

Surveillance of Dengue Hemorrhagic Fever Cases in Thailand 1973

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OBJECTIVE: The purpose of this study is to establish a system for serologic confirmation of dengue hemorrhagic fever cases reported to the Ministry of Health and to assist in the planning of public health control measures.

BACKGROUND: Dengue hemorrhagic fever (DHF), a principal infectious disease problem in Thailand, occurs in yearly epidemics throughout Thailand. The disappearance of Chikungunya infection in the past few years leaves dengue viruses as the sole causative agents of mosquito-borne hemorrhagic fever in Thailand. A previous report described a method of blood collection from finger pricks onto small paper discs, which has allowed transportation of blood specimens over long distances in a warm climate (1). A Dengue 2 antigen provides an economic means for testing for secondary infections by microtiter hemagglutination inhibition (HI). The use of only Dengue 2 antigen for serologic confirmation of DHF is only a little less efficient than using antigen of all four types of dengue. The results suggest that it is an acceptable means for confirmation of dengue infections in a DHF surveillance program.

DESCRIPTION: The localities submitting specimens are shown in Figure 1. Information on each reported case was provided on individual patient forms. The forms included instructions for blood collection and for the recording of the patient's history, physician's diagnosis and the laboratory diagnosis. Two small filter paper discs (12.7 mm diameter, No. 740-E, Schleicher and Schuell) were clipped on the positions for acute and convalescent blood samples. The patients were bled from the finger tip on the day of admission and on the last day of hospitalization. The patient forms with the dried blood samples were mailed to the Division of Epidemiology, Ministry of Public Health and recorded; then transported to the Department of Microbiology, Faculty of Public Health for HI testing. After analysis and tabulation, the results of the laboratory tests were returned to the Division of Epidemiology and to the physicians in charge of the patients.

Dried blood samples were eluted with borate saline pH 9.0, and treated with kaolin and goose red cells. The eluates from paired sera were tested with a microtiter HI test (2). Dengue 2 antigen was used to test all sera; however, in cases of encephalitis, Japanese Encephalitis Virus (JEV) antigen was also used.

Cases were considered positive for dengue or JEV infection if the paired sera showed either 1) a four-fold rise in antibody titer regardless of the titer of initial serum, or 2) a titer greater or equal to 1:640

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in both sera. Paired sera that had antibody titers that did not meet these criteria came from cases considered to be unconfirmed (negative). HI tests were not done on some sera due to miscellaneous technical factors, such as inadequate blood, short stay in the hospital and variation of the units of antigen used in each test. The cases with untested sera were considered undetermined.

PROGRESS: The accuracy of diagnosis. Tables 1 to 4 present the results of HI testing with dengue 2 antigen for each province and town. Specimens were collected from one hospital in each location. Sera were received from 1236 patients. The 1110 cases of dengue sampled represented 13.4% of the 8275 total cases reported for all of Thailand. Some locations provided too few specimens to come from all of the patients; but the number of specimens from 4 regions can be considered representative of the reported cases of DHF in Thailand. The ratio of correct diagnosis of DHF cases for each region is 1:2.4 (Central), 1:3.0 (North), 1:1.9 (Northeast) and 1:2.5 (South). When compared to the ratio 1:2.4 for all cases, serologic confirmation of cases from the North region is below the national average. The accuracy of physicians making the diagnosis varied greatly between locations.

There were requests for JEV tests from every region. The results of HI tests confirmed JEV infection in 14.7% of all cases of encephalitis (Table 5).

As revealed in Figures 2 to 6, in the Central and North regions the peak numbers of confirmed cases came in July. The peaks of confirmed cases and reported cases coincided for the Central region, but in the North the greatest number of admissions occurred in August. In the Northeast and South there was a shift of confirmed cases to September. The peak incidence of confirmed cases of JEV came in July.

