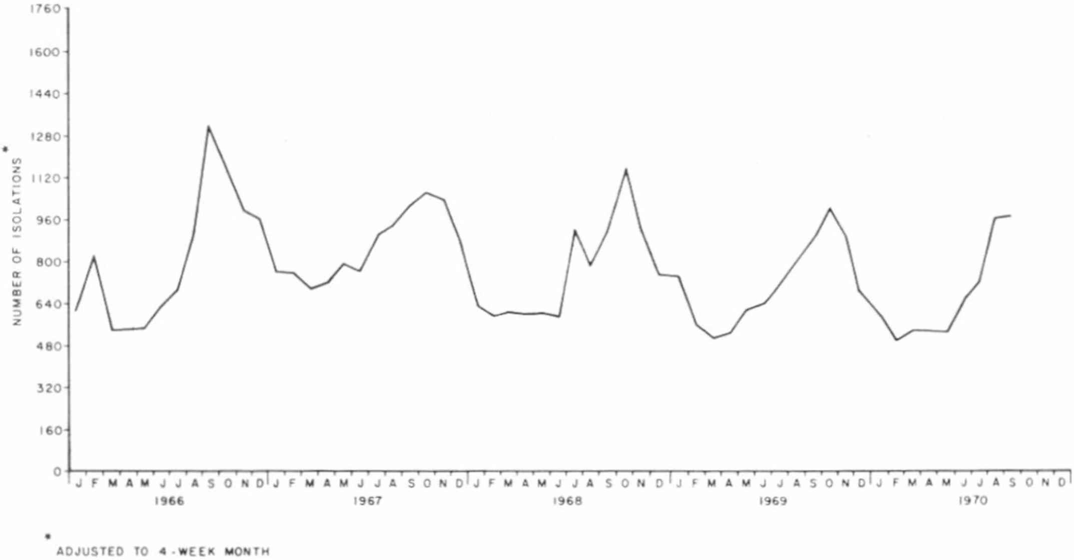
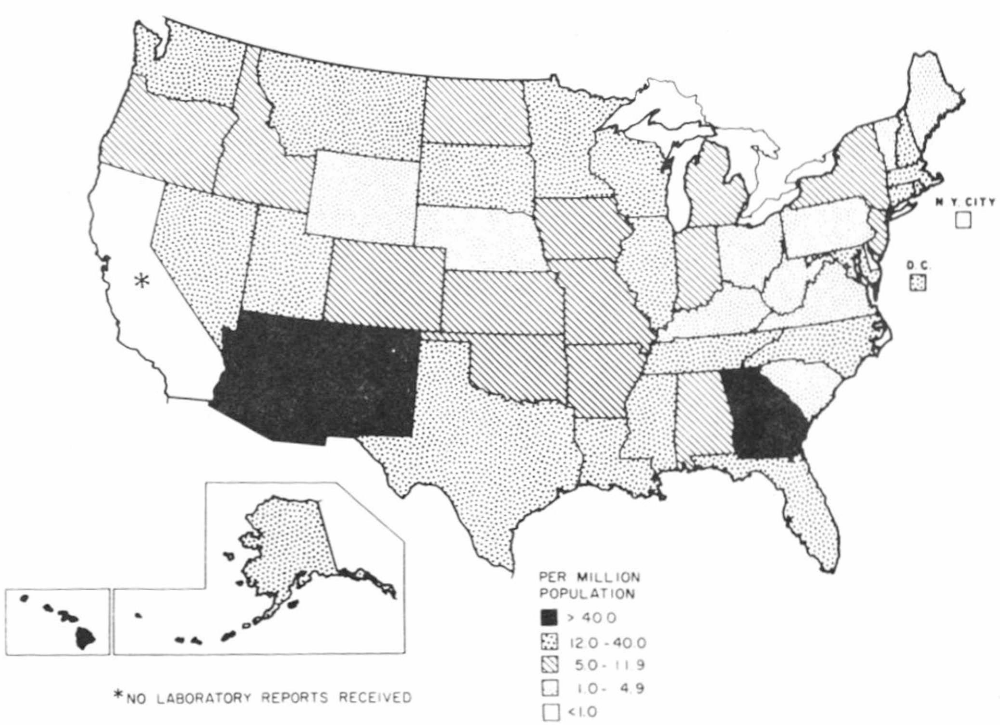


Figure 3 ATTACK RATES OF SHIGELLOSIS, BY STATE, JULY - SEPTEMBER 1970



B. Nonhuman

During the third quarter 1970, 5 nonhuman isolations of shigella, all in primates, were reported.

Table 2

Serotype	Number	Source	State
S. flexneri 3	1	monkey	Hawaii
S. flexneri 4	1	primate	Washington
S. flexneri 4b	2	monkeys	Illinois
S. sonnei	1	gorilla	Texas

III. Current Investigations

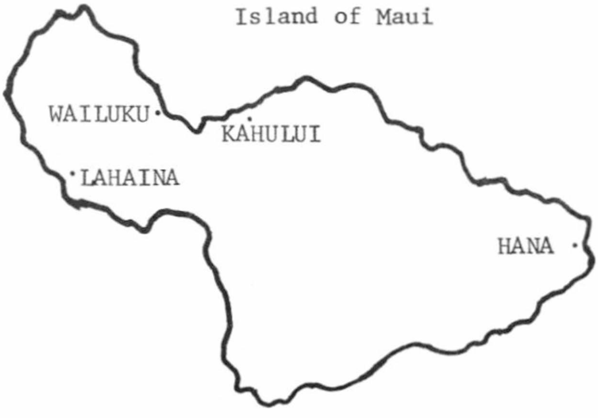
Shigella sonnei Outbreak on the Island of Maui. Reported by Lloyd C. Guthrie, M.D., State Epidemiologist; Ira D. Hirschy, M.D., Executive Officer, Communicable Disease Division; Walter E. Batchelder, M.D., District Health Officer; Mr. Samuel Goo, Acting District Health Administrator; Mrs. Kazue McLaren, Assistant Chief, Public Health Nursing Branch; Mrs. Laura Wong, Supervisor, Public Health Nursing; Mr. Jiro Arakaki, Laboratory Administrator; Mr. Mitsuto Sugi, Communicable Disease Investigator; Mr. Patrick Boland, Public Health Educator, Hawaii Department of Health, Matthew S. Loewenstein, M.D., Chief, Enteric Diseases Section; and John N. Lewis, M.D., Bacterial Diseases Branch, CDC.

From August 17, 1970 through August 20, 1970, 395 cultures submitted to the health department laboratory of Maui Island, Hawaii, were positive for S. sonnei. These isolates came from dysentery cases in all parts of the island. Cases occurred among all age groups and social classes. Poi, the staple starch food of Hawaiians, was discovered to be the vehicle of this common source outbreak. Epidemiologic data suggested that a single day's poi from the island's only poi factory had been contaminated with shigellae.

Maui is the second largest of the Hawaiian Islands. At the time of the 1970 census, its population was 37,852. The majority of the people live in or near the two large central towns, Wailuku and Kahului (Figure 4). There is a resort area around Lahaina at the western tip of the island and a small ranching community at Hana at the eastern tip. From the main towns, Hana can only be reached by a 3-hour drive or by airplane. On Maui 40 percent of the people are of Japanese extraction, 20 percent are classified as Hawaiian or part Hawaiian, 20 percent are Caucasian, and the remainder are Filipino, Chinese, and other.

