



## Memorandum

Date May 11, 1981

From EIS Officer  
Family Planning Evaluation Division, CHPE

Subject Foreign Trip Report: Meningitis Epidemic, Mali

To William H. Foege, M.D.  
Director, Centers for Disease Control  
Through: Horace G. Ogden *ogden*  
Director, Center for Health Promotion and Education

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## I. SUMMARY

From January 1, 1981 to April 18, 1981, 849 cases of presumptive meningococcal meningitis were reported in residents of Bamako, the capital of Mali. This represents an attack rate of 12.65/10,000 population over the 15 week period. One hundred three persons died, giving a case fatality rate of 12.1%. Detailed analysis of data for the first 11 weeks of the year showed that attack rates and death/case ratios were highest among males. Peak attack rates were observed in the 5 to 19 year age groups, while death-to-case rates were highest in the very young (0-4 years) and those persons over 35.

Bacteriologic and serologic analysis performed by the government laboratory in Mali suggested that the outbreak was caused by Neisseria meningitidis serogroups A and C. Of 7 specimens analyzed by CDC, however, 6 were positive for serogroup A and one for serogroup B. The specimens tested at CDC were all sensitive to sulfonamides.

Because of the magnitude of the outbreak, a citywide vaccine campaign was started March 5 and completed by March 26. Reports from Mali show a subsequent leveling off and drop in the number of weekly reported cases. Of interest, 77 cases had developed in vaccinees as of March 21, but only 9% of these cases had been vaccinated more than 7 days before the onset of disease. Two deaths were seen in the vaccinated patients, giving a death-to-case ratio of 2.6%, which compares with 8.6 in the unvaccinated population during the same 11 week interval (relative risk for unvaccinated=3.7; p=0.02).

Active surveillance outside Bamako was initiated in mid-March and showed greater than 2 cases/10,000 population/month in 8 of the 29 administrative cercles for which data was available. None of the 6 major urban areas outside Bamako showed epidemic levels. Vaccine campaigns are currently under way in the affected areas.

## II. DATES AND PLACES

Bamako, Segou, Sikasso, Bougouni, Kangaba, and Mopti, Mali; February 26 through March 25, 1981.

## III. PURPOSE

While in Mali working on a prospective hospital-based study of abortion morbidity and mortality under USAID auspices, I was asked by Mr. Thomas Park, Health Officer, USAID, Bamako to assist in gathering data on a meningococcal meningitis epidemic which had begun in late February. The Malian government did not request official U.S. assistance in studying the epidemic, but it was felt by AID that an informal evaluation of the situation was important in assessing vaccine needs and potential U.S. contribution to the control of the epidemic.

## IV. CHIEF CONTACTS

### U.S.A.I.D., Mali

Mr. Thomas Park, Health Officer

### Ministry of Health

Dr. Kounara, Director, Endemic Disease Service (Service des Grandes Endemies)  
Dr. Coulm, French Technical Advisor, Endemic Disease Service

## V. BACKGROUND

Mali is the westernmost country in the meningitis belt of Africa, a collection of sub-Saharan nations where meningococcal meningitis is hyperendemic and where periodic large scale epidemics occur at 10-12 year intervals. The belt extends from Mali and Guinea in the west to the Sudan in the east and is limited in the north by desert and in the south by rain forests. Meningococcal disease is seasonal; peak months are usually February to May during the dry season. The number of cases usually drops sharply when the rains begin in May (1).

The last epidemic of meningococcal meningitis in Mali occurred in 1969-70, when an estimated 13,000 cases were reported (2), over half of them in the capital of Bamako (3) (Figure 1). Activity since that time has been at a relatively low level, although in 1979 a localized epidemic was reported in Koro near the Upper Volta border (4). CSF samples from the 1969 epidemic in Mali showed group A meningococcus (3) as did 2 specimens from the 1979 Koro epidemic (4). Some of the specimens from the 1969 epidemic were shown to be sulfonamide resistant (3).

