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center for disease control

SHIGELLA

surveillance

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for the
First Quarter 1971

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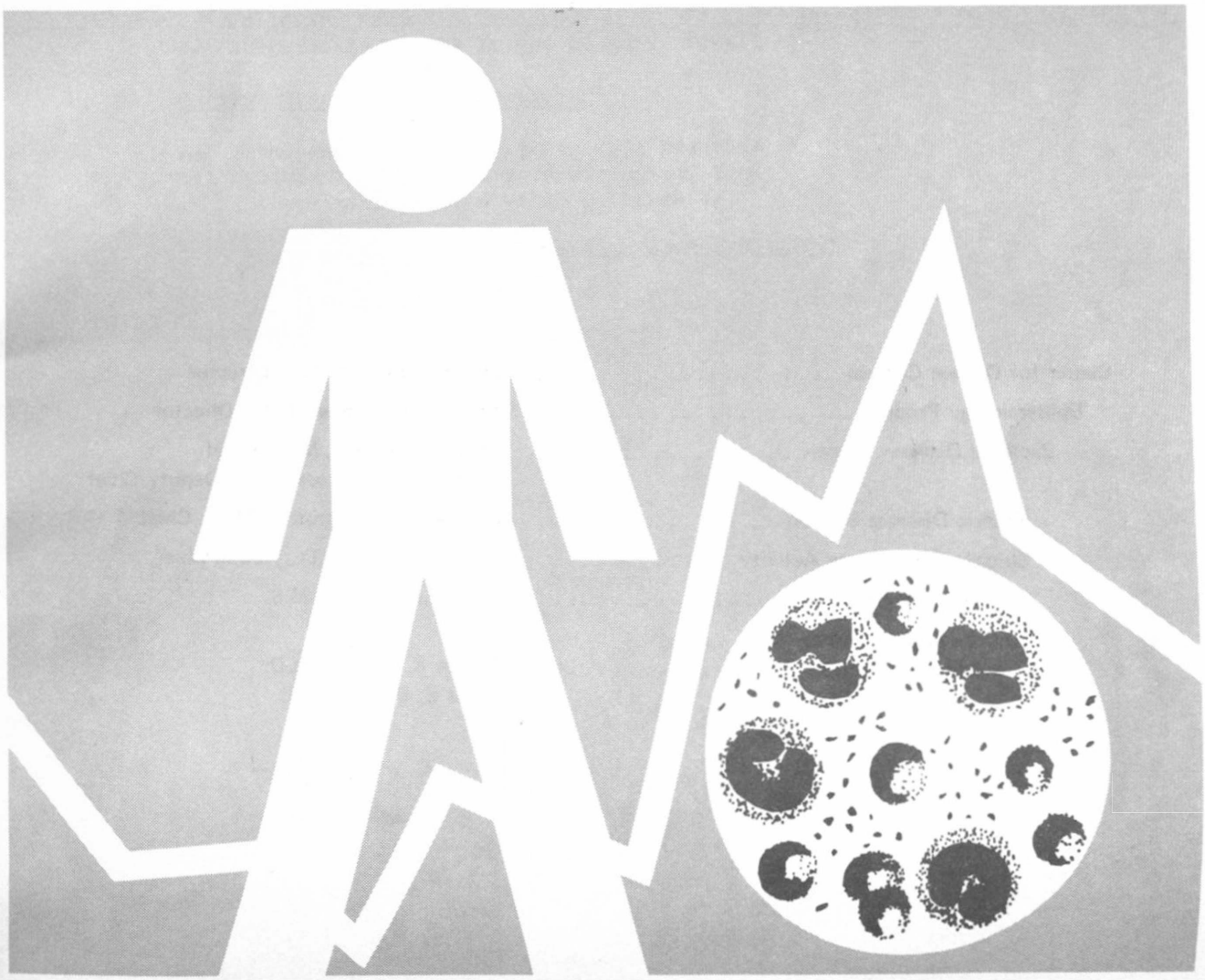

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE: PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

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:

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I. Summary

In the first quarter of 1971, 3,237 isolations from humans were reported. This number represents a decrease of 1,200 (27.0 percent) from the 4,437 isolations in the fourth quarter 1970, and an increase of 322 (11.0 percent) over the 2,915 isolations in the first quarter of 1970 (Table I).*

II. Reported Isolations

A. Human

1. General Incidence

During the first quarter of 1971, 63.1 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 of the 54 reporting centers participating in the Shigella Surveillance Program reported isolations of shigella. Twenty different serotypes were reported (Table I). The six most frequently reported serotypes during the 3 months period were the following (Table 1).

Table 1

Rank	Serotype	Number Reported	Calculated Number**	Calculated Percent**	Rank last Quarter
1	S. sonnei	2,599	2,621	80.9	1
2	S. flexneri 2a	114	226	7.0	2
3	S. flexneri 3a	60	115	3.6	3
4	S. flexneri 2b	33	65	2.0	6
5	S. flexneri 4a	36	61	1.9	5
6	S. flexneri 6	45	59	1.8	4
Subtotal		2,887	3,147	97.1	
Total (all serotypes)		3,237	3,240		

**From Table III

Table III is calculated from data compiled during the first quarter of 1971. This table shows the relative frequency of isolations of the various serotypes; the isolations of the various serotypes; 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. S. sonnei accounted for approximately four-fifths of all isolations during the first quarter. 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

All centers reporting shigella isolations during the first quarter except Arkansas, Louisiana, Mississippi, Arizona, Texas, Alaska, Delaware, Virginia, Montana, and Wyoming reported more S. sonnei than 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 the first quarter, utilizing population estimates for July 1, 1969. Approximately 16.0 isolations per million population were reported during the first quarter of 1971. Table V shows the residence of those patients from whom shigella was isolated.

Figure 1 PERCENTAGE *S. flexneri* AND *S. sonnei* OF TOTAL SHIGELLA ISOLATIONS REPORTED FROM INDICATED REGIONS UNITED STATES, JANUARY - MARCH 1971

