REPORT NO. 26
APRIL 1971

center for disease control

SHIGELLA

surveillance

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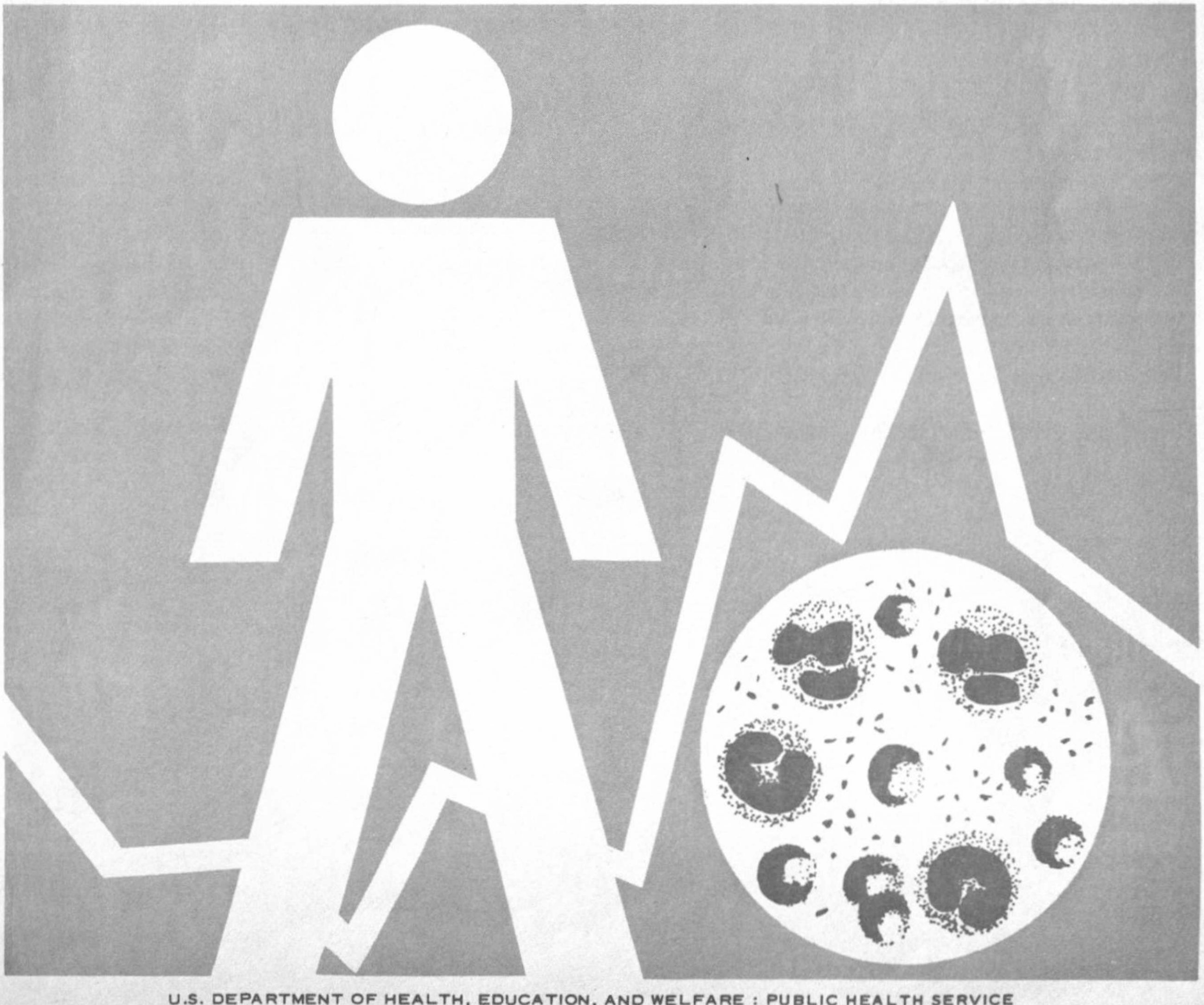
for the
Fourth Quarter 1970



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. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

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 fourth quarter of 1970, 4,437 isolations from humans were reported. This number represents an increase of 1,339 (43.2 percent) over the 3,098 isolations in the third quarter 1970 and an increase of 1,522 (52.2 percent) over the 2,915 isolations in the fourth quarter of 1969 (Table I).*

II. Reported Isolations

A. Human

1. General Incidence

During the fourth quarter of 1970, 69.1 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 groups 1-4 years.

2. Serotype Frequencies

Forty-nine of the 54 reporting centers participating in the Shigella Surveillance Program reported isolations of shigella. Twenty-one different serotypes were reported (Table I). The six most frequently reported serotypes during the 3-month period were the following (Table 1):

Table 1

Rank	Serotype	Reported	Calculated Number*	Calculated Percent*	Rank Last Quarter
1	*S. sonnei*	3,643	3,659	82.5	1
2	*S. flexneri* 2a	133	257	5.8	2
3	*S. flexneri* 3a	83	151	3.4	3
4	*S. flexneri* 6	77	98	2.2	4
5	*S. flexneri* 4a	57	85	1.9	5
6	*S. flexneri* 2b	28	54	1.2	6
Subtotal		4,021	4,304	97.0	
Total (all serotypes)		4,437	4,438		

*From Table III

Table III is calculated from data compiled during the fourth quarter of 1970. This table shows the relative frequency of 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. *Shigella sonnei* accounted for approximately four-fifths of all isolations; this increase resulted for the most part from late reports of a large outbreak which occurred during the third quarter in Hawaii.** The usual proportions of *S. sonnei* and *S. flexneri* were observed after removing this outbreak from the tabulations. 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.
**Shigella Surveillance Report No. 25, Third Quarter, 1970

3. Geographical and Seasonal Observations

More isolations of S. sonnei than S. flexneri were reported from every reporting center except from four states--Montana, Nevada, Mississippi, Arizona. The State of Alaska, which usually reports only S. flexneri isolations, reported 12 isolations of S. sonnei during the fourth quarter 1970 (Figure 1). The seasonal distribution of shigella is depicted in Figure 2. The marked increase in reported isolations for December is due to late reporting of isolations from an epidemic in Hawaii. Shigella Report No. 25 contains a description of that epidemic. Figure 3 shows the number of reported isolations per million population by state for the fourth quarter, 1970, utilizing population estimates for July 1, 1969. Approximately 21.8 isolations per million population were reported during the fourth quarter of 1970. 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, OCTOBER - DECEMBER 1970