## VI. MENINGITIS EPIDEMIC, BAMAKO

During January, 1981, 46 cases of meningitis were seen at the Lazaret Hospital in the capital city of Bamako. This represented a 50% increase over the number of cases seen in January of 1979 and 1980 (Figure 2). In February the number of cases rose to 146, nearly half of which occurred during the last week of February. Five hundred forty one cases were seen in March, and 120 cases had been admitted during the first 3 weeks of April. Total number of cases as of April 18 was 849 with 103 deaths. The epidemic appeared to have peaked the second week in March, with a subsequent sharp drop in the number of cases (Figure 3). Attack rate for the 15 week period was 12.65 cases/10,000 population, with a death-to-case ratio of 12.1. These figures probably represent an under-reporting of cases since no central registry of deaths exists and we were unable to determine if excess deaths had occurred in the city that might be attributed to meningitis.

All patients with probable meningitis were sent by taxi or ambulance from other hospitals and health centers to Lazaret, an open-air hospital on the edge of town. Spinal taps were done on all admissions and medical personnel recorded information in a log book on each patient. Information recorded included name, age, sex, neighborhood of residence, parents' names, place of birth, condition on admission, turbidity of the cerebro-spinal fluid (CSF), date of admission, vaccination status, culture or serotype results, outcome of the hospitalization, and date of discharge or death. Patients were treated with a single dose of intramuscular chloramphenicol in oil and observed in the hospital for 5 to 8 days. A repeat tap was then performed, and if the fluid was clear, the patient was sent home.

Table 1 summarizes the characteristics of patients between January 1 and March 24, 1981. When documented cases of Hemophilus influenzae and pneumococcal meningitis and cases with clear CSF admitted for observation were excluded, the number of cases for this period was 654 with 56 deaths. Attack rates were highest in the 5-19 age group. The highest death-to-case ratios were seen in the 0-4 age group and in those over 35. The male-to-female ratio was 1.2, and attack rates and death/case ratios were highest among males. Analysis of cases by neighborhood of residence is pending. All denominator data was obtained by extrapolation from 1976 census data (5), figuring a 2.5% per year rate of natural increase and a 10% per year rural-urban migration.

### Bacteriologic data

Laboratory analysis was routinely attempted on the CSF from all patients until the first week of March, when the National Institute for Human Biology (INBH) ran out of petri dishes and serotyping reagents. Incidence of actual culture isolation of meningococcus was low due to 1) long delays in carrying specimens to the INBH, which is several miles away from Lazaret, 2) collection of CSF in glass vials that had contained doses of chloramphenicol and 3) contamination of CSF with other organisms when unsterile tubes were used.

Reports from the INBH showed that of 28 specimens on which serotyping was performed, 17 were serogroup A and 11 serogroup C. Antibiotic sensitivities were performed on only 1 CSF specimen during my stay, which reportedly showed the organism to be sensitive to sulfonamides and rifampin but resistant to ampicillin.

Three sets of CSF were hand carried to CDC. Of a total of approximately 20 specimens, analysis was possible on 7. Six of 7 grew N. meningitidis serogroup A, and 1 was positive for serogroup B. All specimens were susceptible to sulfonamides. Susceptibility testing to penicillin is pending.

#### Vaccination Campaign

A vaccine campaign was started on March 5, using the 50,000 doses of bivalent AC vaccine available in Mali. Initially the campaign concentrated on preschool and subsequently elementary and high school students (approximately 40% of the population in the 3 to 20 age group). The director of the Endemic Disease Service, Dr. Kounare, requested 600,000 doses of vaccine from USAID, its French equivalent (FAC), the European Economic Community assistance program (FED), WHO, and UNICEF to vaccinate the population of Mali. We determined that approximately 60% of the 671,000 inhabitants of Bamako were under age 20 and estimated the number of vaccine doses currently needed at 400,000. The donor agencies thus agreed to provide 400,000 doses, with the possibility of ordering a second lot if epidemic levels of meningitis could be documented in other parts of the country. On March 13, the Minister of Health officially declared an epidemic and arrangements were made to vaccinate all residents of Bamako between the ages of 1 and 25. On our suggestion, this target population was later broadened to include the 25-29 age group when age specific attack rates showed at relatively high rate in this group.