Figure 4

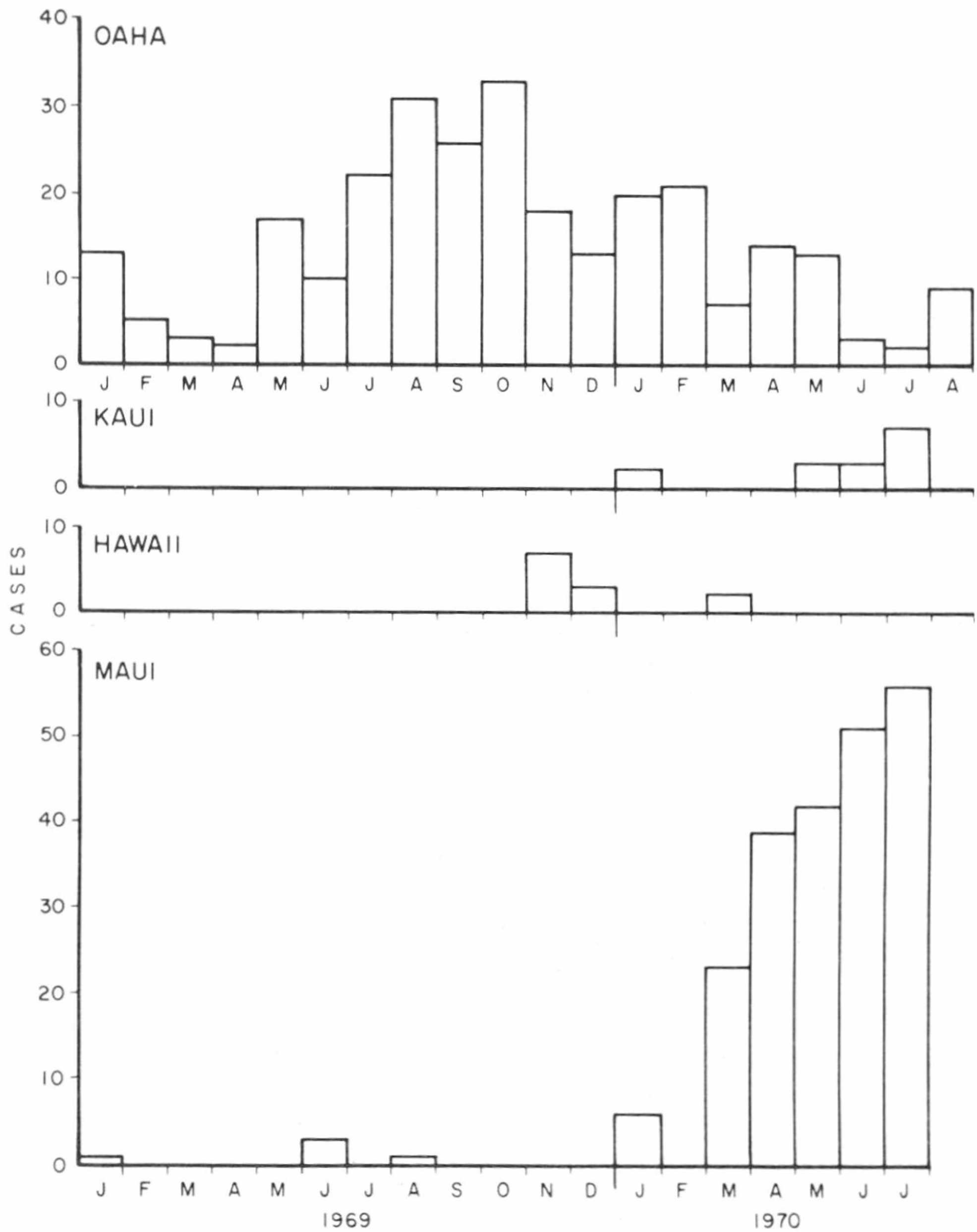
Island of Maui



Over the past few years a number of young people from the United States mainland have come to Maui, and most of them live in two communes which lack adequate facilities for sewage disposal and water supply.

Shigellosis is not uncommon in Hawaii. It was one of only two states which had more than 16 isolates per 100,000 population in 1969. But most of the isolates in 1969 were from the Island of Oahu, where the bulk of the population is found (Figure 5). An unusual number of shigella isolates was first noted on Maui in January of 1970. These were obtained from young people in the two communes. The incidence of dysentery increased through the spring months of 1970, but remained a disease primarily of these young transients until June 1970, when scattered cases began to appear throughout the general population.

Figure 5 *S. SONNEI* ISOLATIONS, BY ISLAND AND MONTH



During the first week of August, well before the large island-wide outbreak, a cluster of shigellosis cases occurred in a small town of Waihee. Waihee has a chlorinated water supply. A section of the town called Kapuna, however, lies beyond the reach of the town water supply. Kapuna's water came from a mountain stream and was not chlorinated. The epidemic curve for the Waihee cases (Figure 6) suggests a common source outbreak. Information from families in Kapuna and in the neighboring area of Waihee revealed that the Kapuna residents had an attack rate for gastroenteritis symptoms of 39 percent during an 8-day period. Waihee residents with chlorinated water, on the other hand, had an attack rate of only 6 percent (Figure 7). In addition, two of the patients with chlorinated water had recently drunk unchlorinated Kapuna water, as well.

Figure 6 SHIGELLOSIS CASES, BY DAY OF ONSET, WAIHEE, AUGUST 3-14, 1970

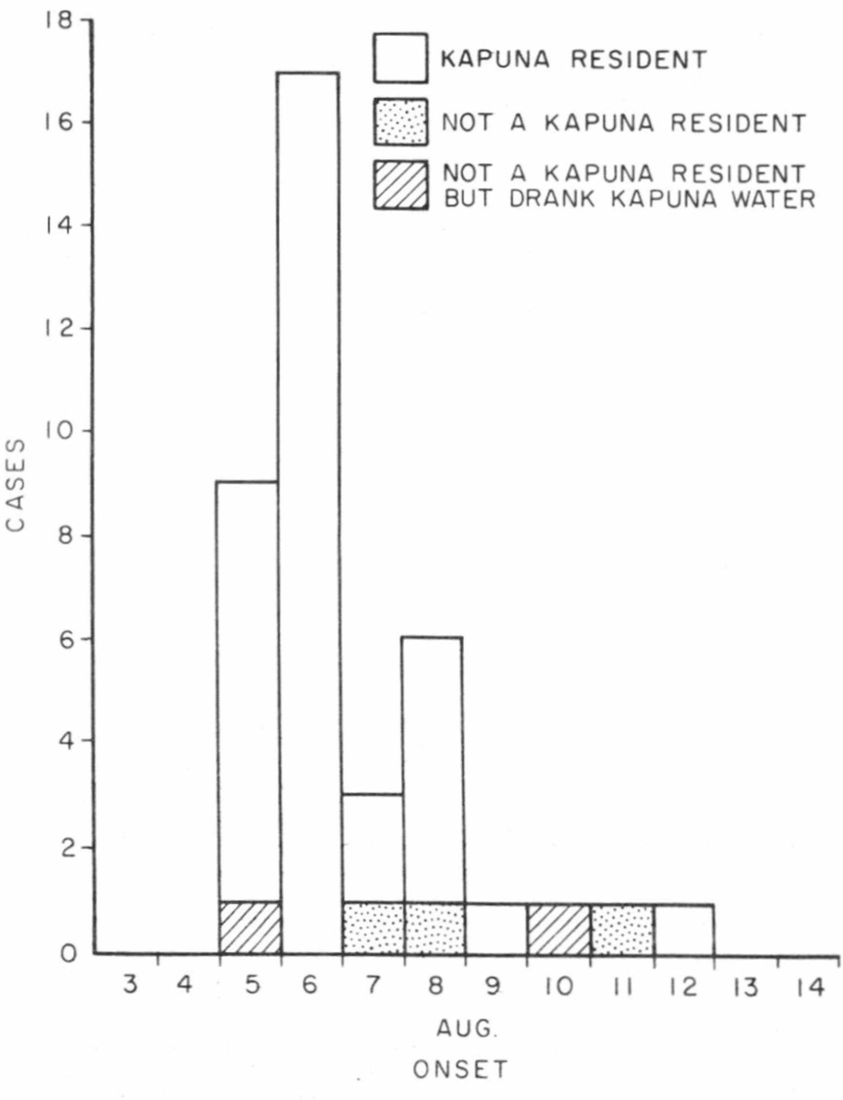
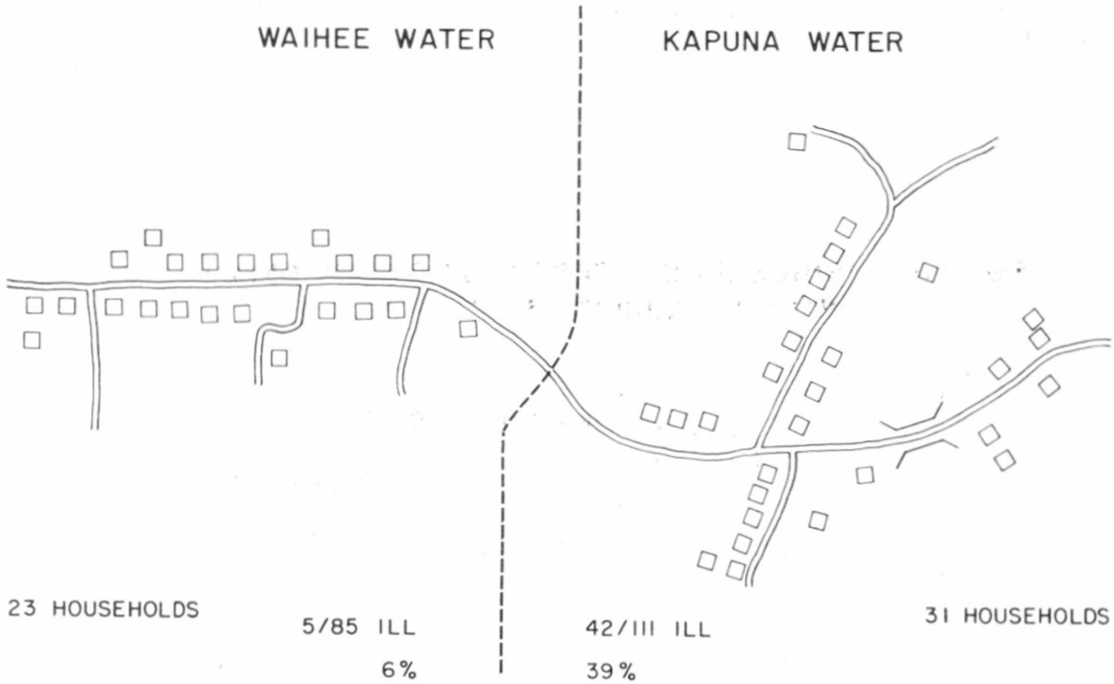