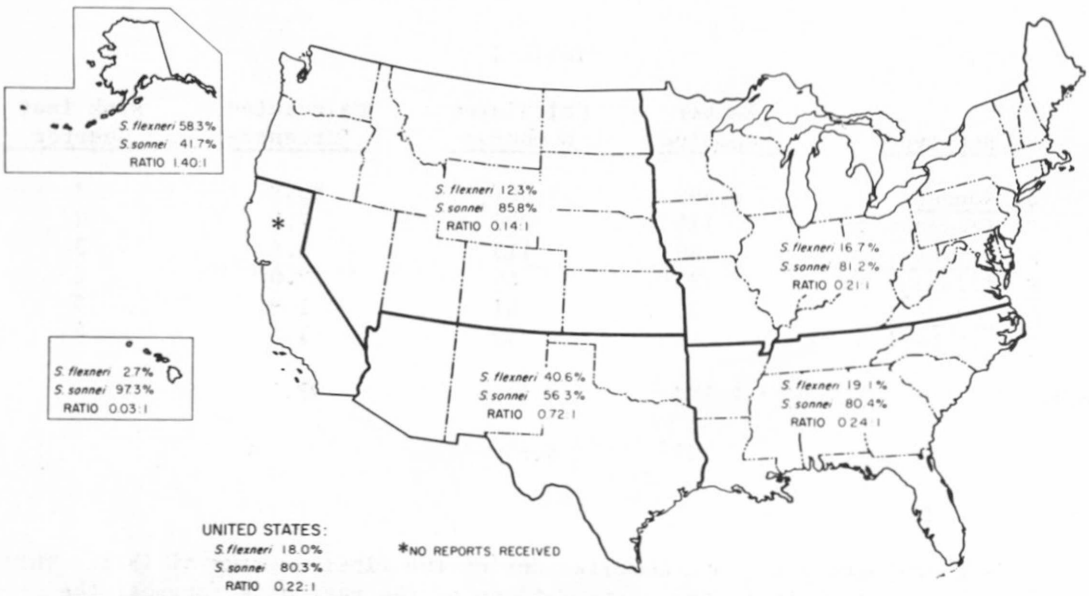
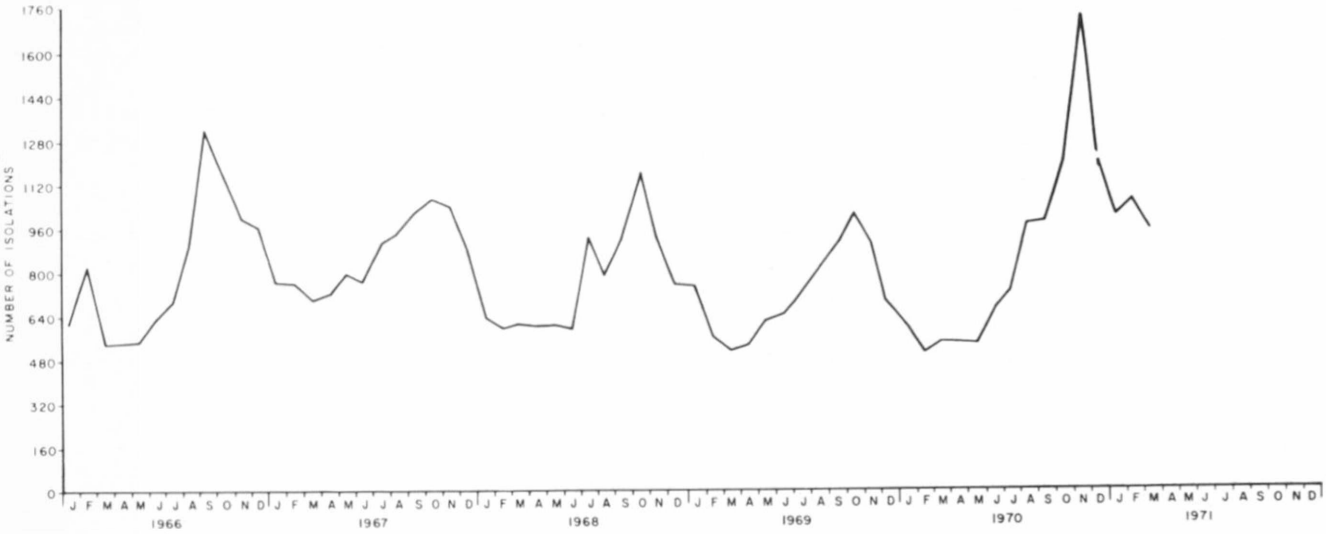
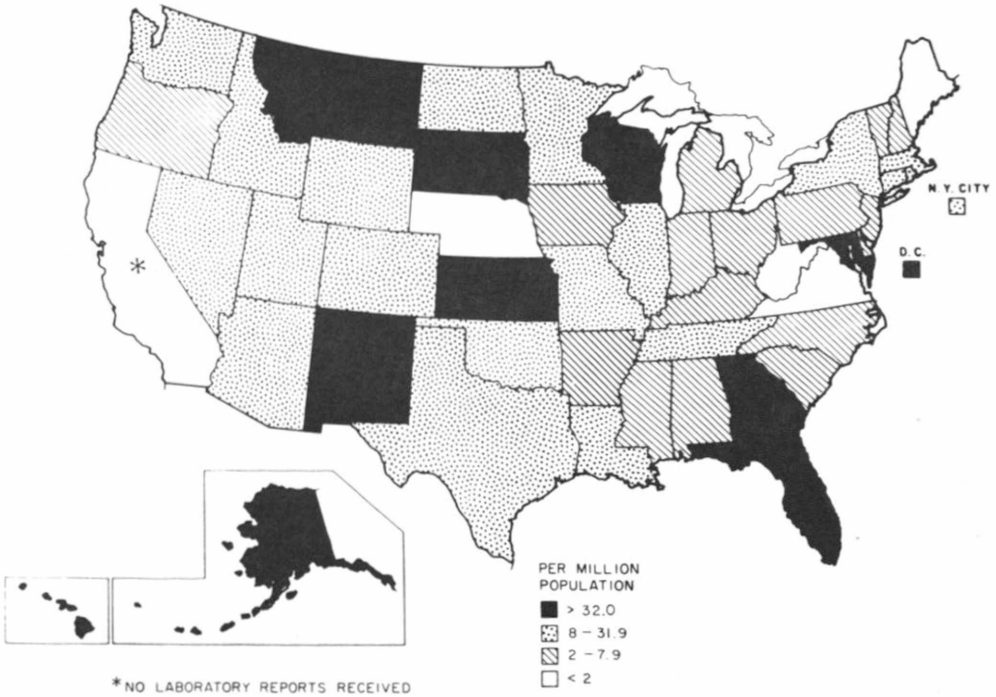


Figure 2 REPORTED ISOLATIONS OF SHIGELLA IN THE UNITED STATES



*ADJUSTED TO 4-WEEK MONTH

Figure 3 ATTACK RATES OF SHIGELLOSIS, BY STATE, JANUARY – MARCH 1971



*NO LABORATORY REPORTS RECEIVED

B. Nonhuman

During the first quarter 1971, 8 nonhuman isolations of shigella were reported:

Table 2

Serotype	Number	Source	State
S. sonnei	1	Unknown	Indiana
S. sonnei	4	Floor sample	Kansas
S. sonnei	2	Gibbon	Oklahoma
S. sonnei	1	Spider monkey	Texas

III. Reports from the States

A. Shigellosis in an Institute for Retarded Children, Kansas.
Reported by Robert A. French, Epidemiologist and Donald E. Wilcox, M.D., State Epidemiologist, Kansas State Department of Health, M. Colin Jordan, M.D., EIS Officer and Robert J. Sullivan, Jr., M.D., Medical Epidemiologist, EIP Kansas City Station.

Beginning in mid-November 1970 an outbreak of Shigella sonnei gastroenteritis occurred at a Kansas institution for the mentally retarded. One hundred thirteen of 475 children (23.8 percent) living at the institution became ill. There was one death. Spread of the infection was primarily by person-to-person contact. Prompt initiation of isolation procedures appeared to control the outbreak. A concurrent outbreak of diarrhea due to S. sonnei was also present in the surrounding community.