Inspection of neighborhood data was performed by Dr. Kounare, and because it appeared that the meningitis activity was not focused in any single area of the city, the vaccine campaign concentrated on sequential vaccination in the 6 administrative sectors of the city. Meningitis is greatly feared in Mali, and a large percentage of the population at risk presented to health subcenters in the neighborhoods to be immunized. Vaccination was done using the 15 pedojets which remained from the 1967-71 smallpox campaign. Cold storage was carefully monitored, and the vaccine campaign was nearly completed by March 26th, with only a few neighborhoods on the far side of the Niger River remaining to be vaccinated.

Seventy-seven patients who were vaccinated were hospitalized with meningitis as of March 21. All but 7 had been vaccinated less than 7 days prior to admission. Medical personnel at Lazaret reported that the cases occurring in vaccinees appeared to be milder than the non-vaccinees. In support of this observation, the death to case ratio was 2.6%, considerably lower than the 8.6% seen in unvaccinated patients during the same time period (relative risk for unvaccinated=3.7 (1.1-13.1); p=0.02).

## VII. MENINGITIS EPIDEMIC, AREAS OUTSIDE BAMAKO

Mali consists of 7 administrative regions, which are further broken down into 43 cercles. Each cercle is supposed to report each month to the Ministry of Health in Bamako on a series of notifiable diseases using radio, telegram or mail. In reality the system is not operational, with only sporadic reporting occurring. Our review of meningitis reports from January to May, 1980 disclosed that only 5 cercles outside Bamako reported any data.

By mid-March, the Ministry of Health attempted to improve surveillance reporting and tried to contact by telephone or radio all 43 cercles. By March 24, reports had been received from 29. Using denominators based on extrapolation of the 1976 population (which probably represents an overestimate since less than 15% of the population is felt to have access to health care), 8 cercles exceeded epidemic levels of 2 cases/10,000 population/month (Banamba, Koro, Kolokani, Koutiala, Kolondieba, Bla, San, and Niono). None of the 6 major urban areas of Mali outside Bamako (Sikasso, Segou, Kayes, Mopti, Tombouctou, Gao, and Nioro du Sahel) reported excess meningitis activity (Figure 4).

The government made 20,000 doses of vaccine available in the major city of each of the 7 regions and subsequently obtained an additional 400,000 doses of vaccine from the international donor agencies. Vaccination programs using needles and syringes as well as pedometers are under way in the cercles reporting epidemic levels.

## VIII. RECOMMENDATIONS

On March 13, I prepared a series of recommendations for the Director of the Endemic Disease Service. These recommendations included the following:

1. That medical personnel should be made aware of the importance of early diagnosis and treatment of cases.
2. That the surveillance system should be modified to assist in determining the magnitude of the problem and be utilized to monitor the efficacy of the vaccine program.
3. That an active system of weekly reporting of cases for the entire country should be re-established.
4. That cases should be analyzed by 5-year age groups and neighborhood to determine the groups at greatest risk so they can be targeted in the initial stages of the vaccination program.
5. That the total daily deaths in the city should be reviewed to ascertain if a significant number of cases died before reaching the hospital.
6. That because of the high secondary attack rate (22%) observed in the 1979 Koro epidemic (4), compound members of cases should be immunized.
7. That in view of the lack of efficacy of A and C vaccine in children under one year of age in epidemic situations, they should be excluded from the vaccination campaign.
8. That a large-scale immunization program should be promptly initiated in Bamako targeting the high-risk groups. This would be best accomplished by using pedometers and by sending 3 pedometers with each team of two vaccinators to insure maximum efficiency.

Subsequently, I also recommended the development of a standard form for recording case information at Lazaret Hospital. Arrangements were made for a carbon of each day's report to be transmitted to Mr. Tom Park of AID so that weekly reports could be transmitted to CDC. Serotyping fluid was sent from CDC and laboratory supplies were obtained from the US Embassy clinic so that laboratory analysis of CSF specimens could be resumed. Finally, it was suggested that sterile technique in doing LPs and injections be implemented to avoid the spread of meningitis and hepatitis, and the US Embassy clinic was able to provide a limited supply of reusable spinal needles and a box of disposable syringes and needle to augment the present supply.

