AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE
Vol. 14, No. 6

Printed in U.S.A.

DISTRIBUTION OF *AEDES AEGYPTI* INFESTATIONS IN THE UNITED STATES*

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A Public Health Service program to eradicate *Aedes aegypti* from the United States was initiated by the Communicable Disease Center (CDC) with funds appropriated by Congress in October 1963.[1,2] From 1956 through 1962, CDC surveys conducted in cooperation with state and local departments of health in 440 communities of 262 countries had shown *Ae. aegypti* in 101 counties of nine southeastern states.[3-5] Additional knowledge of geographic distribution of the species was required for more detailed planning of expanded eradication operations. The following report summarizes results of a 1964 survey in 5,257 communities of 639 counties in 11 southeastern states.

TABLE 1

Summary of Aedes aegypti *survey, 1964*

State	Counties		Communities		Premises	
	Surveyed	Infested	Surveyed	Infested	Surveyed	Infested
Ala.	64	46	693	228	6,597	462
Ark.	23	2	252	2	4,385	3
Fla.	58	29	538	68	5,812	169
Ga.	143	72	844	159	22,253	396
La.	48	1	435	2	13,927	13
Miss.	72	14	493	31	6,601	53
N. C.	17	1	158	1	2,473	1
Okla.	15	0	183	0	3,980	0
S. C.	39	15	413	44	4,582	87
Tenn.	26	2	217	3	3,924	5
Texas	134	21	1,031	28	15,974	42
Total	639	203	5,257	566	90,508	1,231

PROCEDURE

Each county in the 11-state area was considered individually as to whether or not it should be surveyed in 1964. The states were divided into two groups based on previously known extent of infestation. In the group of states with extensive infestations—Florida, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and east Texas—only counties with recent negative surveys were omitted. In the group of marginal states with little or no infestation—North Carolina, Tennessee, Arkansas, and Oklahoma—counties with large cities or located near known infestations were surveyed. In this manner 58% of the counties which contained 64% of the population in the area were surveyed.

The survey consisted of inspection of premises most likely to be infested in each community in the county. The size of the survey in a county differed, based on human population, urban nature, and number of communities. The general requirement was to survey one percent of the premises in the county. In a few cases where the city being inspected was very large or where *Aedes aegypti* infestation was found immediately, less than one percent of the premises were surveyed. In most counties, surveys were completed

* Presented at Symposium on the Eradication of *Aedes aegypti* in the United States, Annual Meeting of the American Society of Tropical Medicine and Hygiene, New York, 5 November 1964.

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TABLE 2

Distribution of Aedes aegypti, *1964 survey**

ALABAMA	
Autauga	31/6
Baldwin	155/14
Barbour	80/12
Bibb	64/3
Blount	79/0
Bullock	63/3
Butler	70/15
Calhoun	131/6
Chambers	159/5
Cherokee	63/0
Chilton	90/8
Choctaw	79/7
Clark	122/8
Clay	64/0
Cleburne	63/0
Coffee	54/12
Conecuh	19/19
Coosa	85/4
Covington	166/20
Crenshaw	116/5
Dale	50/20
Dallas	79/12
DeKalb	113/0
Elmore	41/10
Escambia	94/14
Etowah	141/5
Fayette	94/0
Franklin	103/0
Geneva	53/13
Greene	74/3
Hale	122/17
Henry	91/8
Houston	70/17
Jackson	154/0
Jefferson	328/33
Lamar	98/0
Lauderdale	179/0
Lawrence	75/0
Lee	137/2
Limestone	110/0
Lowndes	82/1
Macon	44/13
Marengo	146/11
Marion	122/0
Marshall	145/0
Mobile	260/14
Monroe	129/4
Montgomery	65/20
Morgan	181/0
Perry	63/15
Pickens	109/3
Pike	37/8
Randolph	82/0
Russell	70/12
St. Clair	116/0
Shelby	121/6
Sumter	107/14
Talladega	78/9
Tallapoosa	29/11
Tuscaloosa	156/10
Walker	254/4
Washington	49/4
Wilcox	118/2
Winston	75/0