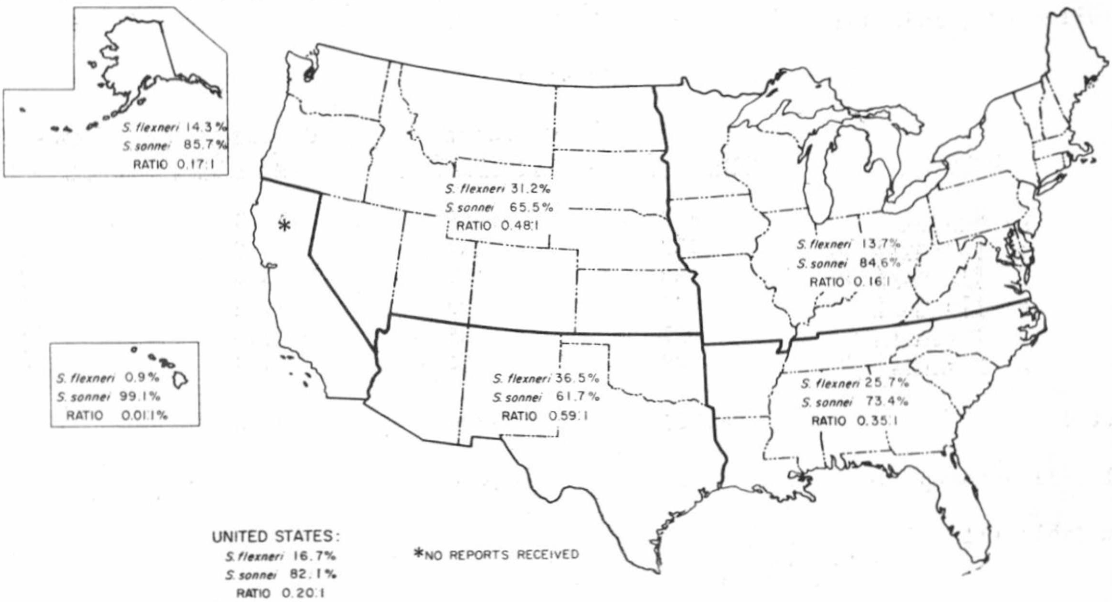


Figure 2 REPORTED ISOLATIONS OF SHIGELLA IN THE UNITED STATES

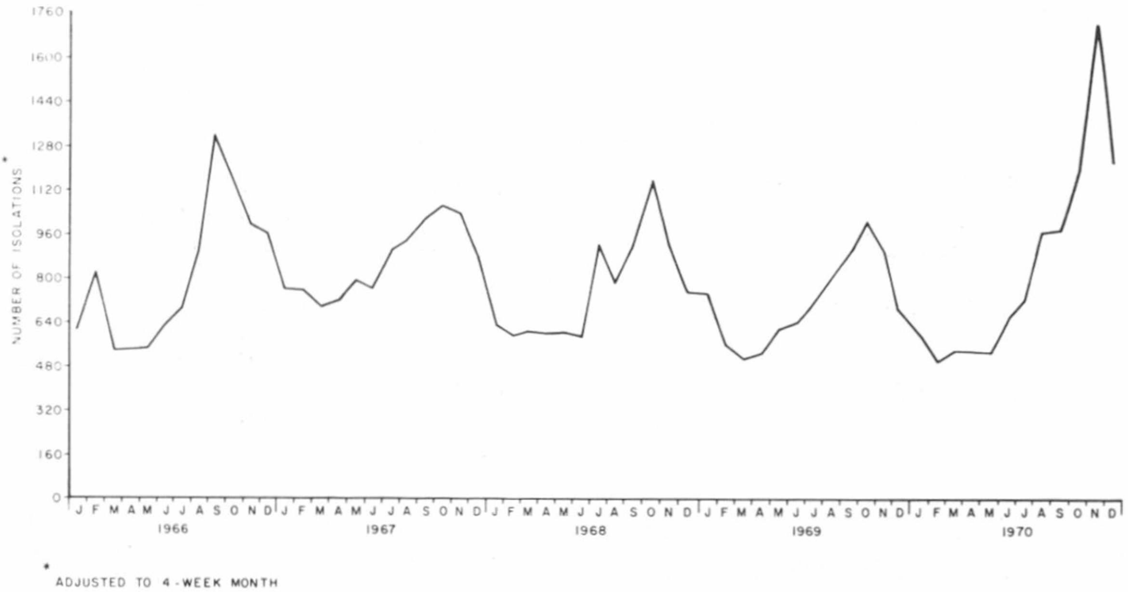
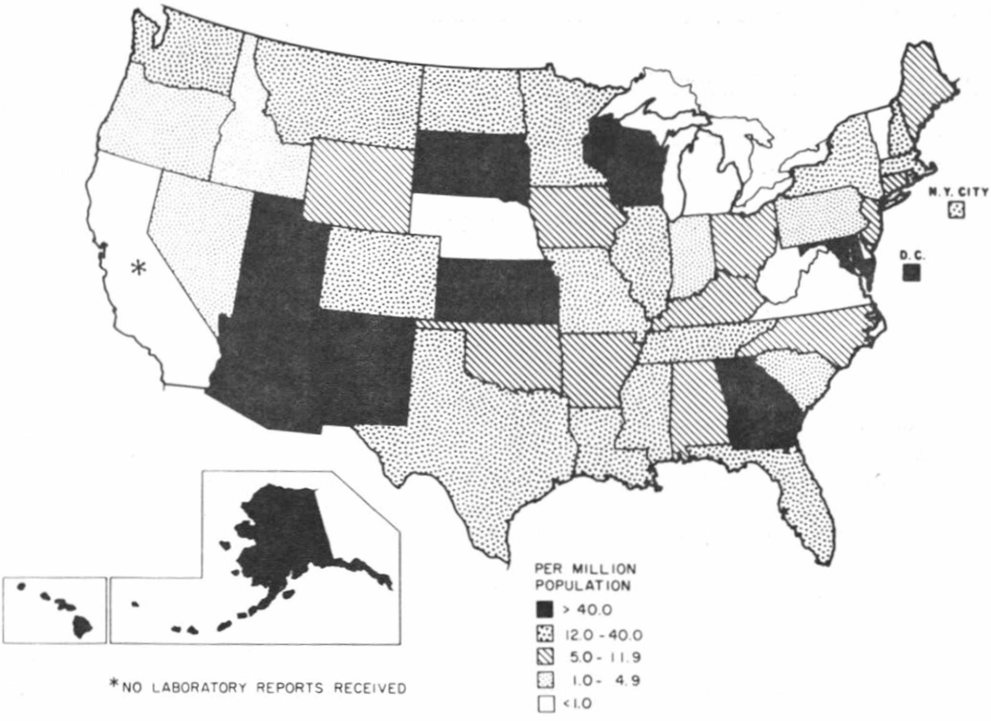