Figure 7

DISTRIBUTION OF WATER TO THE TOWN OF WAIHEE



The sharp increase in S. sonnei isolates beginning August 16, 1970, was suggestive of a large common source outbreak. Histories taken on dysentery patients at that time revealed that onset of symptoms for most of these patients had been August 16 and 17 (Figure 8). There was a preponderance of women and children among the patients (Table 3). A disproportionate number of those affected were Hawaiian or part Hawaiian (Table 4).

Figure 8 SHIGELLOSIS CASES, BY DATE OF ONSET OR POSITIVE CULTURE, MAUI, AUGUST 12 - SEPTEMBER 5, 1970

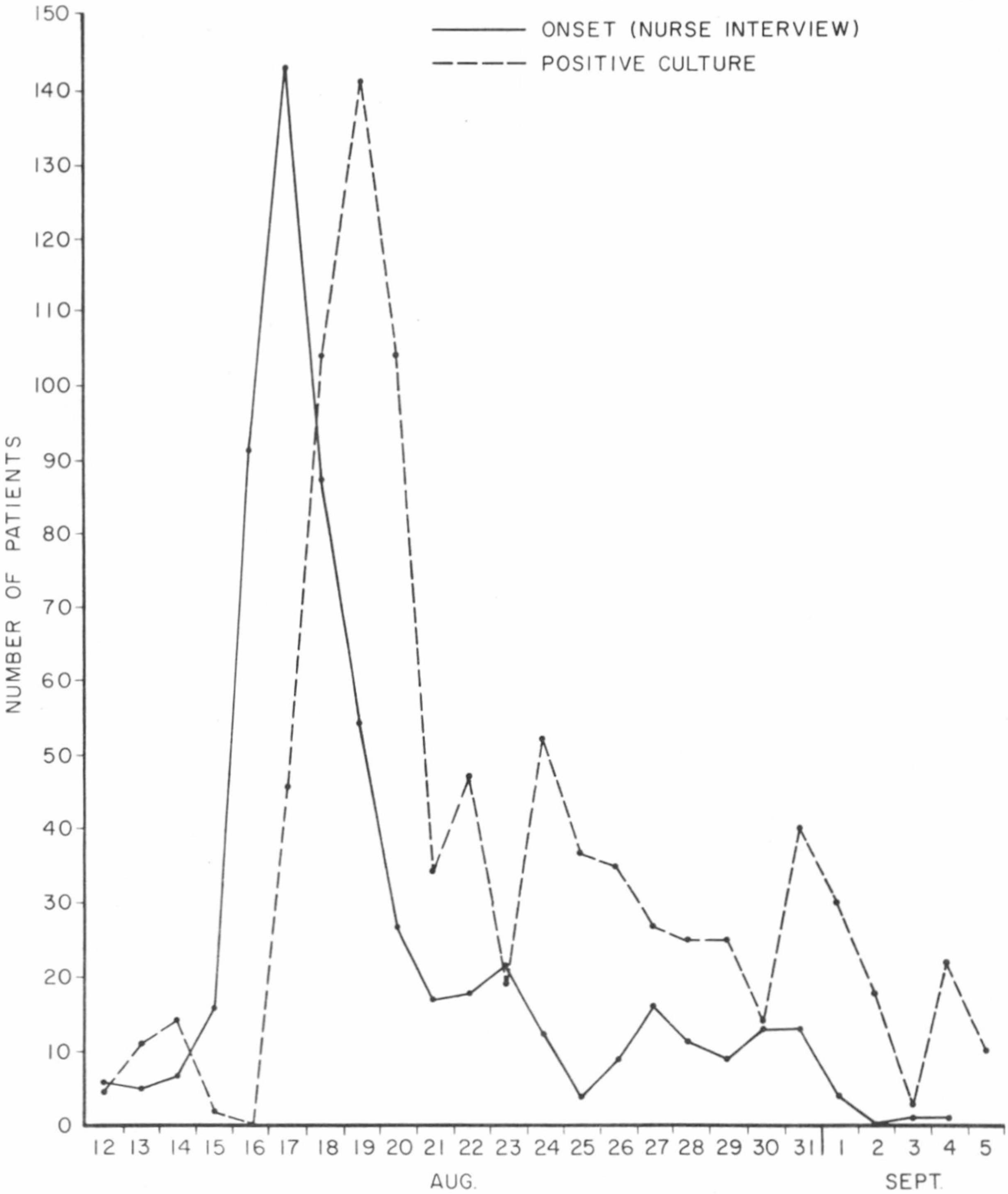


Table 3

Age and Sex of Maui Shigellosis Patients
August 15, 1970--August 18, 1970

Years	Male	Female
<1	4	0
1-4	23	31
5-9	25	24
10-14	21	31
15-19	10	25
20-29	14	42
30-39	14	18
40-49	6	7
50-59	0	7
60 -	8	9
?	5	9
Totals	130	203