DISCUSSION: The widespread yearly epidemics of dengue hemorrhagic fever in Thailand create an important public health problem. This surveillance system may become useful for confirming cases of dengue sufficiently early in an epidemic to permit the initiation of control measures, e.g., insecticide spraying. The one month delay in the peak number of confirmed cases in the Northeast and South regions compared to the North and Central is of uncertain importance but will be looked for again in the next epidemic. Throughout Thailand only 44% of the sampled cases of dengue were confirmed. Only 15% of the sampled cases of encephalitis were found to have JEV infections. The results suggest that the criteria for the clinical diagnosis of DHF and JEV need to be emphasized more.

REFERENCES:

1. SEATO Medical Research Laboratory Annual Report 1972-1973.
2. Clarke, D.H. and Casals, J.: Technique for Hemagglutination and Hemagglutination Inhibition with Arthropod-borne Viruses. *Amer. J. Trop. Med. Hyg.* 7:561, 1958.

Table 1. Results of HI Tests for Dengue and Japanese Encephalitis
Virus Infections in Central Region, 1973

Province	Dengue 2				JEV			
	No. of spec. ¹	HI Pos	HI Neg	Undet. ²	No. of spec.	HI Pos	HI Neg	Undet.
Bangkok	6	2	4					
Samut Sakhon	32	10	17	5				
Samut Prakan	1		1					
Samut Songkhram	36	5	26	5				
Nonthaburi	61	15	38	8				
Pathum Thani	2	1	1					
Nakhon Pathom	97	23	53	21	2	2		
Ratchaburi	12	6	5	1	1		1	
Petchaburi	4	2		2				
Suphan Buri	7	2	4	1	1	1		
Sing Buri	5	2	2	1				
Ayuthaya	24	14	9	1				
Saraburi	102	39	41	22	3		3	
Lop Buri	15	7	8					
Ang Thong	13	6	3	4				
Chon Buri	8	4	3	1				
Chachoengsao	3	1	1	1				
Rayong	198	119	37	42	1	1		
Chantha Buri	20	14	6					
Prachin Buri	42	16	22	4	9	1	8	
Nakhon Nayok	1			1				
Total	689	288	281	120	17	5	12	0

¹ Number of specimens submitted for testing

² Undetermined

Table 2. Results of HI Tests for Dengue and Japanese Encephalitis
Virus Infections in North Region, 1973

Province	Dengue 2				JEV			
	No. of spec. ¹	HI Pos	HI Neg	Undet. ²	No. of spec.	HI Pos	HI Neg	Undet.
Chiang Rai	7	1	5	1	6	1	5	
Chiang Mai	65	35	27	3	12	4	8	
Mae Hong Son	5	2	3		1			1
Lampang	4		4		2			2
Lamphun	4	1	3					
Nan	93	8	58	27	30	5	21	4
Phrae	9	5	4		9	5	4	
Uttaradit	16	5	8	3	11	5	4	2
Tak	2	1	1					
Sukhothai	9	5	3	1	4	1	3	
Phitsanulok	6	5		1	1			1
Phetchabun	10	5	3	2	1		1	
Phichit	1			1				
Kamphaeng—Phet	9	2	7		7	1	6	
Nakhon Sawan	9	2	6	1				
Total	249	77	132	40	84	22	52	10

¹ Number of specimens submitted for testing

² Undetermined

Table 3. Results of HI Tests for Dengue and Japanese Encephalitis Virus Infections in Northeast Region, 1973

Province	Dengue 2				JEV			
	No. of spec ¹	HI Pos	HI Neg	Undet. ²	No. of spec.	HI Pos	HI Neg	Undet.
Nakhon Ratchasima	27	12	13	2	7	2	5	
Khon Kaen	1	1						
Chaiyaphum	7	4	3		3	1	2	
Sakon Nakhon	2	2						
Nakhon Phanom	8	5	1	2	1			1
Kalasin	8	3	3	2				
Nong Khai	4	1	3					
Roi Et	8	5	3					
Buri Ram	5	2	2	1				
Si Sa Ket	3	1	1	1				
Udon Thani	10	5	5					
Yasothon	41	21	19	1				
Ubon Ratchathani	1		1					
Total	125	62	54	9	11	3	7	1

¹ Number of specimens submitted for testing

² Undetermined

Table 4. Results of HI Tests for Dengue and Japanese Encephalitis Virus Infections in South Region, 1973