Figure 3 ATTACK RATES OF SHIGELLOSIS, BY STATE, OCTOBER – DECEMBER 1970



B. Nonhuman

During the fourth quarter 1970, 14 nonhuman isolations of shigella, all in primates, were reported:

Table 2

Serotype	Number	Source	State
S. flexneri (unspec.)	2	primate	Texas
S. flexneri 2a	2	monkey	Connecticut
S. flexneri 3 (unspec.)	1	lab animal	Georgia
	1	monkey	Georgia
S. flexneri 4b	3	monkey	Illinois
	1	baboon	Illinois
	2	monkey	Louisiana
S. sonnei	1	monkey	Georgia
	1	monkey	Georgia

III. Current Investigations

Foodborne Outbreaks Attributed to Shigellae in 1970

Most of the outbreaks listed in Table 3 are discussed in the 1970 Shigella Surveillance Reports: (1) is discussed in report no. 23; (2), (4), and (6) in no. 24, and (7) and (8) in this issue under Reports from the States. It should be emphasized that foodborne spread was not firmly proven in all of these outbreaks. The outbreak involving poi on the Island of Maui is the best documented of those listed and it is the largest common source outbreak of shigellosis reported since nationwide surveillance began in 1965. The actual numbers listed for persons affected and at risk in that outbreak are undocumented estimates; they are probably low estimates and the true numbers may have been twice as high. It is of interest that in all foodborne outbreaks reported in 1970, *S. sonnei* was the serotype implicated. This organism is known to be more durable than either *S. flexneri* or *S. dysenteriae*.

IV. Reports from the States

A. Shigellosis in California. Abstracted from California Morbidity: Reported Cases of Selected Notifiable Diseases, December 1970 (provisional)

Total Shigellosis Cases Reported

1970	1969	1968
1,899	1,904	1,749

B. Foodborne Shigellosis in a School, New Mexico. Reported by the City of Albuquerque Department of Environmental Health, the Bernalillo County Health Department, and the Consumer Protection Section, Environmental Services Division, New Mexico Health and Social Services Department.

The week of December 7, 1970, 300 of the 500 students at an Albuquerque elementary school reported symptoms of gastroenteritis. One-hundred-twenty-one persons were interviewed and date of onset of gastroenteritis symptoms is shown in Figure 4. Three persons were hospitalized, but there were no deaths. Positive cultures for

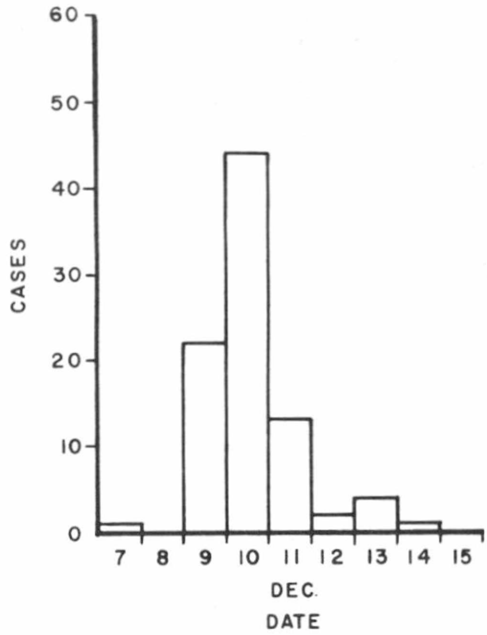
Table 3

Foodborne Outbreaks Attributed to Shigellae in 1970

	State	Date	Serotype	Probable vehicle	Number affected	Number at risk	Attack rate	Comments
1.	Virginia	1/27	*S. sonnei*	unknown	28	42	67%	shipboard dining room
2.	Texas	6/2	*S. sonnei*	unknown	17	36	47%	breakfast at a small institution
3.	Arkansas	6/17	*S. sonnei*	water	50	118	42%	camp for boys
4.	Hawaii	8/5	*S. sonnei*	water	42	111	38%	unchlorinated water source
5.	Missouri	8/9	*S. sonnei*	unknown	28	69	41%	Canadian boys group on tour
6.	Hawaii	8/16	*S. sonnei*	poi	1,200	2,000	60%	commercial poi on Maui Island
7.	Minnesota	10/14	*S. sonnei*	chocolate pudding	334	750	45%	school luncheon
8.	New Mexico	12/10	*S. sonnei*	tossed salad	300	500	60%	school luncheon

S. sonnei were obtained from 28 persons. Four of the positive cultures were from employees of the neighboring YWCA, whose only contact with the school was to eat lunches there. There were some positive cultures among the school food handlers, as well, but none of them had experienced diarrhea prior to the outbreak. Leftover food samples were routinely kept refrigerated. None were culture positive for shigella, but large numbers of other enteric organisms were grown from a salad.

Figure 4 CASES OF GASTROENTERITIS, BY DAY OF ONSET OF SYMPTOMS, NEW MEXICO SCHOOL, DECEMBER, 1970



C. Foodborne Shigellosis in a School, Minnesota. Reported by C. B. Nelson, M.D., Chief, Acute Communicable Diseases, C. B. Schneider, Section Chief, Hotels, Resorts, and Restaurants, and R. Lashbrook, G. Boges, and R. Church, Sanitarians, Minnesota Department of Health.

A combination high school elementary school in Le Sueur County, Minnesota experienced a sudden increase in absenteeism one week in October (Figure 5). Stool specimens from eight persons who were ill revealed S. sonnei in seven. One-hundred-eight students and teachers were interviewed. Of those interviewed 56 percent were ill, with diarrhea in 87 percent and fever in 70 percent. Food specific attack rates were obtained for all lunch items served October 12 through 14. Only for the chocolate pudding served on October 13 was exposure significantly correlated with illness (Table 4). If the October 13 lunch was taken to be the time of exposure, then the incubation periods ranged from 14 to 148 hours with an average of 48 hours.

One of the four food handlers in the school kitchen had a stool culture positive for S. sonnei. She had developed diarrhea on October 16. A culture of the leftover pudding mix was negative. Millipore filter cultures of the school tapwater were negative.