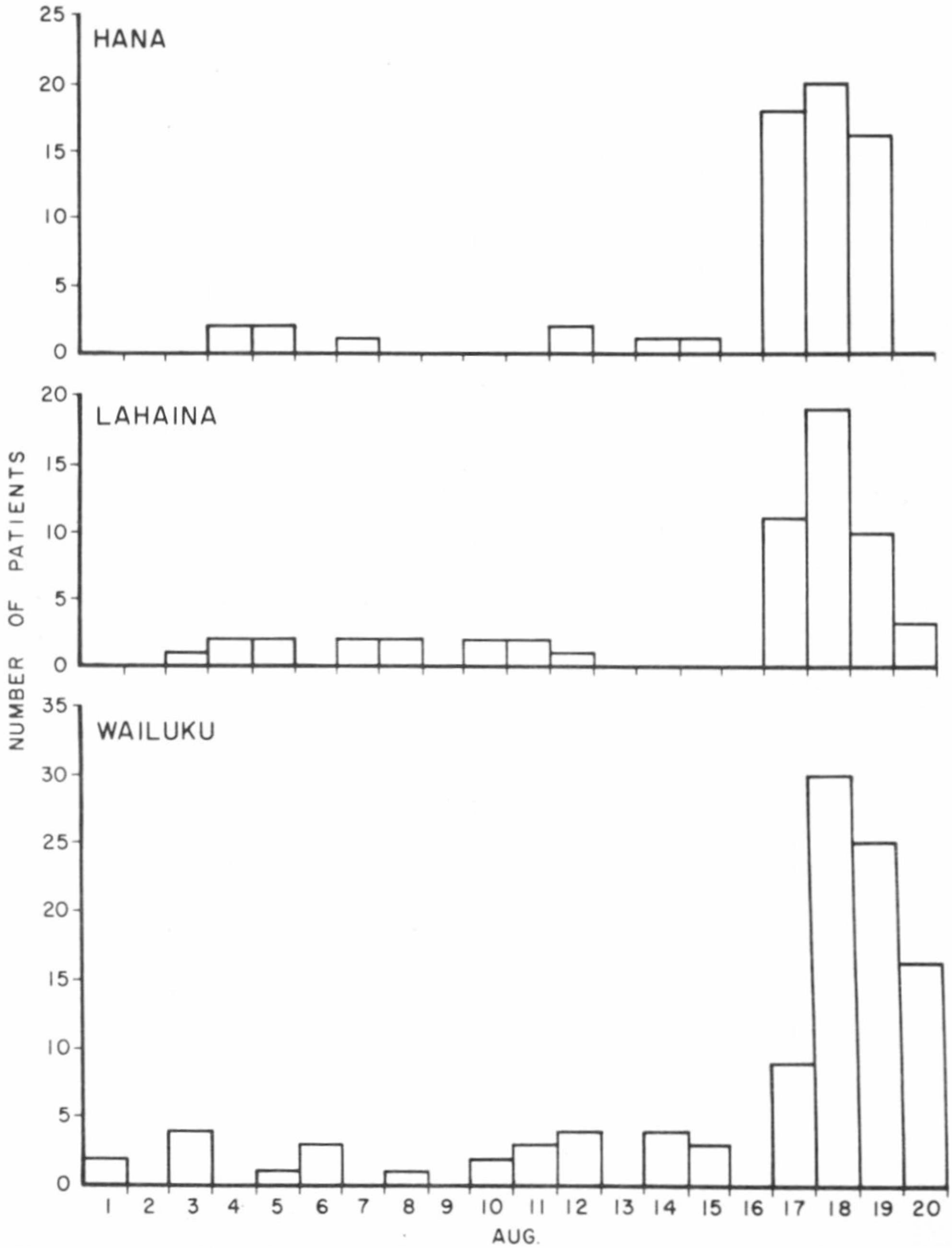
Table 4

Culture Positive Shigellosis, August 16-19 Only
Attack Rates by Race
(Number with Positive Culture/1967 Census Projection)

Race	Attack Rates
All races	393/37,852 = 1.04%
Hawaiian--Part-Hawaiian	185/7,234 = 2.56%
Japanese	56/15,339 = 0.37%
Chinese	8/612 = 1.31%
Filipino	40/5,336 = 0.75%
Caucasian	27/6,919 = 0.39%
All races NOT Part-Hawaiian	208/30,618 = 0.68%

The records of 12 of Maui's 38 physicians were surveyed to gain some idea of the extent of illness on the island. Extrapolating from these records, it was estimated that over 600 patients on Maui sought medical attention for symptoms of enteritis during the period August 17-19. Use of doctors' records from different parts of the island revealed that outbreaks had occurred simultaneously in all parts of the island (Figure 9), even in the remote village of Hana. The idea that drinking water might have accounted for the outbreak was discarded, as there were at least 18 different water sources on the island, each supplying a small area and with no opportunity for common contamination.

Figure 9 NUMBER OF PATIENTS WITH SUSPECTED DYSENTERY, BY DATE OF FIRST VISIT TO DOCTOR'S OFFICE



It appeared likely that some contaminated food had been distributed to all parts of the island immediately prior to the outbreak. Because of its remote location Hana became the center of attention for the investigation. The two grocery stores in Hana received their supplies on Monday, Wednesday, and Friday by truck from Wailuku. The items delivered on Friday, August 14, were milk, ice cream, potato chips, poi, which is the staple starch food of Hawaiians, and sushi, which are hand-made rice cakes. Patients who had dysentery during August 16-19 were questioned as to their prior exposure to these food items. There were two dairies on Maui, abbreviated Dairy H. and Dairy W. in Table 5. The milk of Dairy W. was included along with that of Dairy H. even though H. was the only milk supplied to Hana. Commercial poi on Maui is made Monday, Wednesday, and Friday, so questioning was specifically directed to consumption of poi sold on Friday. Also questioned were the families of patients and their next door neighbors. Questionnaires were completed on 349 individuals with the results shown in Table 5. The attack rate data implied that either poi or sushi could be strongly suspected.

Table 5

Food Specific Attack Rates on 349 Persons Questioned

	ATE			DID NOT EAT		
Food	Sick	Well	Percent sick	Sick	Well	Percent sick
Milk W.	11	48	18	55	160	22
Milk H.	30	70	30	35	139	22
Sushi	17	17	50	56	240	19
Poi	45	58	44	28	173	14
Ice cream	18	110	14	51	140	27
Potato chips	19	77	20	48	158	23

Attack rates for people who ate poi but not sushi and vice versa are shown in Table 6. Increased risk of infection associated with eating poi alone is significant with $p < 0.01$. The attack rate for those who ate sushi alone suggests that sushi may have caused some cases of shigellosis, but a large majority of the shigellosis patients had not eaten sushi. Contamination of poi, on the other hand, could have caused most of the shigellosis cases.

Table 6

Food Specific Attack Rates for Sushi and Poi

	ATE			ATE NEITHER		
	Sick	Well	Percent sick	Sick	Well	Percent sick
Sushi without poi	6	12	33	20	147	12
Poi without sushi	31	54	37			

With consumption of poi significantly correlated with illness, the question was raised whether this correlation might simply reflect contamination of some other of the many Hawaiian foods commonly eaten with poi. There were many luaus held on Maui on August 14 and 15, and attending a luau was associated with an increased risk of infection (Table 7). Guests at one traditional Hawaiian luau held August 15 were interviewed, and the food-specific attack rates are shown in Table 8. These data tend to exonerate most of the foods commonly associated with eating poi. The data for poi, itself, simply reveal that most people at the luau ate poi. But the attack rates for rice are of interest, in that a significant protection from infection was associated with eating rice. A person who eats rice eats proportionally less poi.

Table 7

Luau Attendance on 349 Persons Questioned

ATTENDED A LUAU			DID NOT ATTEND A LUAU		
Sick	Well	Percent sick	Sick	Well	Percent sick
19	31	38	31	136	19

Table 8

Food Specific Attack Rates For 94 Persons Who Attended Kahakuloa Luau

	ATE			DID NOT EAT		
Food	Sick	Well	Percent sick	Sick	Well	Percent sick
Kalua pig	24	64	27	1	1	50
Chicken long rice	18	48	27	4	5	45
Squid	9	34	21	13	22	37
Opihi	14	37	27	8	21	30
Poi	25	62	29	1	4	20
Sweet potato	9	31	22	10	20	33
Rice	5	35	13	14	23	38
Cake	15	44	25	6	13	32
Lomi salmon	16	44	27	8	14	36
Poki	13	36	27	11	21	34

A single poi factory supplies all the commercial poi for Maui. Poi is produced three times a week to be sold on Monday, Wednesday, and Friday. Poi is a gray, pasty food made from taro roots. These roots are grown under water and brought to the factory in wet sacks. There they are steam cooked for 6-12 hours, peeled by hand, and ground into a paste by a machine. Aliquots of the finished product are transferred by hand to a machine for packaging in plastic bags. The poi is transported and marketed at room temperature. Refrigeration is avoided, as the poi ferments if allowed to stand at room temperature, and Hawaiians prefer its flavor after a day or two of fermentation. Several varieties of lactobacilli and streptococci are responsible for the fermentation.[1] The potential of poi as a vehicle of enteric infection has been demonstrated by the finding that shigella organisms can survive 2 days in poi at room temperature.[2] The Hawaii State Health Department Laboratory demonstrated a tenfold rise in numbers of S. sonnei organisms in Maui poi inoculated while fresh and incubated 24 hours at room temperature.