Province	Dengue 2				JEV			
	No. of spec ¹	HI Pos	HI Neg	Undet. ²	No. of spec.	HI Pos	HI Neg	Undet.
Chumphon	1			1				
Ranong	1		1					
Surat Thani	22	8	13	1	3	1	2	
Phang-nga	1			1				
Krabi	4		3	1				
Phattalung	13	5	7	1	1		1	
Nakhon Si Thammarat	38	26	12					
Trang	4	1	3		1		1	
Songkhla	67	16	49	2	6		6	
Satun	2	1	1					
Pattani	18	5	11	2	3		3	
Narathiwat	2	2						
Total	173	64	100	9	14	1	13	0
Total for all of Thailand	1236	491	567	178	126	31	84	11

¹ Number of specimens submitted for testing

² Undetermined

Table 5. Detection of JEV Antibody by HI in Cases of Encephalitis in Thailand

Region	1973									
	Jan-Mar No.* JEV+**		Apr-Jun No. JEV+		Jul-Sep No. JEV+		Oct-Dec No. JEV+		Combined No. JEV+ (%)	
North			10	4	70	7	4	1	84	12 (14.3)
Northeast					9	3	2	0	11	3 (27.3)
Central			4	0	8	3	5	2	17	5 (29.4)
South	2	0	14	0	5	0	17	2	38	2 (5.3)
Combined	2	0	28	4	92	13	28	5	150	22 (14.7)