Figure 5 STUDENTS ABSENT BY DAY, MINNESOTA SCHOOL, OCTOBER, 1970

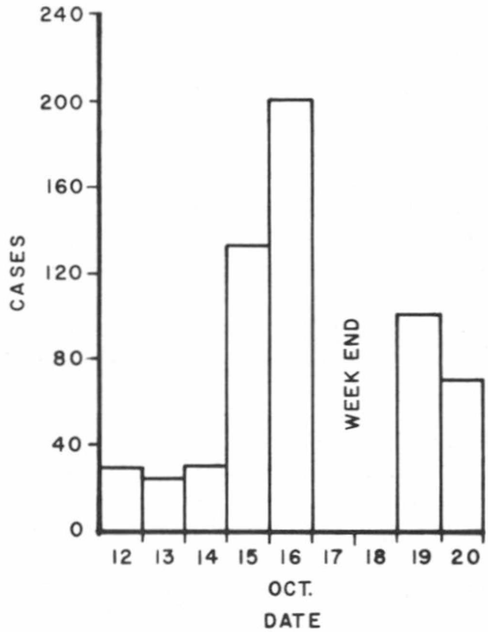


Table 4

Food Specific Attack Rates
October 13 Lunch--Minnesota School, 1970

Food	ATE			DID NOT EAT		
	Ill	Not Ill	Percent Ill	Ill	Not Ill	Percent Ill
Mashed potatoes	57	42	56%	3	6	33%
Hamburger gravy	58	45	56%	2	3	40%
Corn	49	43	53%	11	5	69%
Bread with butter	28	18	61%	32	30	52%
Bread with peanut butter	28	22	56%	32	26	55%
Chocolate pudding	57	37	60%	3	11	21%
Milk	55	46	54%	5	2	71%

Editorial Comment: These two outbreaks are unusual in that epidemics of shigellosis in high schools and elementary schools are reported very infrequently in this country. In England reports of shigellosis in the schools have been more frequent. The following report is from the Public Health Laboratory Service in London, and it was published in the British Medical Journal, June 27, 1970. Of great interest is the extreme facility with which shigellosis spread within the schools and in the families of school children.

"Outbreaks in two schools due to a strain of S. sonnei that spread with unusual vigour have recently been reported. The outbreak in School A began when four children in one of five forms in a primary school of 187 pupils were absent on one day with diarrhoea. During the day five more children were ill with diarrhoea at school. On the assumption that this was dysentery, regular supervised hand-rinsing in 1:30 benzalkonium chloride, and other hygienic measures, were immediately instituted. During the next four days S. sonnei was isolated from the stools of 57 children who attended the school. About a week later term ended; by this time 52 of the 187 children had been ill. Infection had also spread to four other schools, involving 19 children, most of whom were contacts of infected families from School A. Hand-rinsing was begun in the junior departments of these other schools, and no further spread occurred. Altogether S. sonnei was isolated from 136 persons (29 adults, 23 preschool children, and 74 school children) in 62 families. Most children at School A lived on a housing estate, where in some families hygiene is poor and children are in frequent close social contact. Many cases probably resulted from spread through social contacts outside school.

"It was thought that this outbreak began with a boy aged 7 who was away from school with a "bad attack" of diarrhoea about three weeks before the main outbreak. After the outbreak began he was shown to be excreting S. sonnei, and he has continued to do so. His personal hygiene was below average.

"Three weeks after the beginning of the summer term nine of 108 pupils in another primary school, School B, were absent with diarrhoea, and the hand-rinsing regime was started. Three days later 30 children were away with diarrhoea; 14 of these children in 12 families were excreting the epidemic strain of S. sonnei. Altogether 23 families were involved in the outbreak. The environment and family hygiene were similar to those of School A pupils, and almost all members of these families became infected.

"This outbreak apparently began with one child of a family of four who all attended the school. The child was away with diarrhoea for four days in the second week of term, and on his return to school he was sent home again because he still had diarrhoea. His three siblings continued to attend school. This family had had social contact with a family of seven from School A, four of whom were at some time excreting S. sonnei.

"All the strains isolated were resistant to sulphonamides, neomycin, and ampicillin, and sensitive to tetracycline and nalidixic acid; most were sensitive to streptomycin. Representative strains that were typed were colicine type 4.

"In investigating the outbreak at least twelve professional food handlers who had infected home contacts were found, and three were themselves excreting the organism. But for thorough investigations which detected these persons and suitable control measures the outbreak might have been more extensive. Children who were excreting the organism were excluded from school until they had had a negative stool. Treatment with nalidixic acid or streptomycin was given to families of food handlers, problem families, and individual children on clinical grounds. Very few new infections were observed at the two schools after hand-rinsing was started, but many infections continued to arise in the home environment."

V. Current Trends and Developments

Shiga Bacillus Dysentery Among United States Travelers and Review of the Middle American Pandemic. Reported by Shigella Surveillance Activity, Enteric Diseases Section, Bacterial Diseases Branch, Epidemiology Program, Center for Disease Control.

The fourth quarter Shigella Surveillance Report for 1969 included a summary of Shiga's bacillus importation into the United States. In 1970 the number of S. dysenteriae type 1 isolates from U.S. travelers has been greater than that in 1969, and there has been one associated death. 1970 has seen further spread in Middle America, as well.

The Shigella Surveillance Activity revealed only seven isolates of S. dysenteriae type 1 from 1964 through 1968. During 1969 the number of reported isolates increased to 23. All patients who could be traced gave a history of recent travel to Middle America just prior to their illnesses. These cases became apparent just as reports were received from Guatemala of widespread outbreaks of amebic dysentery for which there was no precedent. The question was raised whether the Guatemalan epidemic could be due to Shiga's bacillus. Isolation of S. dysenteriae 1 in September 1969 by Dr. Leonardo Mata confirmed this hypothesis. In October, a team from the CDC collaborated in studies to better define the illness and its epidemiologic characteristics.

Table 5 shows clinical findings in 45 bacteriologically confirmed cases. Symptoms are shown in the order of frequency. Severe cases usually start abruptly, with diarrhea followed in 12-48 hours by blood and pus in the stool with tenesmus and abdominal cramps. Commonly there are as many as 40 bowel movements in a day; the volume is often scanty in spite of much straining. Without treatment, symptoms last for weeks and even months. The mortality early in the epidemic was as high as 30 percent in hospitalized cases due, in part to erroneous treatment for amebiasis. This confusion arose because the diseases are somewhat similar and the response to commonly used antimicrobial drugs was so poor. The pattern of antibiotic sensitivity is shown in Table 6. Many clinicians reasoned spuriously that they had ruled out bacillary dysentery by the failure of patients to respond to such drugs as chloramphenicol and tetracycline to which the organism is resistant. Later the mortality in most treatment centers was reduced to 1 or 2 percent after it was demonstrated that drugs such as ampicillin and even penicillin in large doses given parenterally were dramatically effective in curing the disease.