ARKANSAS	
Ashley	117/0
Bradley	82/0
Calhoun	66/0
Clark	154/0
Columbia	82/0
Craighead	189/0
Crittenden	236/0
Garland	182/0
Hot Spring	90/0
Jefferson	395/0
Miller	166/1
Mississippi	326/0
Montgomery	116/0
Ouachita	131/0
Perry	89/0
Phillips	195/0
Pulaski	657/0
St. Francis	185/0
Saline	187/0
Sebastian	233/0
Union	198/2
Washington	161/0
Yell	148/0

FLORIDA	
Alachua	184/10
Baker	67/0
Bay	175/29
Bradford	86/1
Brevard	125/3
Calhoun	54/0
Charlotte	111/0
Citrus	68/1
Clay	93/1
Collier	108/0
Columbia	78/1
DeSoto	71/1
Dixie	61/0
Duval	69/4
Escambia	202/31
Flagler	55/0
Franklin	71/0
Gadsden	130/9
Gilchrist	45/0
Glades	35/0
Gulf	64/0
Hamilton	50/0
Hardee	80/0
Hendry	80/0
Hernando	45/2
Highlands	121/6
Holmes	50/2
Indian River	95/0
Jackson	77/6
Jefferson	56/0
Lafayette	36/0
Lee	102/2
Leon	209/18
Levy	113/5
Liberty	40/0
Madison	82/0
Marion	170/11
Martin	45/5
Nassau	69/4
Okaloosa	98/12
Okeechobee	34/0
Orange	263/3
Osceola	115/0
Pasco	173/0
Polk	705/0
Putnam	100/0
St. Johns	87/2
St. Lucie	51/4
Santa Rosa	81/6
Sarasota	170/6
Seminole	117/3
Sumter	106/0
Suwannee	87/0
Taylor	80/0
Union	26/0
Volusia	38/5
Wakulla	64/0
Walton	92/7
Washington	55/0

GEORGIA	
Atkinson	80/2
Baker	76/13
Baldwin	40/9
Banks	62/0
Barrow	80/0
Bartow	95/0
Ben Hill	26/5
Berrien	55/0
Bibb	77/8
Bleckley	53/0
Brantley	83/0
Brooks	66/2
Burke	90/0
Butts	65/0
Calhoun	60/2
Camden	75/1
Candler	38/2
Carroll	108/0

TABLE 2 (*Continued*)