* Number of specimens submitted for testing

** Confirmed positive for JEV antibody

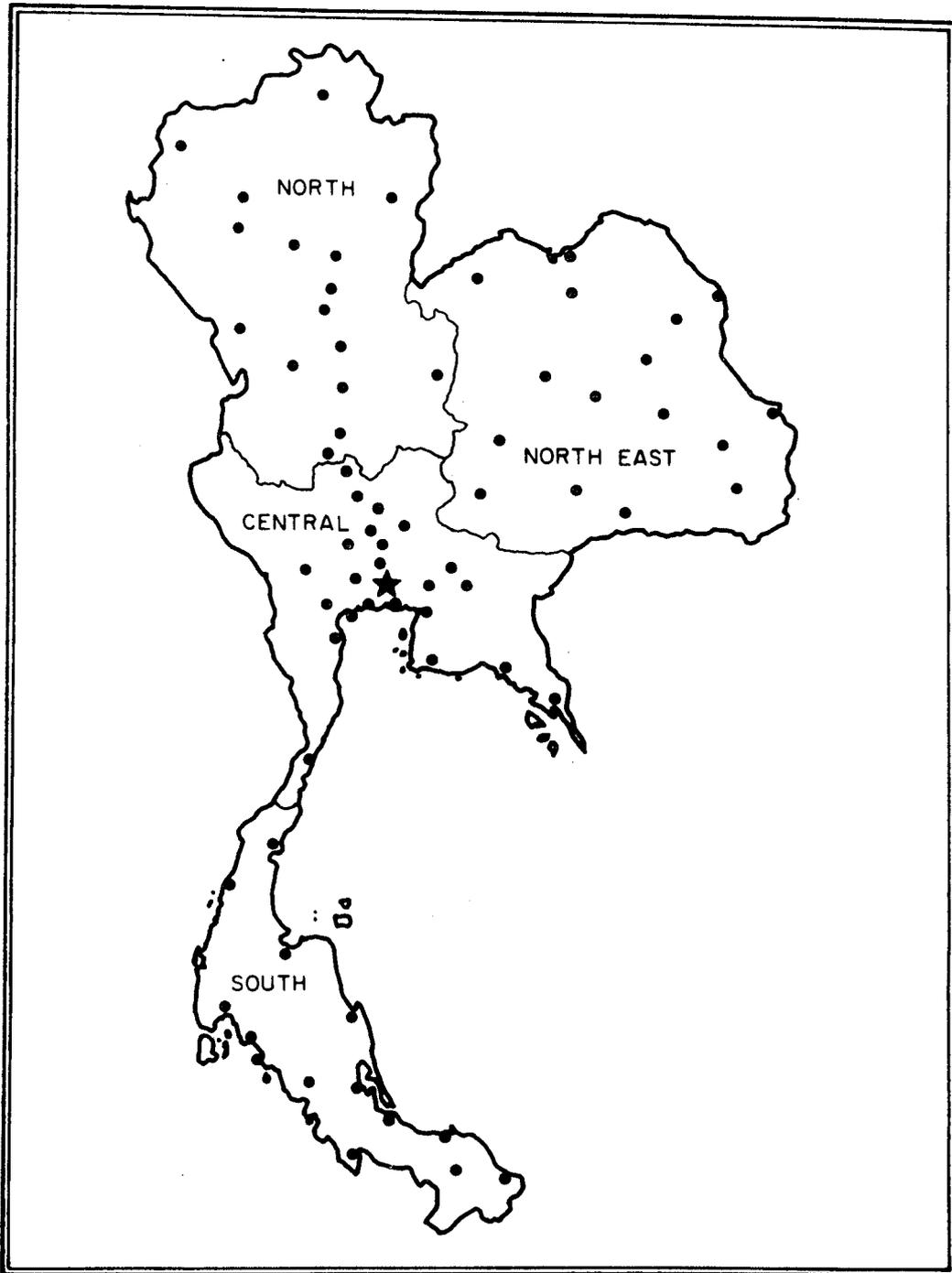


FIGURE 1. MAP DEMONSTRATING PROVINCES OR TOWNS OF STUDY (●), (★).

NORTH

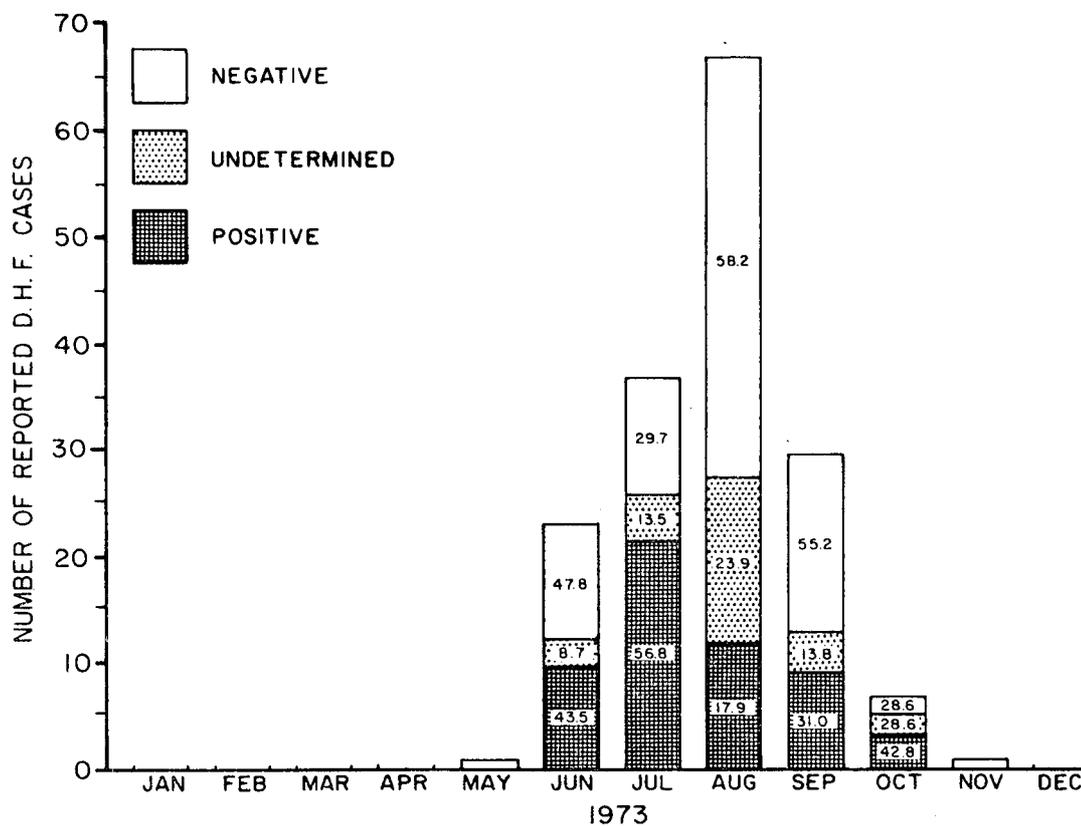


Figure 2. Frequency distribution of cases of hemorrhagic fever from the North Region of Thailand tested by HI for Dengue 2 antibody. Cases were confirmed positive (black), undetermined (dotted) or negative (white). Numbers within the bars indicate the percent of cases.