At the poi factory on Maui, six people were employed handling the taro roots and poi. Beginning on September 3, 1970, each of these workers had three rectal swabs taken on different days, and none were positive for shigella. None of them or their family members reported symptoms suggestive of dysentery during or preceding the outbreak. The taro for this factory was grown in Kapuna. A presumably waterborne outbreak of shigellosis in Kapuna is described above, and it is of interest that the same water source was used to irrigate the taro plants. There could have been cross-contamination from the taro root sacks to the finished product within the poi factory. Shigella is a labile organism, however, and contamination from an asymptomatic carrier at the factory is a more plausible explanation.

This was the largest common source outbreak of shigellosis observed in this country since national shigella surveillance began in 1965. Positive cultures for S. sonnei were obtained from 833 patients between August 17 and September 5 on Maui, and many more who sought medical help were not cultured. Though most of the dysentery cases can be related to poi as a common source, the baseline incidence of shigellosis on Maui was extraordinarily high even before the main outbreak. While not remarkable in total numbers, the 56 S. sonnei isolations on Maui in July 1970 represent a rate of 148 isolations per 100,000 population per month, far exceeding rates for the rest of the country.

General conditions of sanitation and water supply on Maui are similar to those found elsewhere in the United States, but in transient communities sanitation, water supply, and medical care were inadequate. These communities were probably a continuing source of shigellosis on Maui until the disease reached the indigenous population.

There was a high rate of shigellosis on Maui for weeks following the major outbreak (Figure 8). This illustrates shigella's ability to persist in a community through person-to-person spread. One secondary effect of this prolonged outbreak was that over 150 professional food handlers eventually contracted shigellosis, a potential reservoir for further foodborne outbreaks. The persistence of shigellosis in any area, even if limited to a small sector of the community, constitutes a continued threat to the whole community.

---

1. Allen ON and Allen EK: The manufacture of poi from taro in Hawaii with special emphasis on its fermentation. Bull of the Hawaii Agricultural Experiment Station. No. 70, 1933

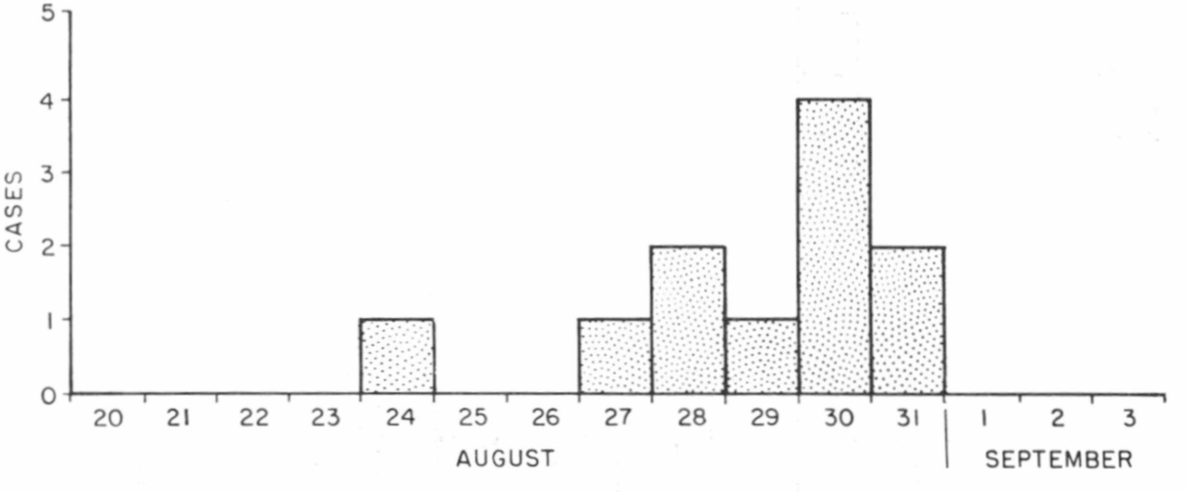
2. Fung G and Bushnell OA: The possible role of poi in the epidemiology of infectious intestinal diseases. Hawaii Med J 7:296-299, 1948

IV. Reports from the States

A. Shigellosis in a Family, Utah. Reported by E. C. Evans, M.D., E. Arnold Isaacson, M.D., M.P.H., Director, Salt Lake City-County Health Department, Taira Fukushima, M.D., M.P.H., Director of the Bureau of Disease Prevention, Utah State Division of Health, Lola Williams, R.N., Public Health Nurse, Salt Lake City-County Health Department, and L. E. Klock, M.D., EIS Officer.

A 20-month-old boy became ill with vomiting, fever, and diarrhea on August 24. His stool culture grew S. sonnei. Investigation revealed 10 additional cases of gastroenteritis among persons in contact with the baby (Figure 10). These included his sister, age 4, his mother, a babysitter and her children, and several relatives who had visited the home. One contact, age 3, was hospitalized with severe bloody diarrhea and dehydration.

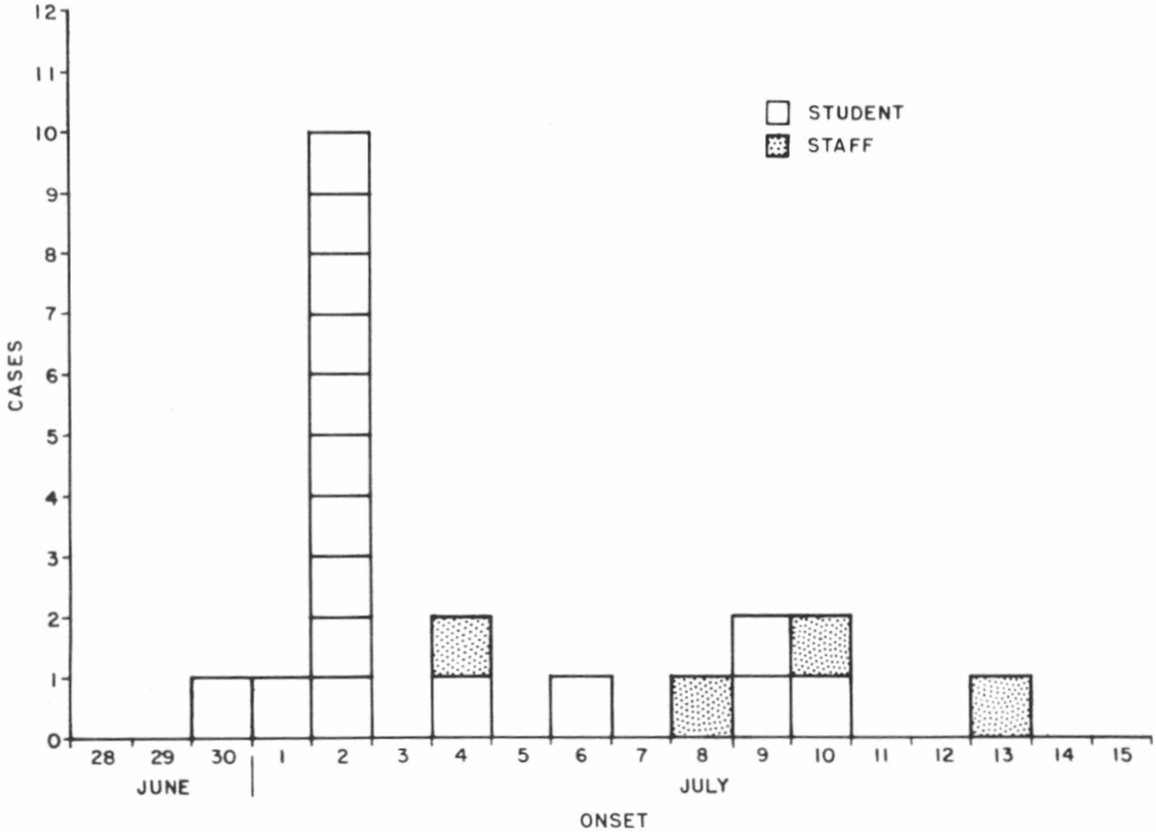
Figure 10 SHIGELLOSIS CASES, BY DAY OF ONSET, SALT LAKE CITY, UTAH, AUGUST 24 — 31, 1970



B. Shigellosis in a Small Institution, Texas. Reported by M. S. Dickerson, M.D., State Epidemiologist, Texas State Department of Health, Elizabeth Gentry, M.D., and Barbara Jensen, R.N., Austin-Travis County Health Department, and Louis W. Miller, M.D., EIS Officer.