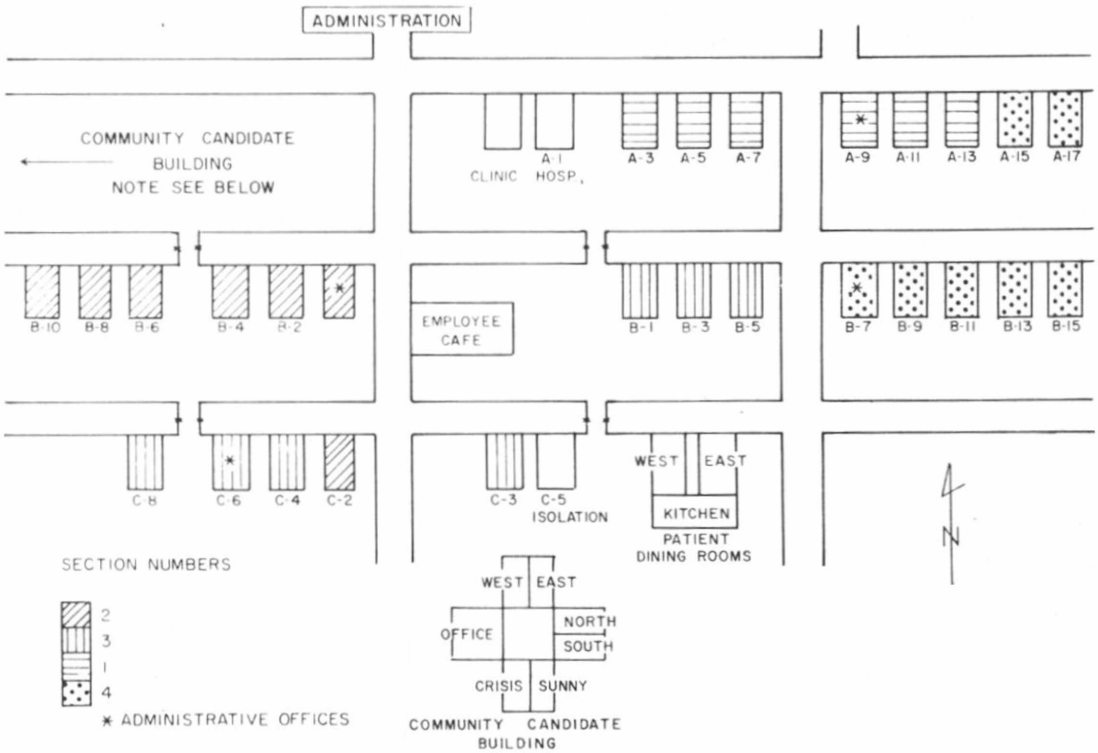
In December 1970 this hospital contained 29 wards housing 475 children of widely ranging degrees of retardation. On admission children were assigned to one of six sections based upon their level of function (Table 3). When patients reached 21 years of age, they were transferred to other hospitals. Children of all ages were included within each section. Sections were divided into wards on the basis of age and sex. Each ward had a separate brick building with beds and a recreation area for 20 patients. Wards were connected by long, enclosed corridors (Figure 4). The community candidate building was physically separated from the rest of the institution.

Table 3

Functional Division of Patients
Kansas Institution--December 1970

Section Number	Functional Level	Eating Area
1	Complete care required	Individual wards
2	Learning toilet training, dressing, and self-feeding	Individual wards
3	Learning to interact with others, and perfecting group #2 activities	East dining room
4	School sessions and work activities	West dining room
5	Training for specific jobs and the transition to life outside the hospital	West dining room
6	Temporary boarding for retarded children from private homes during "crisis" situations	Ward

Figure 4 KANSAS INSTITUTION, DECEMBER 1970



The hospital staff of 664 included seven physicians, 26 nurses, and 290 aids; the remainder were maintenance and administrative personnel. Each section had a team of nurses, social workers, and therapists. Patient care was delegated primarily to aids who were usually assigned to a single ward, although they might occasionally work on other wards within the section to provide adequate coverage. Personnel were almost never shifted outside their sections.

Patients in Sections 1 and 2 normally stayed on their wards. Toilet training was incomplete. Food for these patients was prepared in a central kitchen and served to the individual wards from heated carts. Section 3 patients were allowed some freedom in visiting other hospital areas. They ate in the east dining room under close supervision. The dining room was scrubbed after each meal. Section 4 and 5 patients were usually free to visit other hospital areas and attend group classes and shop activities. These patients were able to use the cafeteria line in the west dining room and feed themselves. In addition, the Group 5 patients worked in the kitchen and provided escort service for the less competent patients. Employees ate in a separate cafe which had its own kitchen.

Laundry was done in a separate building at the hospital. There was no increase in absenteeism or illness among laundry employees at the time of the outbreak.

Stool specimens from all children with unexplained diarrhea were routinely submitted to the state laboratory in Topeka. Between January and November 1970, an average of 75 specimens per month were cultured and all were negative for shigella.

Nurses' notes and patients' charts were reviewed in an attempt to determine when S. sonnei had been introduced into the hospital. Early cases were defined on the basis of meeting one or more of the following criteria: 1) fever over 101° F, with simultaneous diarrhea, 2) more than five loose stools per day, or 3) bloody diarrhea. The first case apparently occurred on November 20, 1970, in Section 4. On November 23 two additional cases occurred on the same ward. No stool cultures were obtained at that time since an outbreak of fever and pharyngitis was then occurring on the ward. On November 26, many of the patients in Section 4 left the hospital on passes for Thanksgiving. Some of these children returned to the hospital the same evening, but many remained out for periods ranging from 2-4 days. The Section 4 patients who remained at the hospital or returned early from their holiday gathered on one ward to minimize staffing of the other wards. They returned to their regular wards later that evening. On Saturday, November 28, cases of severe diarrhea, with fever and bloody stools, appeared in all other wards of Section 4. The first positive stool cultures of S. sonnei was obtained on December 4.

The epidemic curve for the outbreak is shown in Figure 5. Illness appeared on wards of Section 4 several days prior to involvement of other sections, although all six sections eventually experienced shigellosis. The pattern and rate of spread strongly suggest person-to-person contact rather than a common source outbreak. Between November 20, 1970 and January 10, 1971, 113 of the 475 children were clinically ill, an attack rate of 23.8 percent. Attack rates for each ward and section are shown in Table 4. The one death occurred suddenly on December 7; this was a severely retarded child who was recovering from an episode of fever and diarrhea. S. sonnei was grown from the intestinal contents at autopsy.

Stool specimens from all 475 children were submitted for culture during a 3-week period (Table 4). Of the 113 clinically ill children, 80 (70.8 percent) had positive cultures for S. sonnei. Fifteen of the 362 children who were well also had positive cultures, an inapparent infection rate of 4.1 percent. No shigella species other than S. sonnei were isolated during the outbreak.