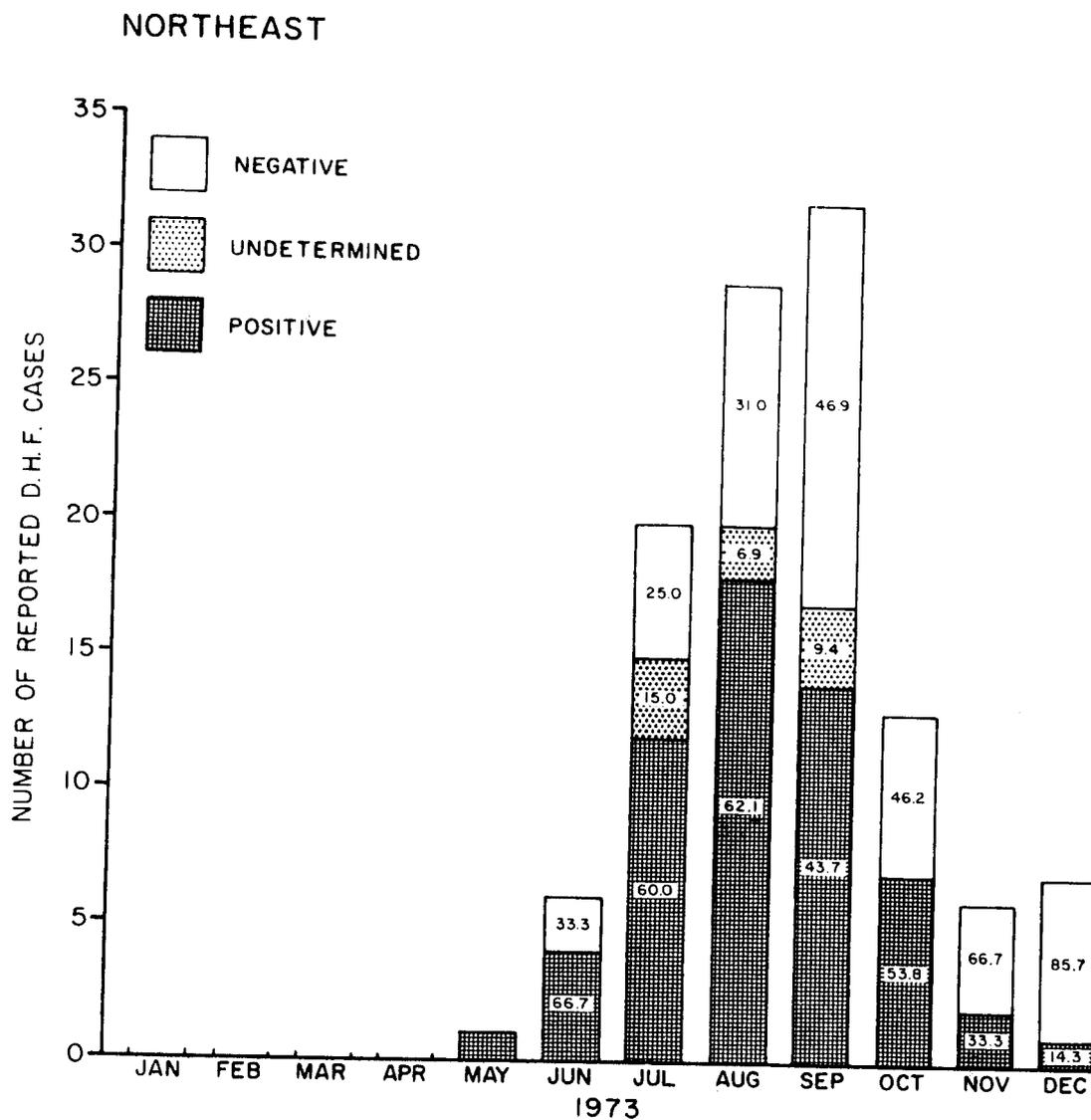


Figure 3. Frequency distribution of cases of hemorrhagic fever from the Northeast Region of Thailand tested by HI for Dengue 2 antibody. Cases were confirmed positive (black), undetermined (dotted) or negative (white). Numbers within the bars indicate the percent of cases.