GEORGIA		Jones	74/0	Ware	69/5
Catoosa	59/0	Lamar	83/4	Washington	96/0
Charlton	45/4	Lanier	36/0	Wayne	75/13
Chatham	226/0	Lee	30/3	Webster	30/6
Chattahoochee	34/2	Lincoln	43/0	Wheeler	31/5
Chatooga	71/0	Long	10/3	Whitfield	129/0
Cherokee	55/0	Lowndes	89/11	Wilcox	23/0
Clarke	72/5	McDuffie	69/0	Wilkes	80/0
Clay	40/5	McIntosh	61/0	Wilkenson	93/2
Clayton	131/0	Macon	75/0	Worth	103/1
Clinch	80/0	Madison	63/0		
Cobb	484/0	Marion	57/3	*LOUISIANA*	
Coffee	75/4	Meriwether	99/0	Ascension	134/0
Colquitt	101/7	Miller	44/5	Assumption	73/0
Columbia	69/2	Mitchell	112/9	Avoyelles	164/0
Cook	50/0	Monroe	62/4	Beauregard	83/0
Coweta	87/2	Montgomery	62/5	Bienville	87/0
Crawford	27/1	Morgan	81/0	Bossier	172/0
Crisp	52/5	Murray	59/0	Caddo	482/0
Dade	45/0	Muscogee	59/10	Calcasieu	644/0
Dawson	28/0	Newton	42/0	Caldwell	59/0
Decatur	70/4	Oconee	73/0	Cameron	71/0
DeKalb	1,342/0	Oglethorpe	73/0	Catahoula	56/0
Dodge	75/0	Paulding	36/0	Claiborne	92/0
Dooly	47/0	Peach	63/0	Concordia	95/0
Dougherty	164/18	Pickens	46/0	DeSoto	142/0
Douglas	57/0	Pierce	71/8	E. Baton Rouge	3,314/0
Early	54/5	Pike	57/0	E. Carroll	56/0
Echols	49/0	Polk	124/0	E. Feliciana	113/0
Effingham	75/1	Pulaski	65/0	Evangeline	116/0
Elbert	85/0	Putnam	56/0	Grant	75/0
Emanuel	67/4	Quitman	23/4	Iberville	118/0
Fayette	51/1	Randolph	28/14	Jackson	108/0
Forsyth	55/0	Richmond	44/5	Jefferson	294/0
Franklin	66/0	Rockdale	60/0	Lafayette	225/0
Fulton	10,722/8	Schley	30/3	LaSalle	70/0
Gilmer	50/0	Screven	75/0	Lincoln	245/0
Glascock	35/0	Seminole	48/11	Livingston	104/0
Glynn	42/6	Spalding	109/6	Natchitoches	167/0
Gordon	75/0	Stephens	70/0	Orleans	4,066/0
Grady	82/11	Stewart	24/5	Ouachita	269/0
Greene	85/0	Sumter	82/5	Plaquemines	142/0
Gwinnett	191/0	Talbot	50/2	Pointe Coupee	119/0
Hall	160/0	Taliaferro	52/1	Rapides	354/13
Hancock	68/0	Tattnall	66/9	Red River	64/0
Haralson	90/1	Taylor	55/1	Richland	153/0
Harris	59/5	Telfair	41/10	St. Bernard	61/0
Hart	66/0	Terrell	42/4	St. Charles	120/0
Heard	45/0	Thomas	126/26	St. Helena	70/0
Henry	104/0	Tift	65/9	St. John The Baptist	98/0
Houston	179/3	Toombs	82/16	St. Martin	109/0
Irwin	84/2	Troup	128/13	St. Tammany	136/0
Jackson	90/0	Truetlen	40/2	Tangipahoa	253/0
Jasper	47/0	Turner	35/1	Tensas	57/0
Jeff. Davis	45/2	Twiggs	67/0	Union	101/0
Jefferson	80/0	Upson	83/5	Vernon	132/0
Jenkins	60/0	Walker	121/0	W. Baton Rouge	71/0
Johnson	40/2	Walton	97/0	W. Carroll	45/0

TABLE 2 (*Continued*)