The initial focus of the epidemic was in southwestern Guatemala where the epidemic began late in 1968. By mid-1969 the entire Pacific side of that country was affected and by fall the whole country. The disease had already become established in the western part of El Salvador by mid-1969 from which it spread rapidly from west to east affecting the rest of the country by February of 1970. Simultaneously, the epidemic involved Honduras. By March the disease extended into Nicaragua and within the past 6 months outbreaks have been reported in Costa Rica. The disease is present in Mexico as indicated by cases occurring in U.S. tourists. A 6 fold increase in deaths due to dysentery in Guatemala was reported in 1969. (There were 13,200 reported deaths throughout Guatemala, a country of five and a half million, during 1969. The actual number was probably greater). Table 7 shows the course of the epidemic in El Salvador with a resurgence of the epidemic in the summer of 1970

Table 5

Symptoms Recorded in 45 Patients Infected With Shiga's Bacillus, Guatemala, August, 1969

Symptom	Number affected	Percent affected
Abdominal pain	42	93%
Cramps	39	87%
Blood and mucus in feces	41	91%
Fever	36	80%
Tenesmus and/or rectal pain	31	69%
Headache	29	64%
Weakness and/or myalgia	27	60%
Nausea	23	51%
Vomiting	21	47%
10-40 B.M. in 24 hours	25	56%
4-9 B.M. in 24 hours	18	40%
< 4 B.M. in 24 hours	2	4%

Table 6

In vitro Sensitivity to Drugs of 53
Strains of S. dysenteriae 1, Guatemala, 1969

Drug	Resistant	Intermediate	Sensitive
Sulfathiazole	53	-	-
Cephalothin	-	-	53
Tetracycline	52	-	1*
Gentamicin	-	-	53
Neomycin	-	10	43
Streptomycin	52	-	1*
Colistin	-	-	53
Kanamycin	-	-	53
Ampicillin	-	-	53
Nalidixic Acid	-	-	53
Nitrofurantoin	-	-	53
Chloramphenicol	52	-	1*
Penicillin	23	30	-
Erythromycin	4	48	1

*Same strain

Table 7

Reported Cases of Shiga Dysentery, El Salvador, January-October 1970

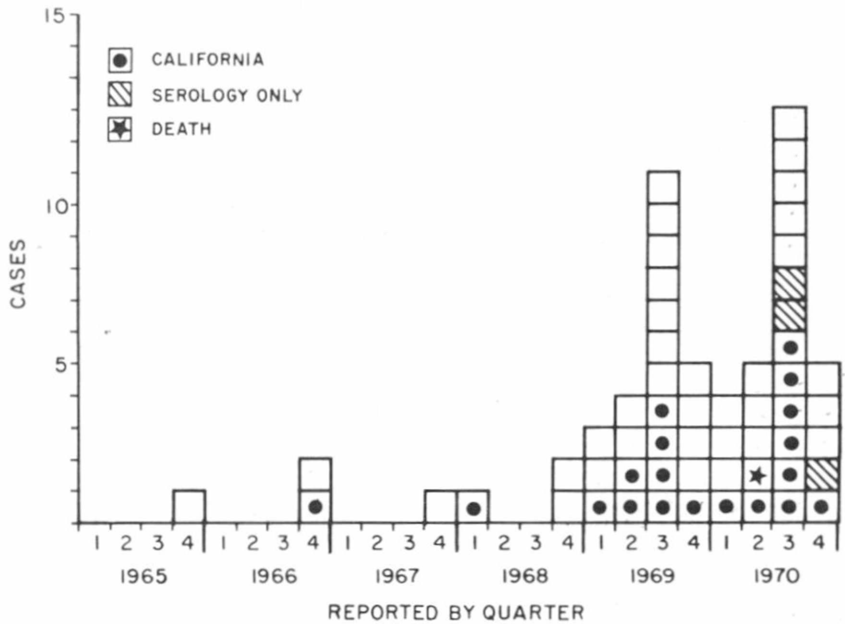
Month	Cases	Deaths
January	9,598	358
February	10,194	277
March	6,324	157
April	6,309	91
May	3,795	38
June	5,630	52
July	33,927	722
August	12,860	244
September	9,320	95
October	3,947	37
Total	101,904	2,071

The isolation of this organism from individual cases and less commonly in community outbreaks of dysentery has been documented since 1912 in Middle America. There is no doubt that an endemic focus existed in this area for many years. The reason for its exacerbation is unknown. Probably no single factor was responsible. A rapid population growth, 5 percent compounded yearly, has probably contributed to transmission by increasing the number of susceptibles and the density of the population. Housing has lagged, so that these susceptibles are now more crowded. But roads have improved; this has increased mobility of the population. This must have played an important role in the widespread occurrence of community outbreaks. Other factors include extensive environmental pollution of water supplies, primitive sanitation essentially unchanged for decades, severe climatic conditions in 1969 (a severe drought early in the year followed by flooding), and the known virulence and propensity for spread of the Shiga bacillus.

Shiga's bacillus has never been the predominant Shigella type isolated in the United States. There are reports of epidemics caused by it as recently as 1940, but since then it has only been reported in connection with travel outside of the U.S.

Since the beginning of 1969 isolations in this country have increased dramatically as shown in Figure 6. The increase can be attributed entirely to importation of the oragnism by travelers from Mexico and Central America. Although massive outbreaks are known to have occurred in Guatemala and El Salvador during this period, travelers from Central America account for only a few of the isolates. Of those patients for whom a travel history is known, 16 of 20 in 1969 and 14 of 23 in 1970 had traveled only to Mexico. Undoubtedly many more United States tourists go to Mexico than to the Central American countries; but the sharp increase in isolations from these tourists clearly indicates that infections with this organism have become more prevalent in Mexico in 1969 and 1970.

Figure 6 PERSONS WITH SHIGA'S BACILLUS INFECTION, UNITED STATES, JANUARY 1965 – DECEMBER 1970



Only a few of the isolates in this country have had antibiotic sensitivity testing, but these show the same pattern of multiple antibiotic resistance seen in the epidemic strain in Guatemala. Most notably, they have been resistant to tetracycline and chloramphenicol and sensitive to ampicillin. Use of inappropriate antibiotics has resulted in a protracted course for several of these patients. Whereas prompt use of ampicillin at the recommended dose of 50 mg/kg/dy has usually resulted in rapid improvement.