Table 4

Attack Rates and Prevalence of Excretion of S. sonnei by Section and Ward for 3-Week Period

Location	Number Patients	Clinically Ill: Positive Culture	Clinically Ill: Negative Culture	Not Ill: Positive Culture	Not Ill: Negative Culture	Attack Rates*
Section 1						
Ward A-3	18	0	0	0	18	0
A-5	19	2	1	0	16	15.8%
A-7	19	0	0	0	19	0
A-11	19	0	0	0	19	0
A-13	17	0	1	0	16	5.9%
Total Section 1	92	2	2	0	88	4.3%
Section 2						
Ward B-2	19	0	0	0	19	0
B-4	20	0	0	0	20	0
B-6	15	7	5	1	2	80.0%
B-10	15	1	1	0	13	13.3%
C-2	18	0	0	0	18	0
C-5	17	1	0	0	16	5.9%
Total Section 2	104	9	6	1	88	14.4%
Section 3						
Ward B-1	15	0	0	0	15	0
B-3	18	1	0	1	16	5.6%
B-5	18	0	0	3	15	0
C-3	16	0	0	0	16	0
C-4	18	1	1	0	16	11.1%
C-8	14	0	0	0	14	0
Total Section 3	99	2	1	4	92	3.0%
Section 4						
Ward B-9	16	8	2	2	4	62.5%
B-11	13	10	1	1	1	84.6%
B-13	16	9	3	0	4	75.0%
B-15	18	3	1	3	11	22.2%
A-15	17	11	5	0	1	94.1%
B-17	13	10	3	0	0	100.0%
Total Section 4	93	51	15	6	21	71.0%
Section 5						
Eastview	16	5	1	1	9	37.5%
Westview	15	0	2	1	12	13.3%
Northview	16	3	0	1	12	18.8%
Southview	13	2	5	0	6	53.8%
Sunnyview	13	2	1	1	9	23.1%
Total Section 5	73	12	9	4	48	28.8%
Section 6						
Crisis Care	14	4	0	0	10	28.6%
Total KNI	475	80	33	15	347	23.8%

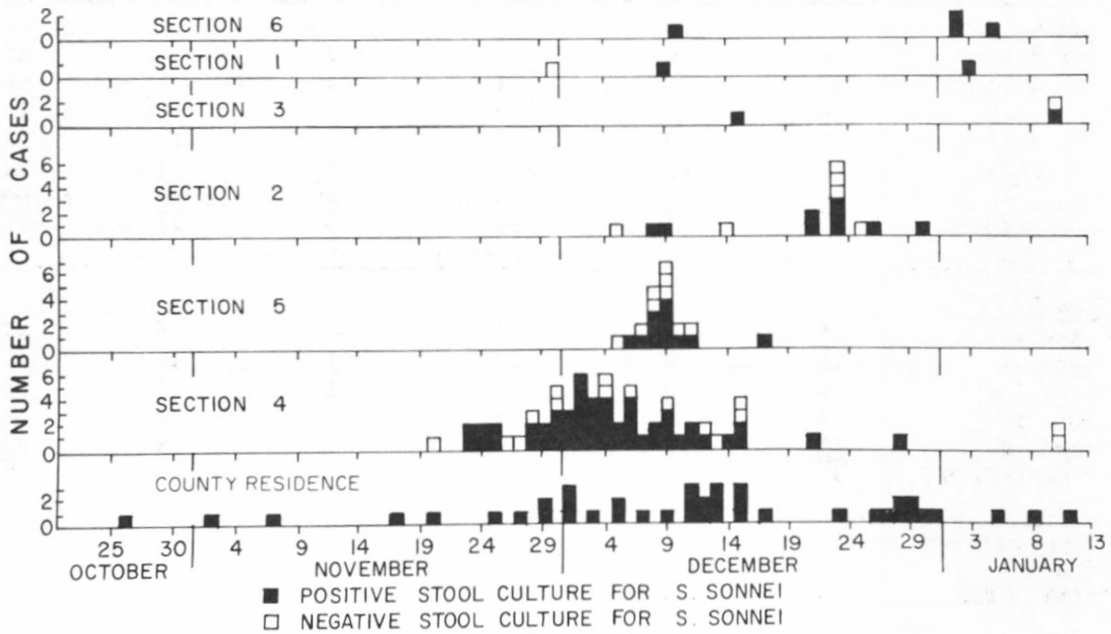
*For clinical illness only.

Stool specimens were obtained from all employees who experienced gastroenteritis prior to or during the outbreak as well as all ward personnel. Positive cultures for S. sonnei were obtained from 10 ward aids and two maintenance workers, both of whom had frequent contact with the children. Nine of these 12 employees gave a history of gastroenteritis, but none were ill prior to the beginning of the outbreak. The prevalence of excretion of S. sonnei was highest among ward employees of Section 4 (9 percent). A 50-year-old woman who worked in the food preparation area of the kitchen noted the onset of mild abdominal cramps, blood-tinged stools, and tenesmus without fever in mid-November 1970. Sigmoidoscopy and barium enema performed by her private physician revealed "inflammation." Stool cultures obtained on December 10 and 16 were negative for enteric pathogens despite the presence of bloody mucus. A 7-day course of ampicillin was begun December 11, with gradual improvement over several weeks.

Tables, counters, floors, and food items in the dining rooms and on the individual wards were cultured. Shigella isolates were obtained only from surfaces in the affected wards. Numerous samples of water from various sources were also negative.

Prior to and during the outbreak, several clusters of illness due to S. sonnei within the community were documented by the county health department (Figure 5). It seemed probable that the hospital outbreak was related to one or more of the community cases since children were frequently visited by or entertained in the homes of parents, foster parents, volunteers, or employees, most of whom lived in the county. Records of all such visits were reviewed and all persons having contact with children from the hospital between November 1 and 20, 1970, were contacted personally or by mail. All denied a history of personal or family illness compatible with shigellosis during this period, and no history of contact with documented community cases by these individuals could be established.

Figure 5 SHIGELLOSIS BY DAY OF ONSET SYMPTOMS, KANSAS INSTITUTION, OCTOBER - JANUARY 1970



On Monday, December 7, immediately after the first positive stool culture for S. sonnei was reported, the affected wards were isolated. Patients were restricted to their wards, and food was served on disposable plates. All patients submitted stool specimens for culture and were then treated with ampicillin. Intensive efforts were made to keep the wards and children clean. Antimicrobial prophylaxis was discontinued on Friday, December 11. Subsequently, only symptomatic or culture-positive children received ampicillin. An isolation ward was later opened on C-5 for children from other sections who had diarrhea.

All ward personnel with positive cultures were withdrawn from duty. Isolation procedures instituted included the use of gowns and gloves on the wards and hand washing when leaving the wards.

Three consecutive negative stool cultures obtained 5 days apart were required before infected children were returned to their usual wards. The same criteria were required before infected employees were allowed to resume their duties.

After initiation of control measures on December 7, the spread of shigellosis was effectively curtailed, except for a small focus on wards of Section 2. By February 15, only 12 patients required isolation, and no new cases of shigellosis were appearing. Two employees have been unable to return to work because of continued intermittent excretion of S. sonnei.