W. Feliciana	76/0
Winn	72/0
MISSISSIPPI	
Adams	106/0
Alcorn	132/0
Amite	69/0
Attala	78/0
Benton	63/0
Calhoun	97/0
Carroll	46/0
Chickasaw	114/0
Choctaw	78/0
Claiborne	79/0
Clarke	69/3
Clay	70/0
Coahoma	169/0
Copiah	138/0
Covington	46/0
DeSoto	81/0
Forrest	118/6
Franklin	61/0
George	90/9
Greene	34/0
Grenada	90/0
Hancock	76/0
Hinds	359/0
Holmes	103/0
Humphrey	88/0
Issaquena	43/0
Itawamba	74/0
Jasper	82/2
Jefferson	61/0
Jeff. Davis	46/1
Jones	128/0
Kemper	79/1
Lafayette	97/0
Lamar	51/0
Lauderdale	53/3
Leake	61/2
Lowndes	121/0
Madison	146/0
Marion	73/0
Marshall	119/0
Monroe	129/0
Montgomery	56/0
Neshoba	90/0
Noxubee	72/0
Oktibbeha	115/0
Panola	94/0
Pearl River	71/9
Perry	54/1
Pontotoc	70/0
Prentiss	88/0
Quitman	96/0
Rankin	144/0
Scott	88/0
Sharkey	91/0
Simpson	71/0
Smith	50/3
Stone	10/3
Sunflower	166/0
Tallahatchie	110/0
Tate	79/0
Tippah	126/0
Tishomingo	99/0
Tunica	103/0
Union	75/0
Walthall	41/0
Warren	131/2
Washington	241/0
Wayne	78/8
Webster	62/0
Wilkinson	59/0
Winston	66/0
Yalobusha	88/0
NORTH CAROLINA	
Anson	88/0
Brunswick	74/0
Cabarrus	245/0
Cleveland	124/0
Columbus	176/0
Gaston	373/0
Henderson	125/0
Onslow	174/0
Orange	117/0
Pasquotank	127/0
Polk	59/0
Richmond	176/0
Rutherford	153/1
Scotland	75/0
Transylvania	52/0
Union	93/0
Wayne	242/0
OKLAHOMA	
Bryan	335/0
Canadian	171/0
Carter	305/0
Choctaw	102/0
Cleveland	350/0
Creek	216/0
Grady	220/0
Muskogee	185/0
Okmulgee	227/0
Pittsburg	247/0
Pontotoc	220/0
Pottawatomie	230/0
Seminole	181/0
Stephens	343/0
Tulsa	648/0
SOUTH CAROLINA	
Abbeville	112/0
Aiken	210/10
Beaufort	71/0
Berkeley	125/0
Calhoun	62/0
Charleston	225/0
Cherokee	125/0
Chester	141/0
Chesterfield	102/0
Clarendon	160/0
Colleton	125/0
Darlington	166/4
Dillon	80/0
Dorchester	109/0
Edgefield	64/0
Fairfield	91/2
Florence	130/7
Georgetown	176/0
Greenville	138/11
Greenwood	135/5
Horry	115/0
Jasper	80/0
Kershaw	89/0
Lancaster	167/0
Laurens	148/0
Lee	65/1
Lexington	82/20
McCormick	68/1
Marion	94/0
Marlboro	145/0
Newberry	110/2
Oconee	153/0
Pickens	178/1
Richland	103/8
Saluda	58/0
Spartanburg	64/4
Sumter	137/10
Williamsburg	104/0
York	186/1
TENNESSEE	
Anderson	205/0
Bedford	117/0