The clinical features of these patients have been like those described in Guatemala with bloody-mucoid stools, tenesmus, and abdominal cramps present in a high percentage. A few features are perhaps distinctive to the situation of the traveler. Travel, itself, frequently delays their seeing a physician, and the correct diagnosis is not usually apparent to the physician they do see. Physicians in Central America have frequently confused the disease with amebic dysentery. Their colleagues in the United States have most frequently confused it with ulcerative colitis. About half of the cases have had over a week's delay between onset of symptoms and diagnosis. Relapse has also been common. In some, a relatively mild acute attack of diarrhea and fever while traveling has been followed by a full-blown picture of dysentery upon their return home with bloody mucopurulent stools and tenesmus appearing in this more severe stage. Once developed, dysentery has generally persisted for weeks unless correctly treated.

To date, S. dysenteriae 1 has been isolated from two patients who had not traveled outside of the United States. One was a teenage girl in New Mexico, whose sister had traveled to Nicaragua and had diarrhea with a negative culture; serology done on the sister, through, was positive. It has been isolated recently from a 1-year-old female in Los Angeles whose father had been to Tijuana, Mexico.

The following are three brief histories of the patients involved:

1. A 50-year-old man traveled with his wife to Mexico on the east shore of the Gulf of California. He recalled, in retrospect, seeing oysters gathered near an open latrine on the shore. Later he and his wife ate oysters in a restaurant. He experienced headache, malaise, nausea, fever, and diarrhea as frequently as every 15 minutes, but his symptoms cleared without treatment. Three days later his diarrhea recurred and was severe with blood and mucus in the stool. He was hospitalized with diffuse abdominal pain and fever reaching 102^{o}. Seven days later after a variety of antibiotics he was worse, agitated, and hallucinating. With recovery of Shiga's bacillus from a stool culture IV ampicillin was begun and he recovered uneventfully.

His wife had experienced mild diarrhea at the same time as his onset. Her stool culture later was negative, but both of them had serology indicating infection.

2. The radio operator on a Dutch ship experienced the onset of abdominal pain while returning through the Panama Canal. He was seen at a hospital there with mild diarrhea but insisted on continuing with his ship. Four days later his diarrhea had progressed to severe dysentery with fever, frequent bloody stools of small quanitity, vomiting, and prostration with dehydration. He was evacuated to Miami by U.S. Coast Guard helicopter and cutter. There sigmoidoscopy showed lesions compatible with ulcerative colitis. When a culture grew out Shiga's bacillus, ampicillin was begun and he recovered slowly.

On their arrival in Baltimore his 23 shipmates were interviewed, cultured, and bled. None had positive cultures. Of the 24 on board, only the patient had serology specific for infection. He had been notoriously fond of the food on shore, especially in Nicaragua.

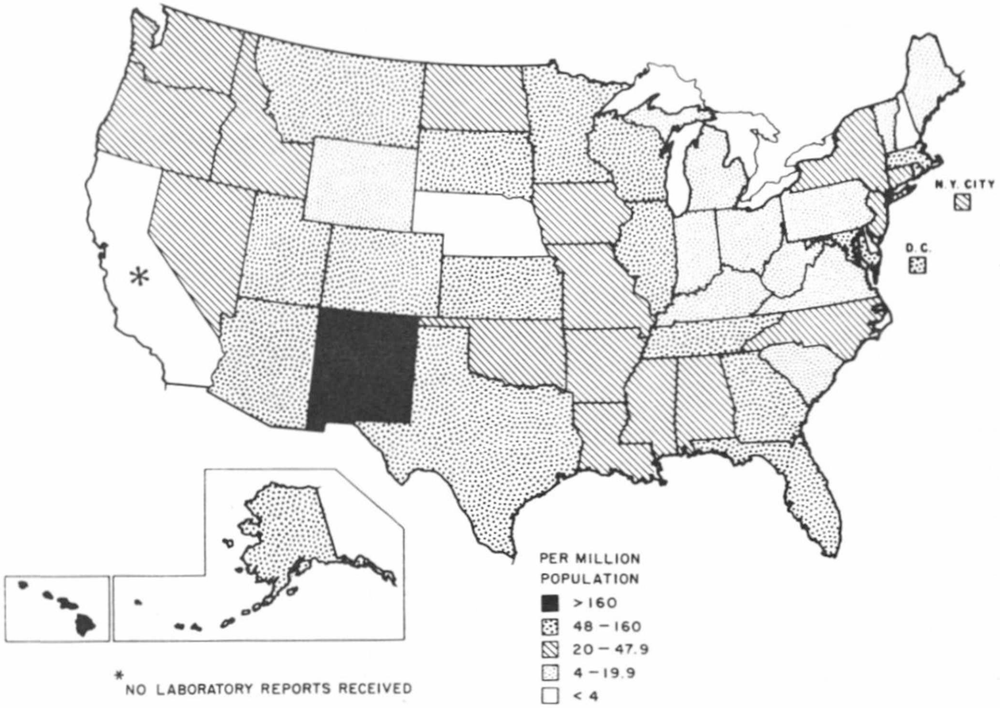
3. A 78-year-old Miami woman returned to her home in Nicaragua for a visit. While there she developed severe bloody diarrhea (20 stools a day). She was given tetracycline and IV's but failed to improve. A month later she was sent to a Miami hospital where she was found to be dehydrated. There she was maintained on intravenous fluids and a variety of antibiotics, not including ampicillin. She was thought to have ulcerative colitis, a rectal biopsy showed a "nonspecific ulcer," and she died from what was thought to be a pulmonary embolus. A premortem blood culture grew out S. dysenteriae 1. The infection had apparently persisted until her death 6½ weeks after the onset of symptoms.

Summary: It can be expected that Shiga's bacillus will persist in Central America. Though the causes of its recent appearance are unknown, there is little reason to think it will disappear unless the formula of overpopulation and undersanitation is somehow altered. In the case of cholera the persistence of the disease in Asiatic foci has permitted its repeated spread to most of that continent. Our position in proximity to Middle America is somewhat comparable. Fortunately, the level of sanitation in this country, although not perfect, is thought to be adequate to prevent serious epidemic spread although individual importations will continue to occur. If the disease is introduced into some of our southwestern Indian or slum populations outbreaks could result.

VI. Summary for 1970

In 1970, a total of 10,903 isolations of shigella was reported to CDC. This was an increase of 20.4 percent over the 9,054 isolations (excluding isolations reported during January and February, 1969 from California) reported in 1969. Utilizing the population estimates for July 1, 1969, the overall U.S. attack rate was 54.0 reported isolations per million population in 1970, compared to 44.8 reported isolations per million population in 1969. Attack rates by state are depicted in Figure 7.