Twenty-one cases of gastroenteritis were reported by a small private institution for emotionally disturbed children (Figure 11). Of the 17 children and four staff who were ill, 17 had cultures positive for S. sonnei. A culture survey on July 8 revealed five additional positive cultures in asymptomatic children.

Figure 11 SHIGELLOSIS CASES, BY DAY OF ONSET, TRAVIS COUNTY, TEXAS, JUNE 28 — JULY 15, 1970



In this institution there were 41 children and 38 staff. Thirty-six children, ages 4-13 years, live and play together in part of the main building. Five boys, ages 17-20 years, live in separate quarters and are employed in the community. Meals are served three times a day to the children and staff, but the staff and the five older boys rarely eat breakfast. The first 14 cases included noen of the five older boys and only one of the staff. There had been a picnic on July 30, but five of the first 14 cases had not attended. A cook had begun work 5 days before the outbreak. Returning from Mexico in early June she had experienced gastrointestinal symptoms. She experienced a recurrence of symptoms on July 13 and her culture then was positive for S. sonnei.

Breakfast served on either June 30 or July 1 was the most likely source of this outbreak. In addition, person-to-person spread of the infection undoubtedly occurred. It is difficult to distinguish between these two mechanisms of transmission.

C. Shigellosis in an Eskimo Community, Alaska. Reported by Elizabeth A. Price, M.D., Chief of Community Health, Kathleen Lynch, P.H.N., Alaska State Health Department, John D. Bell and S. Clarkson Sugg, University of North Carolina School of Medicine, and T. Stephen Jones, M.D., EIS Officer, Alaska.

Tuluksak is an Eskimo community on the Kuskokwim River. In July 1970, 40 cases of diarrheal illness were discovered in the village (Figure 12), the population of which was 147. The diarrheal attack rate was 27 percent, and new cases were still appearing when the investigation was completed. Rectal swab specimens were carried to Anchorage in transport medium; four of the 19 specimens collected grew Shigella flexneri 6. The distribution of symptoms is shown in Table 9; in 40 percent of patients the diarrhea was bloody. There were no deaths.

Figure 12 40 CASES OF SHIGELLOSIS, BY DATE OF ONSET, TULUKSAK, ALASKA, MAY — JULY, 1970

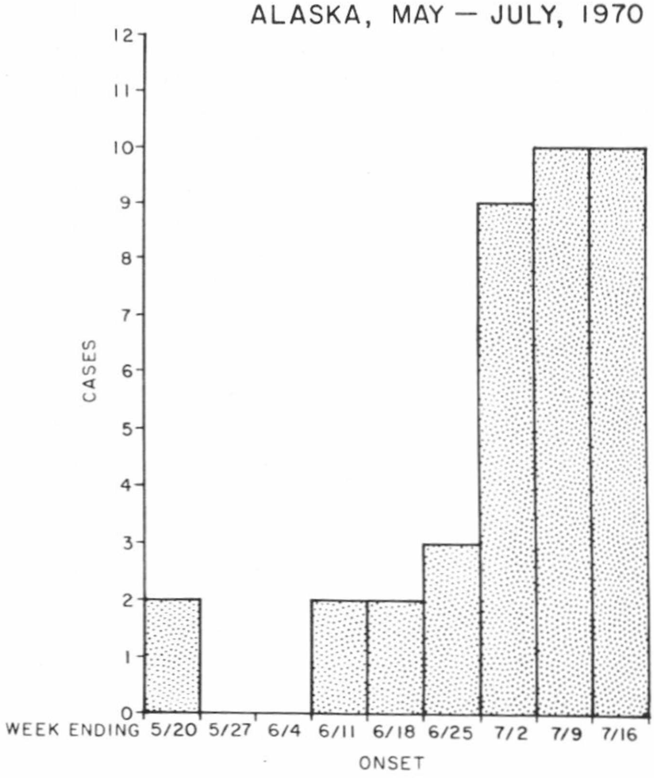


Table 9

Symptoms of 40 Cases of Shigellosis
Tuluksak, Alaska
May--July 1970

Symptoms	Number of cases	Percent of total cases
Bloody diarrhea	16	40
Non-bloody diarrhea	24	60
Abdominal pain	31	77
Fever	26	65
Cough	25	62
Headache	23	57
Weakness	19	47
Anorexia	16	40

During this outbreak the Tuluksak town well was nonfunctional. Drinking water was taken from the river, and most people did not boil the water. Buckets were used in lieu of toilets, and these were emptied into pits or in the tall grass surrounding the village.

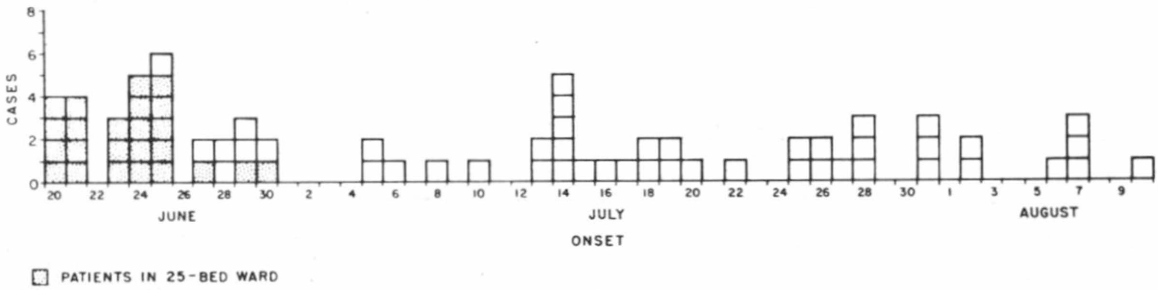
D. Shigellosis Outbreak in a Home for Retarded Children, Kentucky. Reported by J. N. Skaggs, M.D., Acting Director, Office of Communicable Diseases, Calixto Hernandez, M.D., Director, Division of Epidemiology, Wallace Guerrant, Field Investigator, Susan Wood, P.H.N., Grant County, Kentucky State Department of Health, and Andrew Taylor, Jr., M.D., EIS Officer.

Beginning in June 1970 an outbreak of shigellosis spread through a home for retarded children in Dry Ridge, Kentucky. The home had been converted from a home for the aged to one for children within the preceding year. There had been no previous shigellosis reported among the children. The home included a ward of 25 ambulatory patients, many of whom were hyperkinetic, and 72 non-ambulatory patients in the rest of the building. Patients from both sections shared a recreation room and dining hall. Nurses served patients in both sections at the same time. The patient rooms had no separate toilet or hand washing facilities.

On June 20, four patients on the 25-bed ward developed fever and diarrhea (Figure 13). One of these had been admitted 1 day earlier. The disease spread rapidly with 24 of 25 on the ward becoming ill within 10 days. On June 22nd isolation of that ward from the rest of the home was attempted. Children were not allowed to cross to other wards, meals were brought to the ward, and the staff were urged to wash their hands between patient contacts. On June 25, however, the first case of shigellosis outside of the index ward appeared, and the disease continued to spread through the whole home. One death occurred.

On August 11, all 97 residents were cultured, and 22 (23%) were positive for S. sonnei. Only three had diarrhea at the time. All 22 were given a 10-day course of ampicillin. A follow-up culture survey on October 19 showed 12 patients positive for S. sonnei. None of these had been positive in August; five of them were newly admitted children.

Figure 13 SHIGELLOSIS CASES, BY DAY OF ONSET, DRY RIDGE KENTUCKY, JUNE — AUGUST 1970



Editorial Comment: These four reports represent a cross section of the problem of shigellosis as seen in the United States. Small family outbreaks like that described in Utah account for the majority of shigellosis in this country with larger common source outbreaks being the exception to the rule. Shigellosis spreads easily within families. DuPont, et al,[1] have shown that normal volunteers can be infected by as few as 180 organisms, so that spread through person-to-person contact occurs readily. As was the case in Utah, investigation of an isolated case almost invariably reveals additional cases among family members, especially when a small child is the index case. Investigation of an urban outbreak by Mosley, et al,[2] showed that among families of shigellosis patients 60 percent of members were infected, if asymptomatic cases were included; secondary attack rates were highest in the 0 to 4 age group.