Bledsoe	43/0
Blount	174/0
Bradley	124/0
Cheatham	53/0
Coffee	115/0
Davidson	351/0
Dyer	180/0
Hamilton	309/3
Knox	376/0
McMinn	145/0
Madison	200/0
Marion	90/0
Maury	140/0
Meigs	40/0
Montgomery	125/0
Rhea	79/0
Roane	143/0

TABLE 2 (*Continued*)

Robertson	75/0	Fort Bend	223/0	Matagorda	161/0
Rutherford	138/0	Franklin	38/0	Maverick	157/0
Sequatchie	36/0	Freestone	88/0	Medina	140/2
Shelby	440/2	Frio	78/0	Milam	101/3
Sumner	85/0	Galveston	355/0	Montgomery	81/0
Williamson	46/0	Gillespie	85/0	Morris	83/0
Wilson	95/0	Goliad	41/0	Nacogdoches	196/0
		Gonzales	112/0	Navarro	136/0
TEXAS		Grayson	230/0	Newton	59/0
Anderson	76/1	Gregg	104/1	Nueces	508/0
Angelina	60/1	Grimes	81/0	Orange	222/0
Aransas	85/0	Guadalupe	131/1	Panola	63/0
Atoscosca	148/0	Hardin	126/0	Polk	87/0
Austin	96/0	Harris	253/6	Rains	42/0
Bandera	52/0	Harrison	59/4	Real	19/0
Bastrop	121/6	Hays	137/1	Red River	97/0
Bee	105/0	Henderson	101/0	Refugio	142/0
Bell	245/0	Hill	170/0	Robertson	104/0
Blanco	47/0	Hopkins	79/0	Rockwall	43/0
Bosque	102/0	Houston	106/0	Rusk	69,0
Bowie	219/0	Hunt	161/0	Sabine	48/0
Brazoria	271/0	Jackson	68/0	San Augustine	60/0
Brazos	200/0	Jasper	92/0	San Jacinto	60/0
Brooks	54/0	Jefferson	419/0	San Patricio	134/0
Berleson	65/0	Jim Hogg	44/0	Shelby	52/0
Burnet	88/0	Jim Wells	147/0	Smith	223/1
Caldwell	114/0	Johnson	150/1	Starr	93/0
Calhoun	97/0	Karnes	104/0	Tarrant	415/1
Camp	54/0	Kaufman	105/1	Titus	65/0
Cass	125/0	Kendall	70/1	Travis	89/5
Chambers	70/0	Kenedy	35/0	Trinity	76/0
Cherokee	177/0	Kerr	84/1	Tyler	88/0
Collin	226/0	Kimble	58/0	Upshur	61/0
Colorado	107/0	Kinney	39/0	Uvalde	125/0
Comal	117/0	Kleberg	142/0	Val Verde	127/0
Cooke	141/0	Lamar	131/0	Van Zandt	129/0
Coryell	100/0	Lampasas	66/0	Victoria	138/0
Dallas	431/1	LaSalle	50/0	Walker	118/0
Delta	48/0	Lavaca	107/0	Waller	104/0
Denton	199/0	Lee	86/0	Washington	56/1
DeWitt	98/0	Leon	93/0	Wharton	168/0
Dimmit	73/0	Liberty	153/0	Willacy	67/0
Duval	77/0	Limestone	106/0	Williamson	176/0
Edwards	36/0	Live Oak	70/0	Wilson	74/0
Ellis	190/0	McLennan	216/1	Wood	96/0
Falls	109/0	McMullen	30/0	Zapata	73/0
Fannin	137/0	Madison	49/0	Zavala	69/0
Fayette	118/5	Marion	55/0		