Figure 7 ATTACK RATES OF SHIGELLOSIS, BY STATE, 1970



The age and sex distribution of individuals from whom shigella was isolated in 1970 is presented in Table VI. Children 1-4 years of age were at greatest risk with an attack rate of 158.0 per million during 1970.

The seasonal distribution persisted; the greatest number of isolates have been reported each autumn (Figures 3 and 4).

The six most frequently reported serotypes during 1970 are shown in Table 8.

Table 8

Six most Frequently Reported Shigella Serotypes During 1970

Rank	Serotype	Reported Number	Calculated Number	Calculated Percent	Rank in 1969
1	S. sonnei	7,829	7,877	72.2	1
2	S. flexneri 2a	537	1,069	9.8	2
3	S. flexneri 3a	295	633	5.8	3
4	S. flexneri 6	300	368	3.4	4
5	S. flexneri 4a	151	277	2.5	6
6	S. flexneri 2b	128	255	2.3	5

Table VII shows the relative frequency of all shigella serotypes reported in 1970. The trend toward an increasing proportion of all isolates being S. sonnei continued as it has since the fourth quarter of 1966. In 1970, 71.8 percent of all shigella isolations were S. sonnei versus 60.9 percent in 1969 and 54.0 percent in 1968. Concomitantly, S. flexneri has progressively decreased in proportion of total isolations.

TABLE I
SHIGELLA SEROTYPE ISOLATED FROM HUMANS
FOURTH QUARTER, 1970

SEROTYPE	NORTHEAST																										NORTHWEST													
	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							1			1			2	3
1																										0		1											1	1
2				5																						5								1					1	6
3																										0													0	0
Total	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6	0	1	0	0	0	0	1	1	0	1	0	0	4	10
B. flexneri																																								
Unspecified	1		1		1	5				4						3	6	48			1		1			71	19							1	14	1			35	106
1 Unspecified									2				3						1						2	8				1						4	2		7	15
1 A				2								1														3				2									2	5
1 B				2								3														5													0	5
2 Unspecified									13	2			1		1										2	19										1	16		17	36
2 A	5			10							2	9			3				7							36			1	8		1							10	46
2 B	1			14											1											16													0	16
3 Unspecified									1		1		4						4						6	16													0	16
3 A				17							2				6											25						1							1	26
3 B																										0													0	0
3 C											2															2													0	2
4 Unspecified																										0										1			1	1
4 A				2								3														5			31	3									34	39
4 B																										0													0	0
5				1					1						1											3													0	3
6				7			1		3	1																12			12	3							1		16	28
Variant X																										0											1		1	1
Total	7	0	1	55	1	5	1	0	20	7	7	16	8	0	12	3	6	48	12	0	1	0	1	0	10	221	19	0	44	17	0	2	0	1	14	7	20	0	124	345
C. boydii																																								
Unspecified										1																1									6				6	7
1																									1	1													0	1
2												2														2											1		1	3
5																									1	1													0	1
7																										0			1										1	1
10																										0													0	0
Total	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0	0	1	0	0	0	0	0	6	0	1	0	8	13
D. sonnei	24		37	169	16	21	19	8	146	159	24	89	82	17	38	58	31	124	55	44	13		3	1	183	1361	26	1	109	8			9	5	24	43	33	2	260	1621
Unknown			10											2											3	15												1	1	16
TOTAL	31	0	48	229	17	26	20	8	166	167	31	107	90	19	50	61	38	172	67	44	14	0	4	1	198	1608	45	2	154	25	0	2	10	7	44	51	54	3	397	2005

TABLE I (CONTINUED)

SHIGELLA SEROTYPES ISOLATED FROM HUMANS

FOURTH QUARTER, 1970

SOUTHEAST										SOUTHWEST						OTHER							PREVIOUS QUARTER		
ALA	ARK	FLA	GA	LA	MISS	NC	SC	TENN	SOUTHEAST TOTAL	ARIZ	NM	OKLA	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	0.1	Unspecified
									0				1	1	1					0	2	0.0	3	0.1	1
		2							2				1	1	3					0	9	0.2	6	0.2	2
									0				2	2	2					0	2	0.0	2	0.1	3
0	0	2	0	0	0	1	0	0	3	0	0	0	4	4	7	0	0	0	0	0	17	0.4	16	0.5	Total
																									B. flexneri
11					19				30		13	3	1	17	47			1		1	154	3.5	209	6.7	Unspecified
		1	5						6		5			5	11					0	26	0.6	19	0.6	1 Unspecified
								1	1	1			1	2	3					0	8	0.2	4	0.1	1 A
				1				1	2	1			9	10	12					0	17	0.4	14	0.5	1 B
		10	19			7			36		12			12	48					0	84	1.9	164	5.3	2 Unspecified
				6				13	19	19			40	59	78			9		9	133	3.0	170	5.5	2 A
									0	3			9	12	12					0	28	0.6	29	0.9	2 B
		1	19			1			21		4			4	25					0	41	0.9	77	2.5	3 Unspecified
	3			11				13	27	5			25	30	57					0	83	1.9	112	3.6	3 A
								2	2	1				1	3					0	3	0.1	2	0.1	3 B
								6	6					0	6					0	8	0.2	7	0.2	3 C
			1						1		8			8	9					0	10	0.2	33	1.1	4 Unspecified
								3	3	10			5	15	18					0	57	1.3	49	1.6	4 A
	2								2					0	2					0	2	0.0	2	0.1	4 B
								2	2	1			1	2	4					0	7	0.2	7	0.2	5
		6	5	1				3	15	7	14		11	32	47	2				2	77	1.7	106	3.4	6
									0					0	0					0	1	0.0	—	—	Variant X
11	5	18	49	19	19	8	0	44	173	48	56	3	102	209	382	2	0	10	0	12	739	16.7	1004	32.4	Total
																									C. boydii
									0					0	0					0	7	0.2	1	0.0	Unspecified
									0		1			1	1					0	2	0.0	—	—	1
									0	2				2	2					0	5	0.1	6	0.2	2
									0					0	0					0	1	0.0	4	0.1	5
									0					0	0					0	1	0.0	—	—	7
									0	1			1	2	2					0	2	0.0	10	0.3	10
0	0	0	0	0	0	0	0	0	0	3	1	0	1	5	5	0	0	0	0	0	18	0.4	25	0.8	Total
23	7	93	181	31	11	44	1	104	495	33	166	9	145	353	848	12		1162		1174	3643	82.1	2032	65.6	*D. sonnei*
					1		2		3			1		1	4					0	20	0.4	21	0.7	Unknown
34	**12**	**113**	**230**	**50**	**31**	**53**	**3**	**148**	**674**	**84**	**223**	**13**	**252**	**572**	**1246**	**14**	**0**	**1172**	**0**	**1186**	**4437**		**3098**		**TOTAL**