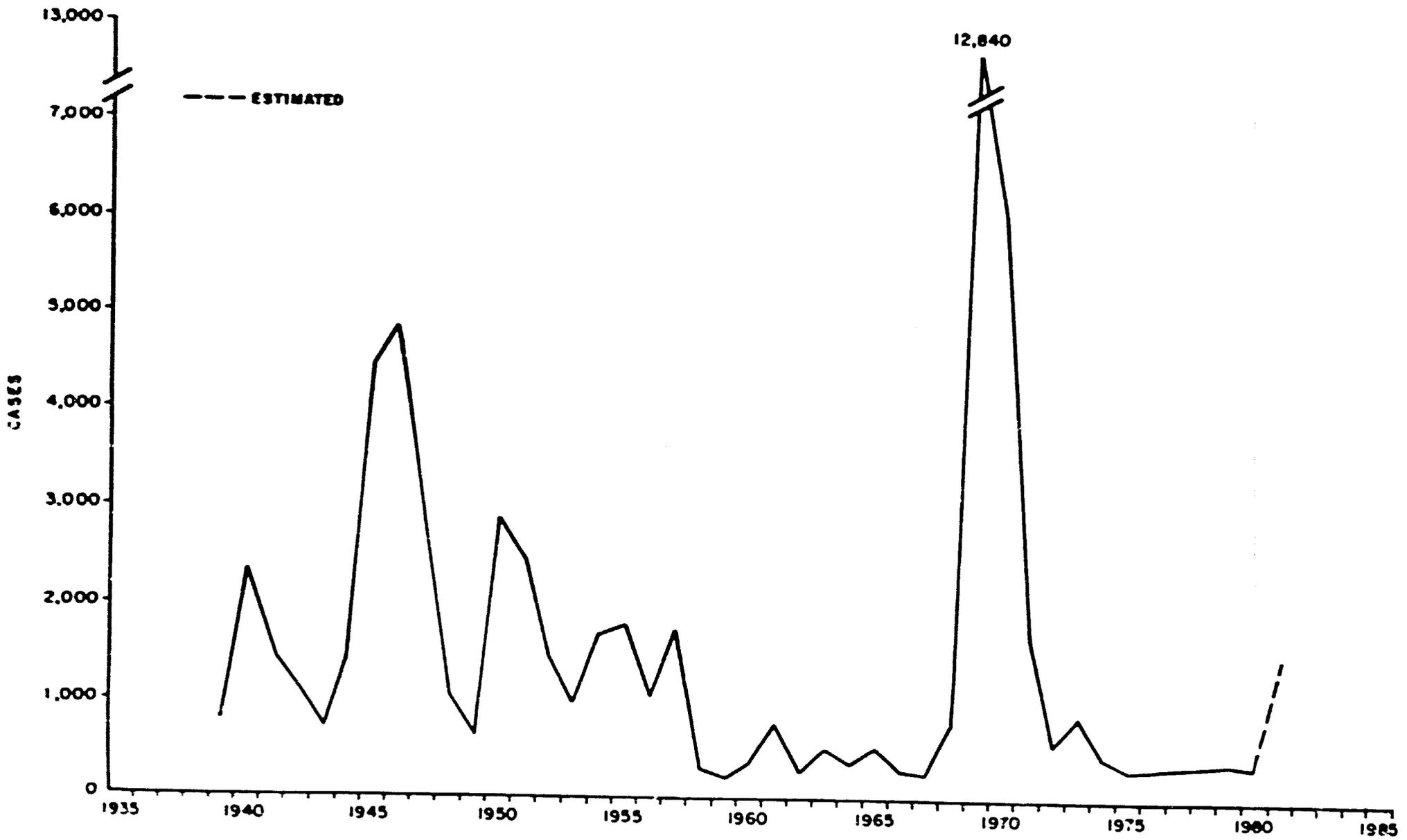
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