* Figures following names of counties or parishes show number of premises inspected and number of premises with *Aedes aegypti*.

in two days. The surveys were completed during the period of June 15–September 11, 1964, by 45 men divided into 7 teams, each with a supervisor and 5 or 6 surveyors.

RESULTS

Infestations of *Ae. aegypti* were found in 566 communities in 203 counties or parishes (Tables 1 & 2 and Fig. 1). This was an addition of 479

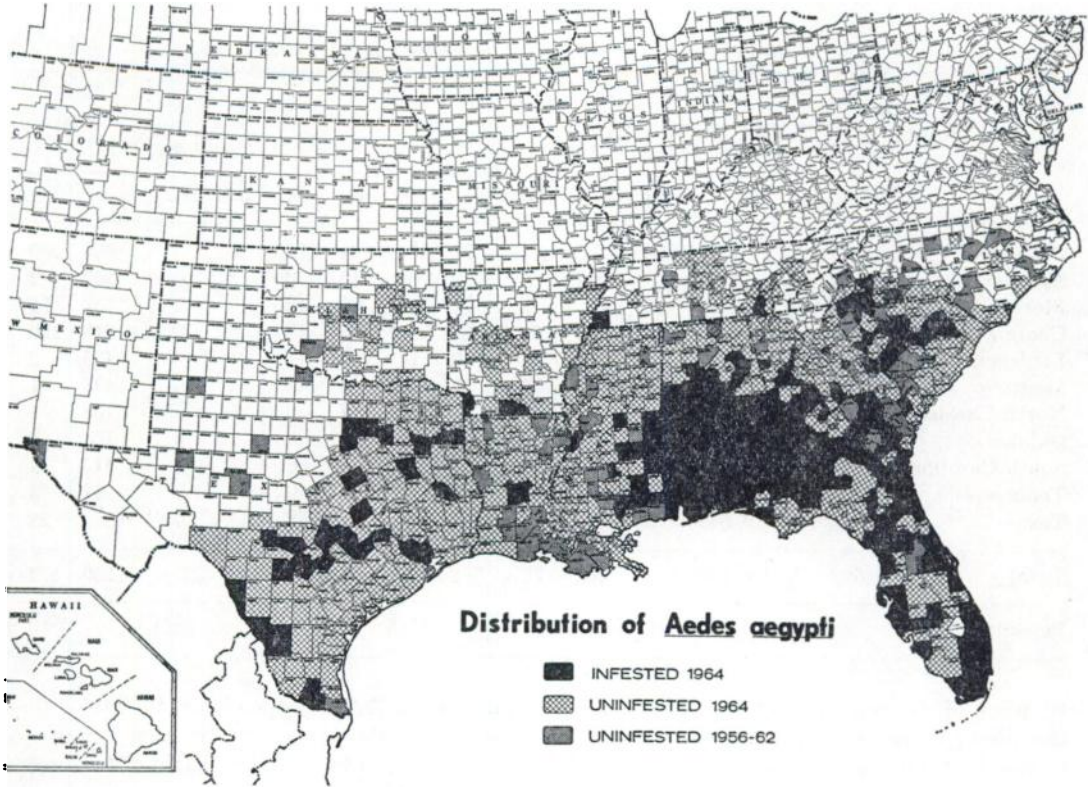

FIGURE 1. Distribution of *Aedes aegypti* infestations in southeastern United States

communities and 125 counties to the list of previously known infestations. The states of Alabama, Florida, and Georgia had the largest number of infestations, with 147 of the 203 infested counties, or 72%. Of the 203 counties infested, 78 had been found infested previously, 12 had been negative on previous inspection, and 113 had not been surveyed. Of the 436 negative counties, 52 had been negative on previous inspection, 14 previously infested, and 370 had not been surveyed. Of the counties surveyed, 32% were infested.

Large cities continued to show a high frequency of infestation, but of the 572 infested communities, 377 (66%) were either rural or in towns with a population of not over 2,500 (Table 3). About 11 percent of all inspected communities were infested; 56% of the cities of over 50,000 population were infested. Infestations in smaller communities and rural areas were mostly found in the heavily infested portions of Alabama, Florida, Georgia and Mississippi. Sixty-three percent of the infested counties contained infested small towns or rural areas.

Infestation appears to be centered in Alabama (Fig. 1). There is a solid block of counties in southern Alabama and neighboring areas of Georgia, Florida and Mississippi that have generalized infestations, *i.e.*, in small towns and rural sections, as well as in central cities. This is surrounded by an area where the infestation is scattered and usually limited to the central city. This area includes most or all of the states of Florida, Georgia, South Carolina, and the eastern part of Texas. In Arkansas, Louisiana, North Carolina and Tennessee, known infestations are limited to 1 or 2 counties.

DISCUSSION

The 1964 survey provided definite information on infested communities but negative findings did not provide conclusive evidence of the absence of *Ae. aegypti*. The survey extended over a large geographic area but inspection was limited to about one percent of the total number of premises. Some areas were inspected before the peak of the seasonal abundance or in periods with low rainfall. Further inspection will undoubtedly find additional areas of infestation. Moreover, the dis-

TABLE 3

Size of communities infested by Aedes aegypti, *1964*

State	Size of community (no. population)												Total	
	Rural		−1000		1000–2500		2,500–10,000		10,000–50,000		+50,000			
	Surv.	Inf.	Surv.	Inf.	Surv.	Inf.	Surv.	Inf.	Surv.	Inf.	Surv.	Inf.	Surv.	Inf.
Alabama	57	21	479	120	60	23	71	45	21	16	5	5	693	230
Arkansas	23	0	181	0	21	0	9	0	15	2	3	0	252	2
Florida	48	8	332	23	63	7	71	18	20	12	3	3	537	71
Georgia	131	28	499	55	105	29	81	29	26	14	6	5	848	160
Louisiana	44	0	267	0	57	0	50	1	13	1	4	0	435	2
Mississippi	67	6	320	14	55	7	41	2	9	2	1	0	493	31
North Carolina	16	0	83	0	26	0	25	1	8	0	0	—	158	1
Oklahoma	15	0	124	0	17	0	14	0	12	0	1	0	183	0
South Carolina	39	4	244	14	66	9	52	9	9	6	3	2	413	44
Tennessee	26	0	114	1	28	0	25	0	20	0	4	2	217	3
Texas	124	1	549	6	166	1	132	6	48	8	11	6	1,030	28
Total	590	68	3,192	233	664	76	571	111	201	61	41	23	5,259	572
Percent		11.5		7.3		11.4		16.5		30.3		56.1		10.9

tribution of *Ae. aegypti* is dynamic. Infestations can disappear in an area and appear later. For example, an infestation was found in Memphis, Tennessee, in 1956, none was found in 1958 or 1959, but the city was infested this year. A rubber reclaiming plant was bringing in tires from over 30 cities in 12 states. Of these, 9 cities had known infestations and in 2 cities the tire yards shipping the tires were shown to be infested. In Rutherfordton, North Carolina, Chattanooga, Tennessee, Memphis, Tennessee, and Vicksburg, Mississippi, infestations found were in or near areas where tires had been brought in from some distance.