Table II

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

Age (Years)	Male	Female	Unknown	Total	Percent	Cumulative Percent	Number of Reported Isolations/ Million Population*
1	62	56		118	5.5	5.5	33.8
1 - 4	413	452	1	866	40.1	45.6	59.9
5 - 9	254	254		508	23.5	69.1	24.4
10 - 19	164	138		302	14.0	83.1	7.8
20 - 29	74	126		200	9.3	92.4	6.9
30 - 39	19	50		69	3.2	95.6	3.1
40 - 49	25	20		45	2.1	97.7	1.9
50 - 59	9	15		24	1.1	98.8	1.1
60 - 69	8	7		15	.7	99.5	1.0
70 - 79	4	4		8	.4	99.9	0.9
80 +	2	5		7	.3	100.2	1.9
Subtotal	1,034	1,127	1	2,162			
Child (unspec)	6	5		11			
Adult (unspec)	9	8	1	18			
Unknown	623	667	956	2,246			
Total	1,672	1,807	958	4,437			
Percent	48.1	51.9					

*Based on data from Current Population Reports, Series P-25, No. 428, August 19, 1969, and No. 441, March 19, 1970.

Table III

Relative Frequencies of Shigella Serotypes
Reported, Fourth Quarter, 1970

Serotype	Reported	Calculated Number*	Calculated Percent*	Rank
A. *S. dysenteriae*				
Unspecified	4			
1	2	3	.07	14
2	9	12	.27	10
3	2	3	.07	14
B. *S. flexneri*				
Unspecified	154			
1 unspecified	26			
1a	8	21	.47	8
1b	17	44	.99	7
2 unspecified	84			
2a	133	257	5.79	2
2b	28	54	1.22	6
3 unspecified	41			
3a	83	151	3.40	3
3b	3	5	.11	13
3c	8	15	.34	9
4 unspecified	10			
4a	57	85	1.92	5
4b	2	3	.07	14
5	7	9	.20	11
6	77	98	2.21	4
Varient X	1	1	.02	16
C. *S. boydii*				
Unspecified	7			
1	2	3	.07	14
2	5	8	.18	12
5	1	2	.05	15
7	1	2	.05	15
10	2	3	.07	14
D. *S. sonnei*	3,643	3,659	82.45	1
Unknown	20			
Total	4,437	4,438		

*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,
Fourth Quarter 1970

	dysenteriae 2	flexneri (unspecified)	flexneri 2 (unspecified)	flexneri 2a	flexneri 2b	flexneri 3a	flexneri 3c	flexneri 4a	flexneri 5	flexneri 6	sonnei	Total
Florida	0	0	0	0	0	0	0	0	0	0	25	25
Georgia	0	0	4	0	0	0	0	0	0	0	0	4
Illinois	5	0	0	4	14	3	0	0	1	0	22	49
Kansas	0	0	0	0	0	0	0	0	0	0	70	70
Maryland	0	0	0	0	0	0	0	0	0	3	0	3
Massachusetts	0	0	0	0	0	0	0	0	0	0	5	5
Michigan	0	0	0	0	0	1	1	0	0	0	2	4
Minnesota	0	0	0	9	0	0	0	2	0	0	1	12
Missouri	0	0	0	0	0	0	0	0	0	0	3	3
New Jersey	0	0	0	0	1	3	0	0	0	0	2	6
New York	0	35	0	0	0	0	0	0	0	0	0	35
Wisconsin	0	0	0	0	0	0	0	0	0	0	54	54
Total	5	35	4	13	15	7	1	2	1	3	184	270

Table V

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

Source	Oct	Nov	Dec	Total	Percent of Subtotal	Percent of Total
Mental Institutions	74	82	114	270	18	
Indian Reservations	9	13	10	33	2	
Other Residencies	448	335	439	1,228	80	
Subtotal	531	430	563	1,531		35
Residencies Unknown	662	592	644	2,906		65
Total	1,193	1,022	1,207	4,437		

Table VI

Age and Sex Distribution of Individuals Infected with Shigellae in the United States, 1970

Age (Years)	Male	Female	Unknown	Total	Percent	Cumulative Percent	Number of Reported Isolations/ Million Population*
<1	208	174	1	383	5.9	5.9	109.6
1 - 4	1,122	1,162	2	2,286	35.3	41.2	158.0
5 - 9	713	750		1,463	22.6	63.8	70.2
10 - 19	482	509		991	15.3	79.1	25.4
20 - 29	261	460	1	722	11.1	90.2	24.9
30 - 39	118	155		273	4.2	94.4	12.2
40 - 49	78	78		156	2.4	96.8	6.4
50 - 59	32	54		86	1.3	98.1	4.1
60 - 69	29	34		63	1.0	99.1	4.2
70 - 79	14	23		37	.6	99.7	4.1
80 +	11	12		23	.4	100.1	6.4
Subtotal	3,068	3,411	4	6,483			
Child (unspec)	11	13	2	26			
Adult (unspec)	19	25	2	46			
Unknown	1,645	1,712	991	4,348			
Total	4,743	5,161	999	10,903			
Percent	47.9	52.1					

*Based on data from Current Population Reports, Series P25, No. 428, August 19, 1969 and No. 441, March 19, 1970

Table VII

Relative Frequencies of Shigella Serotypes Reported, 1970

Serotype	Reported	Calculated Number*	Calculated Percent*	Rank
A. *S. dysenteriae*				
Unspecified	15			
1	9	12	.11	16
2	23	31	.28	10
3	8	11	.10	17
4	2	3	.03	20
B. *S. flexneri*				
Unspecified	514			
1 unspecified	66			
1a	32	70	.64	8
1b	52	114	1.05	7
2 unspecified	415			
2a	537	1,069	9.80	2
2b	128	255	2.34	6
3 unspecified	248			
3a	295	633	5.80	3
3b	12	26	.24	12
3c	23	49	.45	9
4 unspecified	79			
4a	151	277	2.54	5
4b	9	16	.15	15
5	20	25	.23	13
6	300	368	3.37	4
Varient X	1	1	.01	22
Varient Y	2	2	.02	21
C. *S. boydii*				
Unspecified	8			
1	4	5	.05	19
2	26	30	.28	11
4	4	5	.05	19
5	6	7	.06	18
7	1	1	.01	22
10	16	18	.17	14
14	2	2	.02	21
D. *S. sonnei*	7,829	7,877	72.22	1
Unknown	66			
Total	10,903	10,907		

*See footnote Table III

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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