CENTRAL

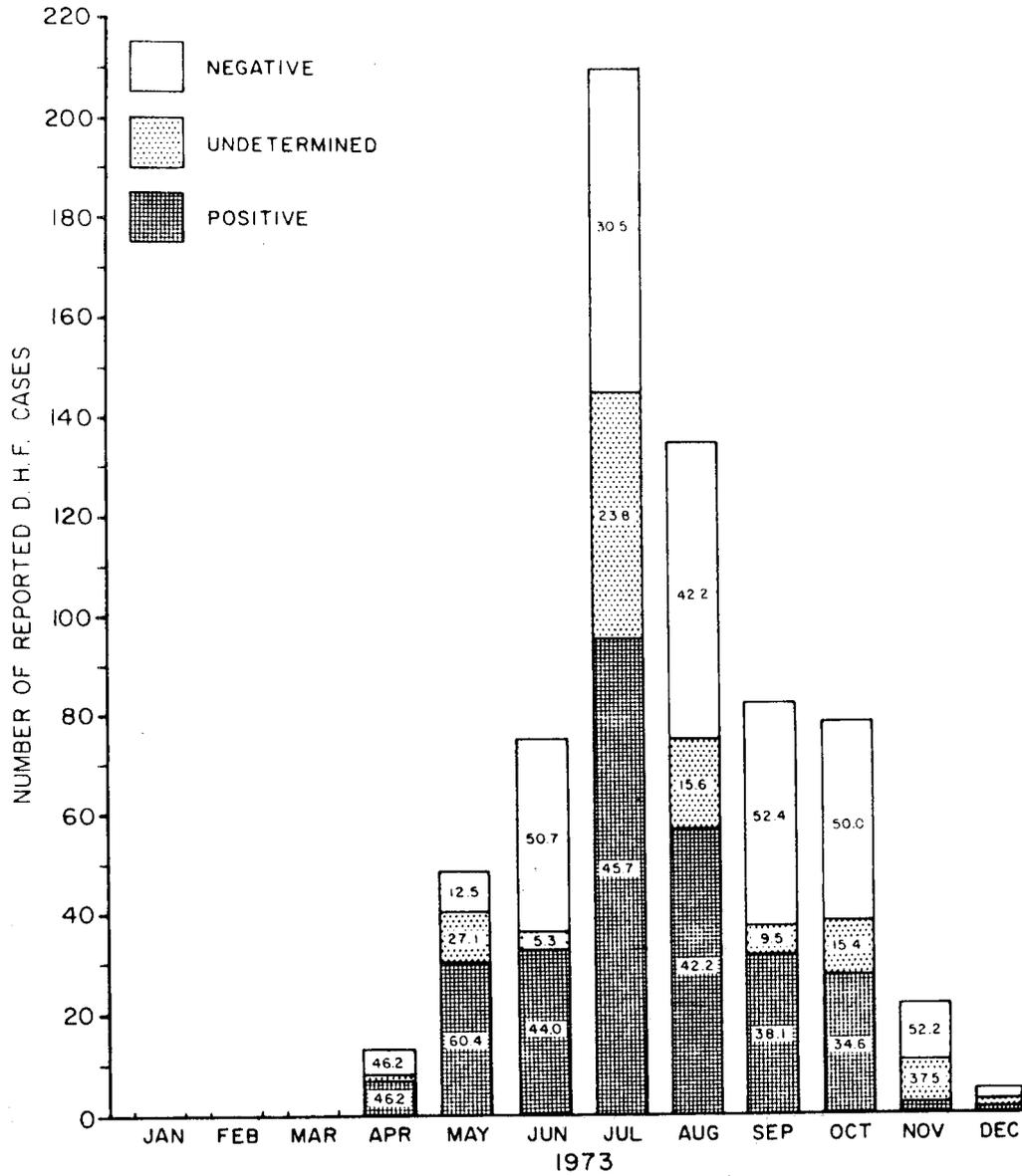


Figure 4. Frequency distribution of cases of hemorrhagic fever from the Central Region of Thailand tested by HI for Dengue 2 antibody. Cases were confirmed positive (black), undetermined (dotted) or negative (white). Numbers within the bars indicate the percent of cases.