The infestation in Louisiana has changed considerably. Surveys through 1962 indicated that 5 cities were infested: New Orleans, Baton Rouge, Alexandria, Monroe, and Ruston. Infestations could not be found in the other 23 cities and parishes inspected. In 1964, of the 435 communities in 48 parishes, infestations were found only in Alexandria and Pineville in Rapides Parish.

Experimental Use of Aedes aegypti

There has been discussion and concern about the possible need for establishing policy on future use of *Ae. aegypti* in research. To gain background information, a survey of the colonies in the United States has been initiated. Questionnaires were sent to 2,348 laboratories, mainly in colleges and universities: 1,383 respondents indicated that they are neither using nor planning to use *Ae. aegypti*. Of 110 laboratories that use *Ae. aegypti* (Table 4), 27 were in Puerto Rico and 12 southeastern states where the climate should be favorable to the survival of *Ae. aegypti*. Universities accounted for 81 of the establishments using this mosquito.

In reply to specific questions, duration of research was estimated at one year or less by 10 laboratories; at one to five years by 20 laboratories; at an indefinite period by 64 laboratories. Of the 64 laboratories that indicated their research objective could be accomplished by use of other species, 22 felt a substitution would be easy, 15 felt a substitution would be less convenient, 27 felt a substitution would result in significant loss of time. A total of 38 laboratories indicated their objective could be reached only by the use of *Ae. aegypti*.

SUMMARY

From June 15 through September 11, 1964, about one percent of the premises in 639 counties of 11 southeastern states were inspected for domestic mosquitoes by 7 teams totaling 45 men. Infestations of *Aedes aegypti* were found in 566 communities of 203 counties. A solid block of counties in southern Alabama, and the neighbor-

TABLE 4

Report on laboratory use of Aedes aegypti*

Items from questionnaire	No. of laboratories with		
	Permanent colonies	Periodic use of *A. aegypti*	Total
Location:			
Puerto Rico & 12 S. E. states	16	11	27
Washington D. C. & 25 other states	47	36	83
Estimated duration of research:			
1 yr or less	6	4	10
1–5 years	11	9	20
Indefinitely	45	19	64
No reply	1	15	16
Research objectives:†			
1. Could easily be accomplished by use of other species	5	17	22
2. Are more convenient with *A. aegypti* but could be accomplished with other species	4	11	15
3. Could be accomplished with other species but would result in significant loss of time	19	8	27
4. Can be reached only by use of *A. aegypti*	33	5	38
5. No reply	2	6	8
Type of establishment:			
University	40	41	81
Federal	11	2	13
State and local	4	1	5
Commercial	8	3	11
Total	63	47	110

* From responses obtained through December 11, 1964.

† Fourteen laboratories which checked more than one of the 4 alternatives were recorded under the highest numbered alternative that was checked, *i.e.*, 11 were recorded under number 4, 2 under number 3, and 1 under number 2.

ing areas of Georgia, Florida, and Mississippi were found to have extensive urban and rural infestations. In the remaining portions of Florida and Georgia, in all of South Carolina and in eastern Texas, the infestations were more scattered and usually limited to the central city of the county. Infestations were found in only one or two counties of Arkansas, Louisiana, North Carolina, and Tennessee. No infestations were found in Oklahoma. The 1964 survey added 479 communities and 125 counties to the list of known infestations.

Questionnaires were sent to 2,348 laboratories: 1,383 respondents indicated that they are neither using nor planning to use *Ae. aegypti*; 63 laboratories maintain permanent colonies; 47 make periodic use of the species.

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