Colicin typing of a sample of 20 S. sonnei isolates from this outbreak was performed at CDC. Fifteen of the isolates were of the same colicin type. The remaining five isolates were untypable though they all had the same antibiogram, which was distinct from that of the typable isolates. Fourteen of the 15 typable isolates were from children at the hospital, one from a community resident; whereas four of the five untypable isolates were from community residents, the remaining one being from a child at the hospital.

The clinical and epidemiologic evidence suggests that S. sonnei was introduced into ward B-13 in mid-November 1970. Due to a concurrent outbreak of febrile pharyngitis and a history of chronic diarrhea among many of the children, shigellosis was not immediately recognized. A temporary grouping of children from Section 4, on a single ward during the Thanksgiving holiday allowed dissemination of the illness to other wards where it spread rapidly by person-to-person contact.

The exact method of introduction of S. sonnei into the hospital could not be determined. An asymptomatic or convalescent carrier may have been responsible since children and employees have frequent outside contacts. This hypothesis would be supported by the fact that a large number of shigellosis cases occurred simultaneously among residents of the same county. But the colicin type of isolates from most of the children at the hospital was different from that of the community cases. The increased number of cases reported from the community may have simply reflected better surveillance by the county health department.

A kitchen employee had symptoms compatible with shigellosis at approximately the same time as the beginning of the outbreak. Stool cultures were negative for S. sonnei, but were not obtained until the fourth week of illness. Although introduction of the organism by this individual can neither be confirmed nor denied, the pattern of spread and the failure of shigellosis to strike some wards with food sources common to involved wards suggest that she was not a major factor in its dissemination.

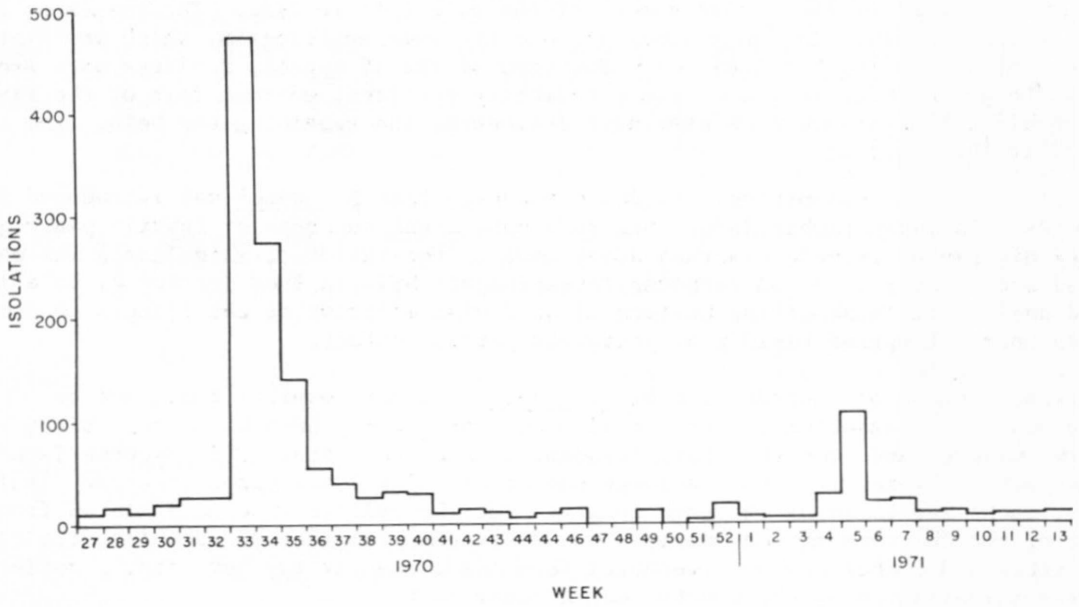
Surveillance of enteric infections had previously been established at this center. The stool culture surveillance system allowed relatively prompt recognition, isolation, and treatment of suspected cases. These measures appear to have limited the extent and duration of this outbreak.

B. Shigellosis on the Island of Maui, Hawaii. Reported by Lloyd C. Guthrie, M.D., Chief, Epidemiology Branch, Communicable Disease Division, Hawaii Department of Health

A large common source outbreak of shigellosis on the Island of Maui, Hawaii, was reported in Shigella Surveillance Report No. 25. In that outbreak there were 475 culture confirmed cases of Shigella sonnei in a single week, involving people on all parts of the island. Poi, a Hawaiian food, was implicated as the vehicle of infection for many of these cases. That epidemic was superimposed on an already high baseline level of shigellosis on the island. It was thought that young people living in two communes had introduced the organism when they arrived from the mainland.

Figure 6 shows the pattern of S. sonnei isolates from Maui over an extended period. The large peak during week number 33, 1970, represents the common source outbreak reviewed above. Secondary spread then accounted for the high tapering prevalence for the next 7 weeks.

Figure 6 ISOLATIONS OF *SHIGELLA SONNEI*, BY WEEK OF ISOLATION, MAUI, 3RD QUARTER 1970 – 1ST QUARTER 1971



The second large increase in isolates during weeks 4 and 5, 1971, is the result of yet another common source outbreak. One-hundred thirty-one of these isolates were from persons who had developed diarrhea after attending a wedding luau on January 16. The vehicle was not discovered.

In the face of continued difficulties with S. sonnei on Maui, colicin typing of different strains on the island has proven to be epidemiologically very helpful (Table 5). Fifteen isolates of S. sonnei from Maui's permanent residents during July 1970 were of colicin type X1, as were 10 isolates from persons involved in the August 1970 outbreaks. Twenty-six isolates from patients who had attended the January 1971 wedding luau were all type X3. Isolates from patients in the two communes on Maui were obtained in January 1971. Eight of nine isolates were of colicin type 15, and the other was untypable. These results show that the luau outbreak and the commune residents were probably not directly related. It is also remarkable that earlier isolates were of an entirely different colicin type. This variety of colicin types probably reflect repeated introduction of new strains, though actual changes in colicin type cannot be excluded. Factors governing the patterns of shigellae colicin and serotypes among human populations are poorly understood.

Table 5

Colicin Type of S. sonnei Isolates

Maui: Third Quarter 1970--First Quarter 1971

Group Tested	Number Tested	Colicin Type X1	X3	15	Untypable
Permanent residents 7/70 and 8/70	15	+			
Guests at wedding luau 1/71	26		+		
Commune residents 1/71	8			+	
Commune resident 1/71	1				+

C. Shigellosis Among Members of a Tour to Mexico, Minnesota.
Reported by C. B. Nelson, M.D., Chief, Section of Acute Communicable Diseases, Minnesota Department of Health

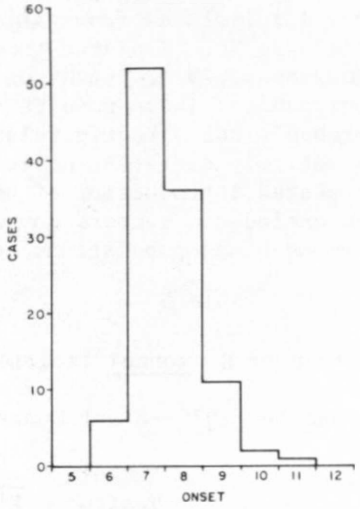
On March 2, 1971, a physician reported to the Minnesota Department of Health that Shigella flexneri 2a had been isolated from the stool of a patient who had recently traveled on a tour in Mexico. Known isolates of S. flexneri 2a were reviewed and compared with the list of 165 persons who had been on the tour together. It was discovered that six of these known Minnesota cases had been on the tour; a seventh case of proven S. flexneri 2a infection was found as the result of the follow-up questionnaire.