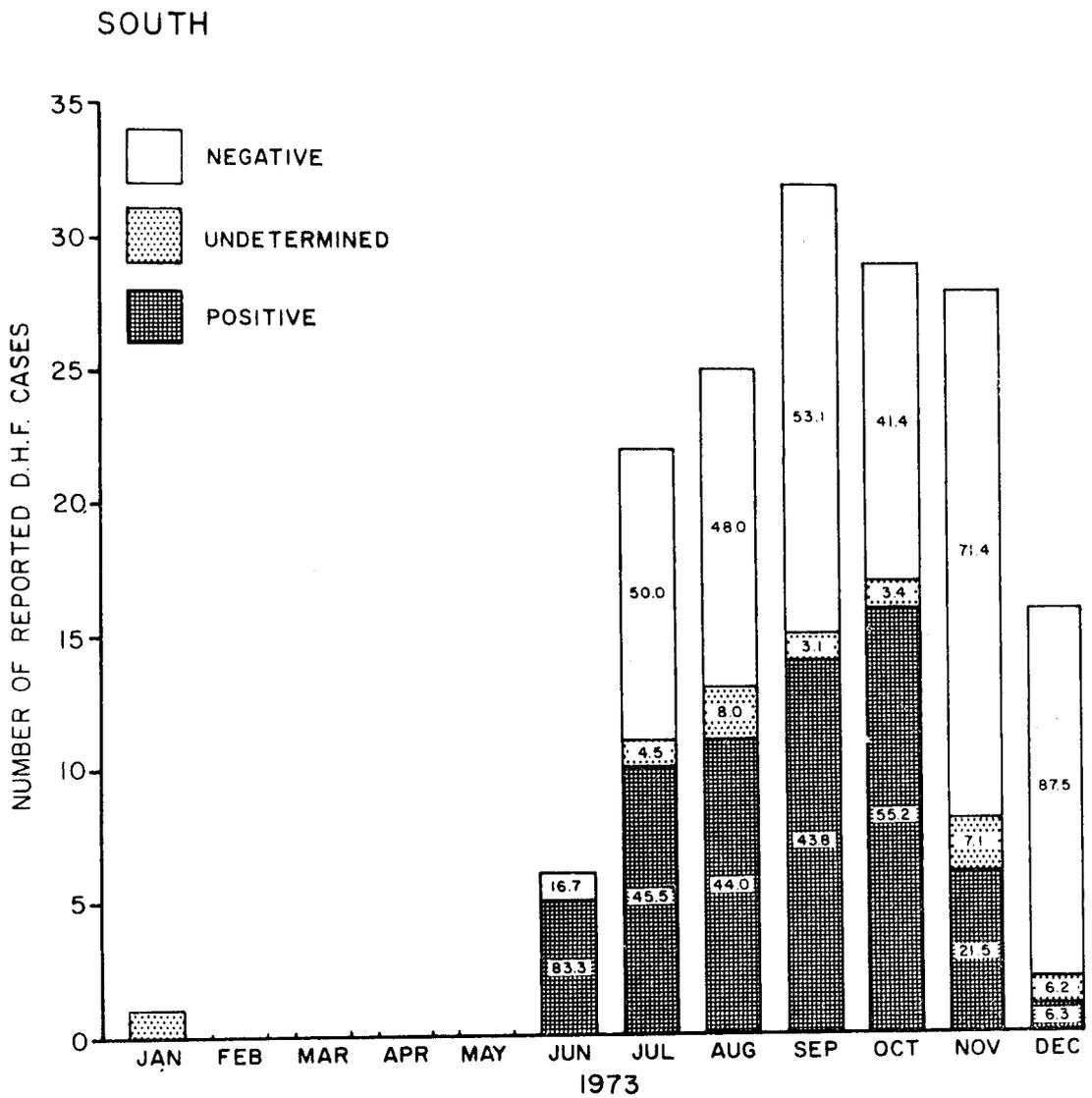


Figure 5. Frequency distribution of cases of hemorrhagic fever from the South Region of Thailand tested by HI for Dengue 2 antibody. Cases were confirmed positive (black), undetermined (dotted) or negative (white). Numbers within the bars indicate the percent of cases.