Because of shigella's propensity to spread by contact, investigation of outbreaks is often difficult and confusing. In an outbreak like that reported by Texas there is always some secondary spread, so that all cases rarely fall into a single common source pattern. In this institutional outbreak, as in most family outbreaks, it is most difficult to distinguish foodborne from person-to-person spread. Many family outbreaks are undoubtedly related to contamination of food in preparation, though this would be difficult to prove.

Shigellosis among Eskimos, as among many other American Indians, simply points to the fact that they do not have the health education, sanitary facilities of sewage disposal, and safe water supply that most North Americans have. All enteric diseases, therefore, persist at excessive levels and will continue to do so until the underlying factors can be corrected.

Homes for retarded children and other mental institutions continue to account for a high proportion of shigella isolates reported to the CDC (36 percent of the isolates in this report). Personal hygiene is an inherent problem with retarded patients, and the situation is often aggrevated by overcrowding and understaffing.

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1. DuPont HL, Hornick RB, Snyder MJ, Libonati JP, and Formal SB: Immunity in shigellosis. II. Protection induced by oral live vaccine or primary infection. Accepted for publication in JID

2. Mosley WH, Adams B, and Lyman ED: Epidemiologic and sociologic features of a large urban outbreak of shigellosis. JAMA 182:1307-1311, 1962

V. Current Trends and Developments

A. Role of Antibiotics in the Control of Shigellosis

The question frequently arises whether antibiotics are of benefit in controlling the spread of shigellosis. Of central importance to this question is the role of shigella carriers in the spread of the infection and the use of antibiotics in treating carriers. Shigella carriers and antibiotic treatment of shigellosis have been discussed at length in previous issues of this report.[1,2] But a few points should be re-emphasized, particularly so because the treatment of shigellosis is occasionally confused with that of salmonellosis. Aserkoff and Bennett have recently shown that antibiotics for the treatment of salmonellosis prolong the duration of excretion of salmonellae.[3] Such is not the case in shigellosis. Antibiotics to which shigellae are sensitive have repeatedly been shown to be effective in eliminating the excretion of shigellae.[4,5]

Two factors are involved in the decision to treat patients or carriers. One relates to the good of the individual patient, the other to the public health. On clinical grounds alone "The necessity for antibiotic treatment of patients with milder forms of disease has not been conclusively established."[6] But the effect of treatment in limiting excretion of organisms and spread of infection to others is well established. Small children who are excreting shigellae should be treated to protect their siblings and parents. Food handlers and nurses with shigellosis pose a similar threat to others, and they should be treated.

So-called shigella carriers are not a homogeneous group. The vast majority of carriers either have an asymptomatic, self-limited infection or are in the convalescent phase of a symptomatic infection. Some are in an incubatory phase just prior to the onset of symptoms. Long-term carriage of shigella is unusual.[7]

In a study of 29 volunteers experimentally infected with shigellae, duration of excretion ranged from 1 to 78 days, with an average of 27 days if antibiotics were withheld.[8] Surveillance to detect carriers in a home for retarded children showed that the vast majority of shigellosis patients excreted the organism for less than a month; only 3.5 percent excreted shigellae for more than 18 months.[9] Control of shigellosis in custodial institutions is a particularly difficult problem. Antibiotics will usually stop excretion in individual patients, but they do not prevent later re-infection. In addition, the propensity of shigellae to develop multiple antibiotic resistance is accentuated in institutions where shigellosis is endemic and antibiotic usage is extensive.

Special mention must be made of the problems in treating infections due to Shigella dysenteriae type 1. This organism has been responsible for severe epidemics of dysentery in Central America since early in 1969. Travelers have from time to time returned to this country infected with S. dysenteriae type 1 after travel to Mexico or Central America.[10] Isolates of this epidemic strain have been notably resistant to sulfathiazole, tetracycline, streptomycin, and chloramphenicol. They have been sensitive to ampicillin, cephalothin, nalidixic acid, nitrofurantoin, gentamycin, neomycin, colistin, and kanamycin.[11] The relative clinical efficacy of these antibiotics has not yet been reported in this epidemic. In infections of United States tourists reported to the CDC, ampicillin has been consistently effective, if used at the recommended dosage of 50 mg/kg/day. This form of dysentery can be severe and prolonged, if not treated properly.

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B. International Notes

Antibiotic Sensitivities of Shigella Isolates in Vietnam, 1968-1969. Lt. Donald G. Martin, MSC, USN, Lt. Myron J. Long, MC, USNR, HMCS, Paul E. Ewald, USN, and HMC Howard V. Kelley, USN, Military Medicine 135:560-562, 1970.

The authors studied 505 isolates from United States military personnel in Vietnam. Breakdown of these organisms by group was S. dysenteriae 10 percent, S. flexneri 34 percent, S. boydii 4 percent, S. sonnei 36 percent; the remainder were classified as alkalescens-dispar group. Antibiotic disc sensitivities were determined for all isolates. Most isolates of S. flexneri and of S. sonnei were resistant to streptomycin, tetracycline, and chloramphenicol, but were sensitive to ampicillin, cephalothin, kanamycin, and neomycin. Most isolates of S. dysenteriae were sensitive to all antibiotics tested. The authors noted a definite increase in rates of shigella resistance to streptomycin, tetracycline, chloramphenicol, and ampicillin when compared to a previous study in Vietnam.

TABLE I

SHIGELLA SEROTYPES ISOLATED FROM HUMANS

THIRD QUARTER, 1970

	NORTHEAST																									NORTHWEST													
SEROTYPE	CONN	DEL	DC	ILL	IND	IOWA	KY	ME	MD	MASS	MICH	MINN	MO	NH	NJ	NY-A	NY-BI	NY-C	OHIO	PA	RI	VT	VA	W. VA	WISC	NORTHEAST TOTAL	COLO	IDAHO	KANS	MONT	NEB	NEV	ND	ORE	SD	UTAH	WASH	WYO	NORTHWEST TOTAL	NORTH TOTAL
A. dysenteriae																																								
Unspecified																1					1					2										1			1	3
1											1															1													0	1
2				3																						3													0	3
3																										0								1					1	1
4																									1	1													0	1
Total	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	7	0	0	0	0	0	0	0	1	0	1	0	0	2	9
B. flexneri																																								
Unspecified			2		6	3				2					1	3	1	53					4		2	77	2					2		10	18			1	33	110
1 Unspecified									2				1												2	5										1			1	6
1A																										0				3									3	3
1B				3																						3		1											1	4
2 Unspecified							1		19	1	1	1	1		1				1	1						27										2	11		13	40
2A	3			21							2	11	1		1				6	1						46			1	17			3						21	67
2B				9											1				1							11			7										7	18
3 Unspecified									2	1	20	1	8		1				5	1					2	41			1							1			2	43
3A	7			24							8				14											53													0	53
3B				2																						2													0	2
3C											5															5													0	5
4 Unspecified	1									2		8														11										2			2	13
4A				3								1														4			3	5									8	12
4B																										0													0	0
5				3																						3													0	3
6				14						1	4	3			1				1							24				1							3		4	28
Total	11	0	2	79	6	3	1	0	23	7	40	25	11	0	20	3	1	53	14	3	0	0	4	0	6	312	2	1	12	26	0	2	3	10	18	6	14	1	95	407
C. boydii																																								
Unspecified																							1			1													0	1
2												1														1											4		4	5
4																										0										1			1	1
5				3																						3											1		1	4
10																									1	1								1					1	2
14																										0													0	0
Total	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	6	0	0	0	0	0	0	0	1	0	1	5	0	7	13
D. sonnei	34		18	176	20	23	9	4	45	126	29	110	27	24	39	51	10	93	32	49	21	1	2	3	110	1056	10	6	13		4	4	1	8	6	8	47		107	1163
Unknown			7	1							2										5					15													0	15
TOTAL	45	0	27	262	26	26	10	4	68	133	72	136	38	24	59	55	11	146	46	52	27	1	7	3	118	1396	12	7	25	26	4	6	4	20	24	16	66	1	211	1607