The 165 tour members were from Minnesota and Wisconsin. Their chartered flight left Minneapolis on February 5 and returned February 7. A questionnaire regarding symptoms of gastroenteritis was distributed to all those on the tour and was returned by 125. One hundred twelve of the respondents (96 percent) reported they had been ill. Dates of onset of their symptoms are shown in Figure 7.

Symptoms frequently reported included diarrhea (108), abdominal cramps (89), fever (47), nausea (32), and vomiting (26). Chills, anorexia, weakness, headache, dizziness, and bloody stools were present less frequently. The duration of illness was less than 5 days in 34 cases, 6 to 10 days in 29 cases, 11 to 15 days in 19 cases, and over 15 days in 17 cases. Forty-nine of 112 ill persons consulted physicians, and 11 were hospitalized. There were no deaths. No secondary cases among household contacts were reported.

The first meals shared by members of the tour were on the flight to Mexico, but none of the flight personnel who shared those meals became ill. Tour members stayed in two separate hotels; cases occurred in patrons of both. All persons on the tour were together for supper on February 5 and for lunch and supper on February 6. Specific food histories were not available.

Figure 7 SHIGELLOSIS CASES BY DATE OF ONSET OF SYMPTOMS, MINNESOTA TOUR GROUP, FEBRUARY 1971



Editorial Comment: This appears to have been a common source outbreak related to a meal shared by members of a tour in Mexico. An alert physician noted the association of a single case of shigellosis with the tour and postulated that other cases might have occurred. His observation led to uncovering 111 related cases. Routine reporting of shigella isolates to the Minnesota Department of Health provided a rapid means of confirming that a single serotype was implicated. This outbreak demonstrates the importance of the shigella surveillance system in demonstrating that an outbreak has occurred. But it must be emphasized that only seven isolates were reported through routine channels. Even large outbreaks may go undetected unless health officials are alert to small increases in reporting.

IV. Current Trends and Developments

A. Pathogenesis of Escherichia coli Diarrhea. Herbert L. DuPont, M.D., Samuel B. Formal, Ph.D., Richard B. Hornick, M.D., Merrill J. Snyder, Ph.D., Joseph P. Libonati, Ph.D., Daniel G. Sheahan, M.D., M.Sc., Eugene H. La Brec, Ph.D., and John P. Kalas, M.D.

The authors explored the potential of certain E. coli strains to produce diarrhea in adults. Although diarrhea in infants caused by E. coli is a common entity, E. coli has only recently been accepted as a cause of diarrhea in adults. Other workers have reported that some E. coli strains caused a shigellosis-like syndrome or "colitis" in adults while other strains caused a salmonellosis-like syndrome or "enteritis."[1]

In this study, four E. coli strains which caused diarrhea in adult male volunteers were carefully evaluated. Similarly studied were a virulent strain of Shigella flexneri 2a and an E. coli strain, HS, which was isolated from an asymptomatic adult. Laboratory models were used to test specific parameters of pathogenicity of enteric organisms. Ability of organisms to invade the intestinal mucosa was determined by testing ability to invade (1) guinea-pig corneas (Sereny test), (2) HeLa cell monolayers, and (3) intestinal mucosa of starved and opiated guinea pigs. The capability of organisms to elaborate an active enterotoxin was studied by injecting sterile supernatent of broth cultures into rabbit ileal loops.

Two of the four virulent E. coli strains tested (4608 and 1624) caused a shigellosis-like syndrome with chills, fever, abdominal cramps, and diarrhea, with bloody mucoid stools present in some volunteers. The two other strains (B2C and B7A) produced a cholera-like syndrome. The diarrhea was of greater volume, the stools did not contain blood, abdominal cramps were minimal, and fever was absent.

The striking clinical difference between these two categories of E. coli strains correlated well with the laboratory tests of pathogenicity as is shown in Table 6.

Table 6

Pathogenicity of Six Enteric Organisms

	Guinea Pig Eye Invasion	HeLa Cell Invasion	Guinea Pig Intestine Invasion	Rabbit Ileal Loop Reaction	Cholera-like Syndrome Volunteers	Shigellosis-like Syndrome Volunteers
4608	+	+	+	0	0	+
1624	+	+	+	0	0	+
B2C	0	0	0	+	+	0
B7A	0	0	0	+	+	0
Shigella	+	+	+	0	0	+
HS	0	0	0	0	0	0

Strains 4608 and 1624 which produced a shigellosis-like syndrome were invasive in the three tests performed and yielded a negative rabbit loop reaction. Strains B2C and B7A which produced a cholera-like syndrome lacked invasive capability in the laboratory, but produced an enterotoxin active in the rabbit ileal loop. The shigella strain tested was comparable to E. coli strains 4608 and 1624 in all respects in these studies, and the control E. coli strain, HS, failed to demonstrate any pathogenic potential.

Editorial Comment: This most important report elucidates different types of acute bacterial diarrheas. It is well known that shigellae produce disease by epithelial cell invasion and that cholera vibrios produce disease by means of bacterial adhesion with production of a toxin without disruption of the intestinal mucosa. The relative importance of these two mechanisms in the overall picture of acute diarrheas remains obscure. Many investigators feel that toxin-mediated disease is by far the more common syndrome among E. coli diarrheas. Most studies have failed to implicate a specific bacterial pathogen in the majority of sporadic acute diarrheas. The relative roles of as yet undescribed E. coli serotypes and viruses in causing these diarrheas remains conjectual.

Whereas this study divides the E. coli strains into two clear-cut categories of pathogenicity, other recent studies have concentrated on organisms which produce enteric disease by a combination of mechanisms. The epidemic strain of S. dysenteriae type 1 from Central America has been shown to elaborate an enterotoxin giving a positive rabbit ileal loop reaction. Investigations on the relative importance of toxin and invasion in Shiga dysentery are now in progress.

B. Colicin Typing as an Epidemiological Tool in the Investigation of an Outbreak of Shigella sonnei. L. Barth Reller, M.D., Applied Microbiology 21:21-26, 1971

Shigella sonnei, unlike organisms of the other three serotype groups, cannot be divided serologically into different subtypes. To distinguish between strains of S. sonnei in epidemic situations, therefore, one may resort to colicin typing,

testing the capacity of a shigella isolate to produce colicins that inhibit the growth of other selected shigella strains. The method and terminology devised by Gillies are generally used.[2]

The author, formerly chief of the Shigella Surveillance Activity, Epidemiology Program, Center for Disease Control, applied colicin typing to strains of S. sonnei isolated from eight shigellosis outbreaks in the United States during 1968 and 1969.