THAILAND

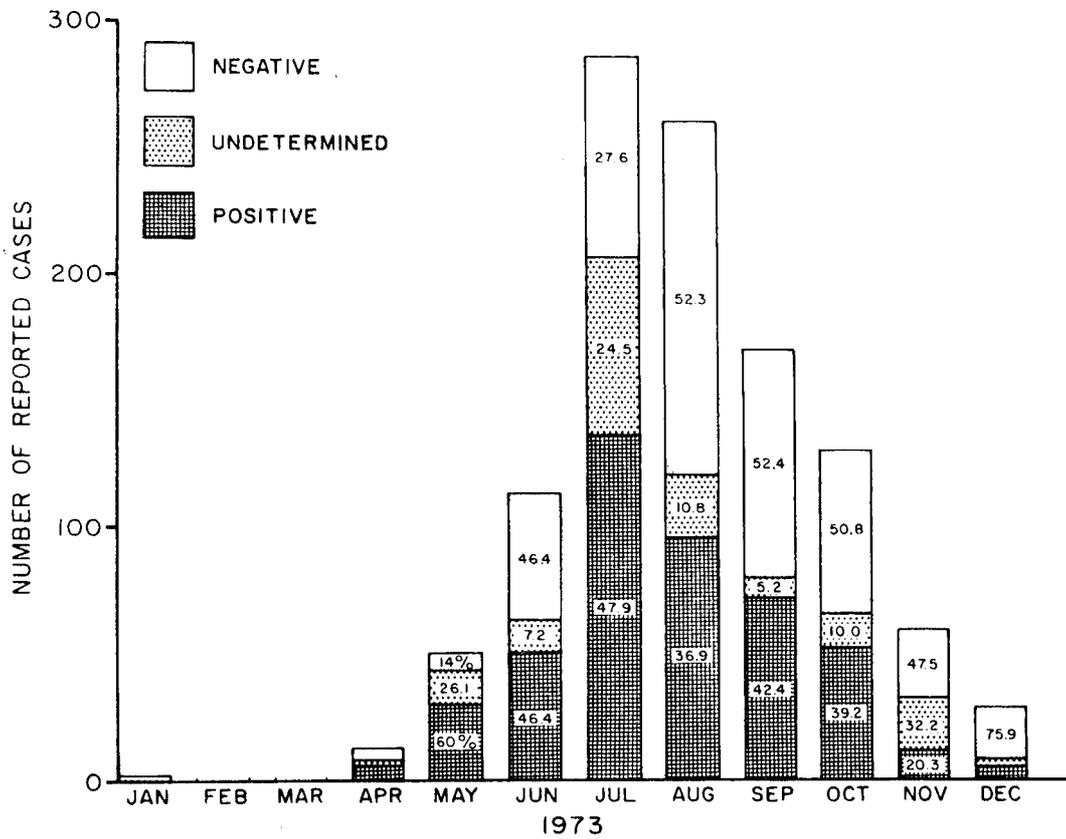


Figure 6. Frequency distribution of cases of hemorrhagic fever from all of Thailand tested by HI for Dengue 2 antibody. Cases were confirmed positive (black), undetermined (dotted) or negative (white). Numbers within the bars indicate the percent. of cases.