TABLE I (CONTINUED)
SHIGELLA SEROTYPES ISOLATED FROM HUMANS
THIRD QUARTER, 1970

SOUTHEAST										SOUTHWEST						OTHER							PREVIOUS QUARTER		
ALA	ARK	FLA	GA	LA	MISS	NC	SC	TENN	SOUTHEAST TOTAL	ARIZ	NM	OKL	TEX	SOUTHWEST TOTAL	SOUTH TOTAL	ALK	CAL	HAW	VIRGIN ISLANDS	OTHER TOTAL	TOTAL	PERCENT OF TOTAL	TOTAL	PERCENT OF TOTAL	SEROTYPE
																									A. dysenteriae
		1							1					0	1					0	4	0.1	4	0.2	Unspecified
		1							1		1			1	2					0	3	0.1	2	0.1	1
						1			1	1			1	2	3					0	6	0.2	4	0.2	2
									0				1	1	1					0	2	0.1	2	0.1	3
									0					0	0					0	1	0.0	1	0.1	4
0	0	2	0	0	0	1	0	0	3	1	1	0	2	4	7	0	0	0	0	0	16	0.5	13	0.7	Total
																									B. flexneri
14		1			26		1		42		45	12		57	99					0	209	6.7	89	4.8	Unspecified
			1						1		11		1	12	13					0	19	0.6	12	0.7	1 Unspecified
									0	1				1	1					0	4	0.1	11	0.6	1A
	1			1					2				8	8	10					0	14	0.5	17	0.9	1B
		12	47			33			92		32			32	124					0	164	5.3	86	4.7	2 Unspecified
	1		1	6				6	14	21			47	68	82			21		21	170	5.5	133	7.2	2A
				1				4	5				6	6	11					0	29	0.9	43	2.3	2B
		4	14			1			19		10			10	29			5		5	77	2.5	54	2.9	3 Unspecified
	2			14				12	28	10			21	31	59					0	112	3.6	58	3.2	3A
									0					0	0					0	2	0.1	3	0.2	3B
								2	2					0	2					0	7	0.2	5	0.3	3C
		2	7			1			10		10			10	20					0	33	1.1	18	1.0	4 Unspecified
		3		4				10	17	8			10	18	35			2		2	49	1.6	30	1.6	4A
	1								1	1				1	2					0	2	0.1	4	0.2	4B
									0	2	1		1	4	4					0	7	0.2	3	0.2	5
		1	11	2		5		3	22	10	22		17	49	71	7				7	106	3.4	68	3.7	6
14	5	23	81	28	26	40	1	37	255	53	131	12	111	307	562	7	0	28	0	35	1004	32.4	636	34.6	Total
																									C. boydii
									0					0	0					0	1	0.0	0	–	Unspecified
									0				1	1	1					0	6	0.2	12	0.7	2
									0		1			1	1					0	2	0.1	1	0.1	4
									0					0	0					0	4	0.1	1	0.1	5
									0				8	8	8					0	10	0.3	4	0.2	10
									0				2	2	2					0	2	0.1	0	–	14
0	0	0	0	0	0	0	0	0	0	0	1	0	11	12	12	0	0	0	0	0	25	0.8	18	1.0	Total
17	18	96	115	30		29	2	31	338	30	98	7	187	322	660			209		209	2,032	65.6	1,148	62.5	*D. sonnei*
			1		3		2		6					0	6					0	21	0.7	21	1.1	Unknown
31	23	121	197	58	29	70	5	68	602	84	231	19	311	645	1247	7	0	237	0	244	3,098		1,836		**TOTAL**

Table II

Age and Sex Distribution of Individuals Infected with Shigella in the United States, Third Quarter, 1970

Age (Years)	Male	Female	Unknown	Total	Percent	Cumulative Percent	Number of Reported Isolations/ Million Population*
< 1	65	51		116	5.8	5.8	33.2
1- 4	336	352		688	34.3	40.1	47.6
5- 9	205	222		427	21.3	61.4	20.5
10-19	155	170		325	16.2	77.6	8.3
20-29	97	144		241	12.0	89.6	8.3
30-39	41	48		89	4.4	94.0	4.0
40-49	28	24		52	2.6	96.6	2.1
50-59	8	20		28	1.4	98.0	1.3
60-69	7	14		21	1.0	99.0	1.4
70-79	2	11		13	.6	99.6	1.4
80 +	4	1		5	.2	99.8	1.4
Subtotal	948	1,057		2,005			
Child (unspec.)		4	2	6			
Adult (unspec.)	7	8	1	16			
Unknown	517	536	18	1,071			
Total	1,472	1,605	21	3,098			
Percent	47.8	52.2					

*Based on provisional data from Population Estimates, Series P25, No. 428 (August 19, 1969) and No. 441 (March 19, 1970).

Table III

Relative Frequencies of Shigella Serotypes Reported, Third Quarter, 1970

	Serotype	Number Reported	Calculated Number*	Calculated Percent	Rank
A.	*S. dysenteriae*				
	Unspecified	4			
	1	3	4	.13	13
	2	6	8	.26	11
	3	2	3	.10	14
	4	1	1	.03	16
B.	*S. flexneri*				
	Unspecified	209			
	1 unspecified	19			
	1a	4	10	.32	9
	1b	14	37	1.19	7
	2 unspecified	164			
	2a	170	395	12.75	2
	2b	29	67	2.16	6
	3 unspecified	77			
	3a	112	233	7.52	3
	3b	2	4	.13	13
	3c	7	15	.48	8
	4 unspecified	33			
	4a	49	103	3.32	5
	4b	2	4	.13	13
	5	7	9	.29	10
	6	106	135	4.36	4
C.	*S. boydii*				
	Unspecified	1			
	2	6	6	.19	12
	4	2	2	.06	15
	5	4	4	.13	13
	10	10	10	.32	9
	14	2	2	.06	15
D.	*S. sonnei*	2,032	2,046	66.04	1
	Unknown	21			
	Total	3,098	3,098		

*Calculated number is derived by distributing the unspecified isolations in each group to their subgroups in the same proportion as the distribution of specified isolation of that group.

Table IV

Shigella Serotypes from Mental Institutions
Number of Isolations by State,
Third Quarter 1970

State	dysenteriae (unspecified)	dysenteriae 2	flexneri (unspecified)	flexneri 1 (unspecified)	flexneri 2 (unspecified)	flexneri 2a	flexneri 2b	flexnier 3 (unspecified)	flexneri 3a	flexneri 3c	flexneri 4 (unspecified)	flexneri 4a	flexneri 5	flexneri 6	sonnei 1	Total
Alabama	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Florida	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Georgia	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	24
Illinois	0	3	0	0	0	9	5	0	4	0	0	0	3	11	34	69
Indiana	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Maryland	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Massachusetts	0	0	1	0	0	0	0	0	0	0	1	0	0	0	8	10
Michigan	0	0	0	0	0	0	0	19	6	3	0	0	0	0	8	36
Minnesota	1	0	0	0	1	10	0	0	0	0	5	0	0	0	0	17
Mississippi	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
New Hampshire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
New Jersey	0	0	0	0	0	0	1	0	7	0	0	0	0	0	13	21
New York	0	0	33	0	0	0	0	0	0	0	0	0	0	0	1	34
Tennessee	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Wisconsin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8
Total	2	3	38	1	25	19	6	19	17	5	6	2	3	11	73	230

Table V

Sources of Reported Isolations of Shigella
By Residence at Time of Onset
Third Quarter 1970

Source	Jul	Aug	Sep	Total	Percent of Subtotal	Percent of Total
Mental Institutions	56	63	111	230	12	
Indian Reservations	7	16	11	34	2	
Other Residencies	491	509	562	1594	86	
Subtotal	554	588	684	1858		60
Residencies Unknown	354	379	496	1240		40
Total	908	967	1180	3098		

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Key to all disease surveillance activities are the physicians who serve as State epidemiologists. They are responsible for collecting, interpreting, and transmitting data and epidemiological information from their individual States; their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors; we are indebted to them for their valuable support.

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