Colicin patterns were usually consistent within outbreaks but varied between them. Isolates from only two outbreaks conformed to the types described by Gillies. Two others showed distinct patterns of inhibition not previously described. In the four remaining outbreaks, all isolates failed to inhibit any of the indicator strains. Such isolates are designated "untypable." In several instances individual isolates differed from all others from that outbreak. In each of these instances it was shown that the cases differed epidemiologically in some way and that the source of the organism was probably different. Thus, even the classification of isolates as untypable may be useful epidemiologically, since they may be distinguished from sporadic typable ones.

The author concluded that colicin typing was of proven usefulness in S. sonnei epidemiology, but that a more comprehensive colicin classification would depend upon wider use of this tool.

Editorial Comment: Colicin typing proved useful in the two large S. sonnei epidemics reported elsewhere in this issue. In the Kansas outbreak, colicin type X1 was isolated from 14 of 15 patients studied in the institutional outbreak and in only one of five patients studied in the surrounding community. In the Hawaii outbreak isolates from three different groups of affected persons on a single island were studied and showed the predominance of a distinctly different colicin type in each group. This was especially interesting since it had been thought that the three groups were closely related epidemiologically.

The previously undescribed type discovered by Reller in a Texas outbreak was later named X1. It was also found in both Kansas and Hawaii and has proven to be the most common type among isolates studied in this country.

In both the Kansas and Hawaii outbreaks variation in S. sonnei type was demonstrated in a situation where epidemiologic studies suggested an etiologic relationship between the separate groups. These results, especially those from Hawaii, raise the possibility that a spontaneous change from one colicin type to another occurred.

Colicin typing remains a useful tool in the epidemiology of shigellosis, especially so since 82.5 percent of shigella isolates reported in the United States during 1970 were S. sonnei. The questions whether S. sonnei strains may undergo spontaneous conversions from one colicin type to another and how this might occur remain unanswered.

C. Extra-Intestinal Manifestations of Shigellosis. Reported by Elizabeth Barrett-Connor, M.D. and James D. Connor, M.D., American Journal of Gastroenterology 53:234-245, 1970

The authors of this article reviewed 330 culture confirmed cases of shigellosis at Jackson Memorial Hospital in Miami during 1962-1965. Three-hundred twenty-eight of the isolates were either S. sonnei or S. flexneri. Patients' ages varied from 2 days to 80 years, but 89 percent were less than 10 years old.

The following table summarizes the data on symptoms for the three most common serotypes in this series.

Table 7

Incidence of Symptoms by Serotype

Symptom	S. sonnei	S. flexneri 2	S. flexneri 3
Fever > 100° F.	74.4%	82.0%	78.8%
Diarrhea without blood	37.8%	48.0%	63.6%
Diarrhea with blood	57.8%	49.0%	36.4%
Vomiting	38.5%	36.0%	39.4%
Respiratory symptoms	20.0%	26.0%	21.2%
Convulsions	11.9%	12.0%	10.6%
Number of cases	125	100	66

Seventy-eight percent of patients with convulsions were children less than 5-years-old. Most of these had no past history of seizures nor focal abnormalities on electroencephalogram. Convulsions occurred in 23 percent of children with fevers > 103° F. and in only 6 percent of children with lower temperatures. Lumbar punctures performed on 36 children with convulsions yielded completely normal cerebrospinal fluid specimens except for three that showed minimal pleocytosis.

Twenty-three percent of all patients suffered from cough, coryza, or chest pain. Thirty-three of the 133 patients had x-ray findings of lobar or bronchopneumonia. Of these cases, however, 10 had no respiratory symptoms nor physical findings of lung disease.

Blood cultures from 93 patients yielded shigella in only three, all children. One of these patients had sickle-C hemoglobin, a mixed S. boydii, and salmonella bacteremia. The other two children had S. sonnei bacteremia. One of these two also had a rash. Only 13 of the 330 patients had this symptom concurrent with their infection.

Albuminuria was transiently present in half of the hospitalized patients. Fifteen children had blood urea nitrogen levels between 30 and 67 mg percent, but all of these were thought to be 10 percent dehydrated. Extra-intestinal manifestations, other than convulsions and respiratory symptoms, were very rare.

There were five deaths (1.5% mortality). Three of these patients had serious diseases coinciding with their shigellosis, and the other two were babies who had convulsions and died shortly after admission.

References

1. Sakayaki R, Tamura K, Saito M: Enteropathogenic Escherichia coli associated with diarrhea in children and adults. Jap J Med Sci Biol 20:387-399, 1967
2. Gillies RR: Colicine Production as an Epidemiological Marker of S. sonnei. J Hyg 62:1-9, 1964

TABLE I
SHIGELLA SEROTYPES ISOLATED FROM HUMANS
FIRST QUARTER, 1971

SEROTYPE	NORTHEAST																											NORTHWEST												NORTH TOTAL
	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	
A. dysenteriae																																							
1				1									1													2													0	2
2	1																									1													0	1
3																										0													0	0
4																										0													0	0
Total	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B. flexneri																																							
Unspecified		2	4		1	1				1			1			3	1	56		3	1		3			77	3							1	10		1	3	18	95
1										1																1										6	1		7	8
1A				1								3			1											5				2									2	7
1B												1														1													0	1
2 Unspecified				1			1		11	14		1	3		1										2	34				1							10		11	45
2A				19							1	16			2				1							39		3	3	4		1	2						13	52
2B	1			15											1											17													0	17
3 Unspecified										2			1						2						1	6				2						1			3	9
3 A	4			15							1				2											22													0	22
3 B																										0													0	0
3 C											3															3													0	3
4 Unspecified	1																									1										3			3	4
4 A	1												1	1												3				9	1								10	13
5				1									1													2													0	2
6				5							3				1											9				3	5						2		10	19
Total	7	2	4	57	1	1	1	0	11	18	8	22	7	0	8	3	1	56	3	3	1	0	3	0	3	220	3	3	15	15	0	1	2	1	10	10	14	3	77	297
C. boydii																																							
Unspecified			1																							1									6				6	7
1												1														1													0	1
2																										0											6		6	6
9																										0													0	0
10																										0													0	0
Total	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	0	6	0	12	14
D. sonnei	32	2	66	88	25	15	14		183	86	25	60	61	2	43	35	11	87	31	46	7	3	2		147	1071	25	12	411	10	2	3	3	4	15	19	35		539	1610
Unknown			21											1							1					23														23
TOTAL	40	4	92	146	26	16	15	0	194	104	33	83	69	3	51	38	12	143	34	49	9	3	5	0	150	1319	28	15	426	25	2	4	5	5	31	29	55	3	628	1947

TABLE I (CONTINUED)