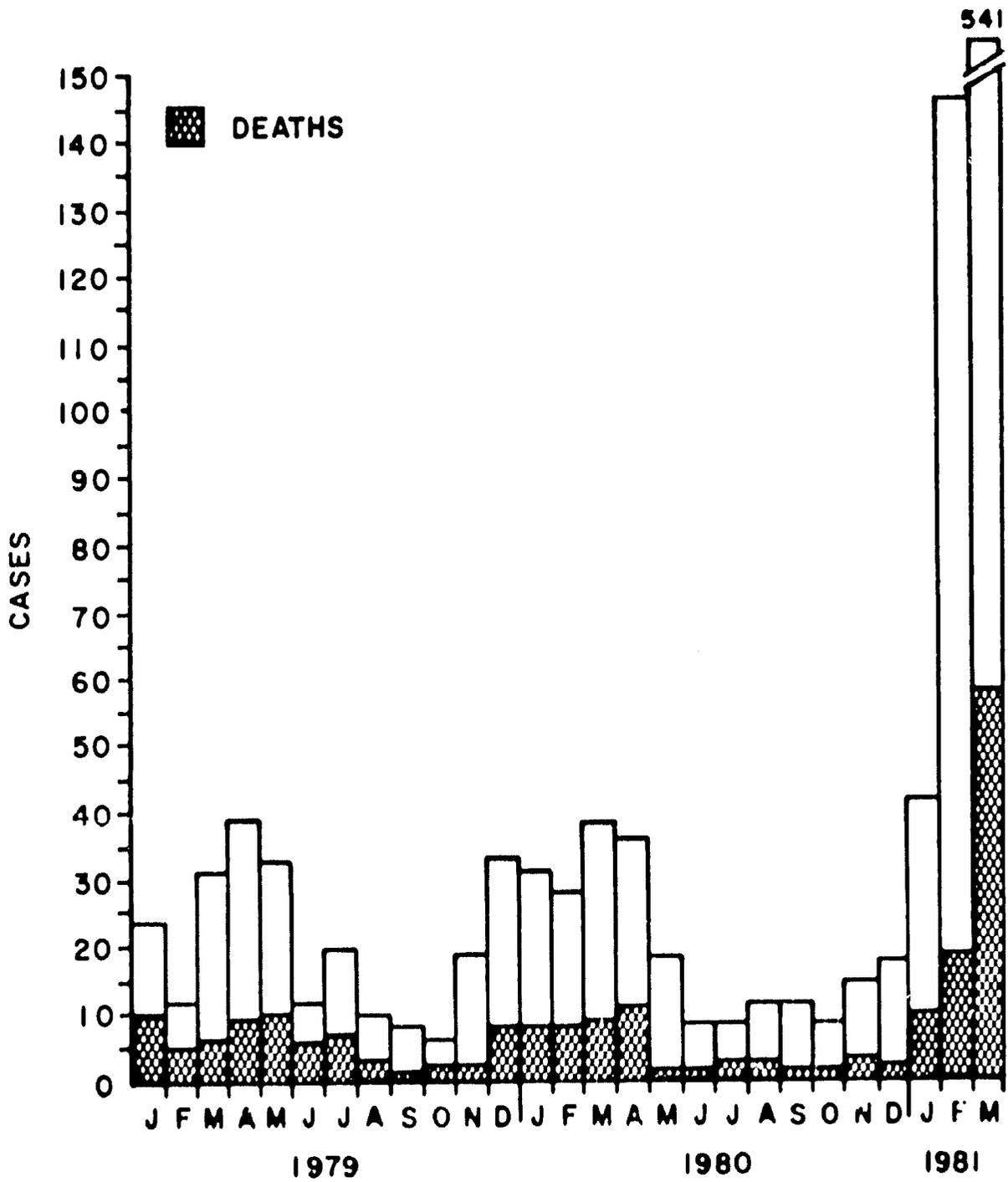