SHIGELLA SEROTYPES ISOLATED FROM HUMANS

FIRST QUARTER, 1971

SOUTHEAST										SOUTHWEST					SOUTH TOTAL	OTHER					TOTAL	PERCENT OF TOTAL	PREVIOUS QUARTER		SEROTYPE
ALA	ARK	FLA	GA	LA	MISS	NC	SC	TENN	SOUTHEAST TOTAL	ARIZ	NM	OKL	TEX	SOUTHWEST TOTAL		ALK	CAL	HAW	VIRGIN ISLANDS	OTHER TOTAL			TOTAL	PERCENT OF TOTAL	
																									A. dysenteriae
									0				1	1	1					0	3	0.1	2	0.0	1
						1			1				1	1	2					0	3	0.1	9	0.2	2
									0	2			2	4	4					0	4	0.1	2	0.0	3
			1						1					0	1					0	1	0.0	0	—	4
0	0	0	1	0	0	1	0	0	2	2	0	0	4	6	8	0	0	0	0	0	11	0.3	17	0.4	Total
																									B. flexneri
9		3			10				22		2	8		10	32	3				3	130	4.0	154	3.5	Unspecified
		3	1						4		1			1	5					0	13	0.4	26	0.6	1
								1	1	1			1	2	3					0	10	0.3	8	0.2	1 A
	1			1					2				6	6	8					0	9	0.3	17	0.4	1 B
		9	6			6			21		11			11	32					0	77	2.4	84	1.9	2 Unspecified
	2			6				3	11	11			34	45	56			6		6	114	3.5	133	3.0	2 A
								2	2	1			13	14	16					0	33	1.0	28	0.6	2 B
		8	10			1			19		2			2	21			2		2	32	1.0	41	0.9	3 Unspecified
				9				4	13	9			16	25	38					0	60	1.9	83	1.9	3 A
								3	3				2	2	5					0	5	0.2	3	0.1	3 B
									0					0	0					0	3	0.1	8	0.2	3 C
		1							1	1	5			6	7					0	11	0.3	10	0.2	4 Unspecified
				4				2	6	5			12	17	23					0	36	1.1	57	1.3	4 A
				1				1	2				1	1	3					0	5	0.2	7	0.2	5
		1	3			1		1	6	3	8		5	16	22	4				4	45	1.4	77	1.7	6
9	3	25	20	21	10	8	0	17	113	31	29	8	90	158	271	7	0	8	0	15	583	18.0	739	16.7	Total
																									C. boydii
									0					0	0					0	7	0.2	7	0.2	Unspecified
									0					0	0					0	1	0.0	2	0.0	1
									0				1	1	1					0	7	0.2	5	0.1	2
									0				1	1	1					0	1	0.0	0	—	9
		1							1					0	1					0	1	0.0	2	0.0	10
0	0	1	0	0	0	0	0	0	1	0	0	0	2	2	3	0	0	0	0	0	17	0.5	18	0.4	Total
11	2	178	176	20	8	32	7	43	477	6	134	9	70	219	696	5		288		293	2599	80.3	3,643	82.1	*D. sonnei*
									0			4		4	4						27	0.9	20	0.4	Unknown
20	5	204	197	41	18	41	7	60	593	39	163	21	166	389	982	12	0	296	0	308	3237		4,437		TOTAL

Table II

Age and Sex Distribution of Individuals Infected With Shigella in the United States, First Quarter, 1971

Age (Years)	Male	Female	Unknown	Total	Percent	Cumulative Percent	Number of Reported Isolations/ Million Population*
< 1	66	58	1	125	5.9	5.9	35.8
1- 4	372	343		715	33.6	39.5	49.4
5- 9	267	235		502	23.6	63.1	24.1
10-19	242	172		414	19.4	82.5	10.6
20-29	63	121		184	8.6	91.1	6.4
30-39	38	51		89	4.2	95.3	4.0
40-49	14	27		41	1.9	97.2	1.7
50-59	9	19		28	1.3	98.5	1.3
60-69	8	11		19	.9	99.4	1.3
70-79	4	4		8	.4	99.8	0.9
80 +	4	1		5	.2	100.0	0.9
Subtotal	1,087	1,042	1	2,130			
Child (unspec)	7	7	2	16			
Adult (unspec)	1	9		10			
Unknown	442	445	194	1,081			
Total	1,537	1,503	197	3,237			
Percent	50.6	49.4					

*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, First Quarter, 1971

Serotype	Number Reported	Calculated Number*	Calculated Percent	Rank
A. S. dysenteriae				
Unspecified				
1	3	3	.09	13
2	3	3	.09	13
3	4	4	.12	12
4	1	1	.03	15
B. S. flexneri				
Unspecified	130			
1 unspecified	13			
1a	10	22	.68	7
1b	9	20	.62	8
2 unspecified	77			
2a	114	226	6.98	2
2b	33	65	2.01	4
3 unspecified	32			
3a	60	115	3.55	3
3b	5	10	.31	10
3c	3	6	.19	11
4 unspecified	11			
4a	36	61	1.88	5
5	5	6	.19	11
6	45	59	1.82	6
C. S. boydii				
Unspecified	7			
1	1	2	.06	14
2	7	12	.37	9
9	1	2	.06	14
10	1	2	.06	14
D. S. sonnei	2,599	2,621	80.90	1
Unknown	27			
Total	3,237	3,240		

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

Table IV

Shigella Serotypes from Mental Institutions
Number of Isolations by State,
First Quarter, 1971

State	dysenteriae 2	flexneri (unspecified)	flexneri 2 (unspecified)	flexneri 2a	flexneri 2b	flexneri 3a	flexneri 4a	flexneri 5	flexneri 6	sonnei	Total
Alabama	0	1	0	0	0	0	0	0	0	0	1
Florida	0	0	0	0	0	0	0	0	0	115	115
Georgia	0	0	1	0	0	0	0	0	0	3	4
Illinois	0	0	1	12	12	0	0	1	2	0	28
Iowa	0	0	0	0	0	0	0	0	0	3	3
Kansas	0	0	0	0	0	0	0	0	0	255	255
Maryland	0	0	0	0	0	0	0	0	0	1	1
Massachusetts	0	0	13	0	0	0	0	0	0	0	13
Minnesota	0	0	0	6	0	0	1	0	0	27	34
Mississippi	0	1	0	0	0	0	0	0	0	0	1
New Jersey	0	0	0	0	1	2	0	0	0	15	18
New York	0	32	0	0	0	0	0	0	0	0	32
North Carolina	1	0	0	0	0	0	0	0	0	0	1
Wisconsin	0	0	0	0	0	0	0	0	0	5	5
Total	1	34	15	18	13	2	1	1	2	424	511

Table V

Sources of Reported Isolations of Shigella
By Residence at Time of Onset
First Quarter, 1971

Source	Jan	Feb	Mar	Total	Percent of Subtotal	Percent of Total
Mental Institutions	107	126	278	511	28	
Indian Reservations	9	7	5	21	1	
Other Residencies	410	522	379	1,311	71	
Subtotal	526	655	662	1,843		57
Residencies Unknown	472	397	510	1,394		43
Total	998	1,052	1,172	3,237		

STATE EPIDEMIOLOGISTS AND STATE LABORATORY DIRECTORS

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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