Nancy Binkin, M.D., M.P.H.

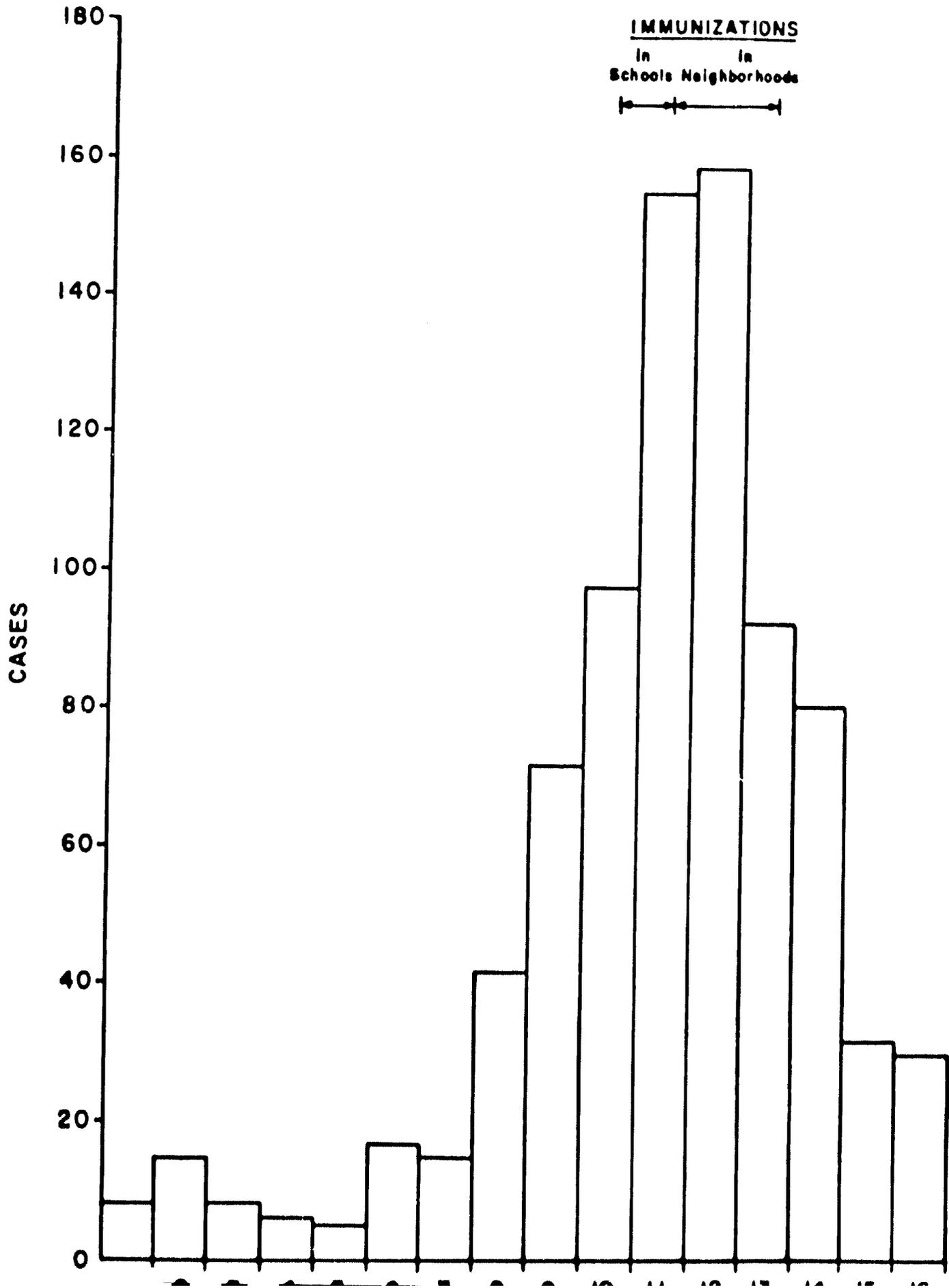
**Fig.1 MENINGOCOCCAL INFECTIONS, BY YEAR, MALI, 1939-1981**



**Fig. 2 MENINGOCOCCAL MENINGITIS, BY MONTH, LAZARET HOSPITAL, BAMAKO, JANUARY 1979 - MARCH 1981**



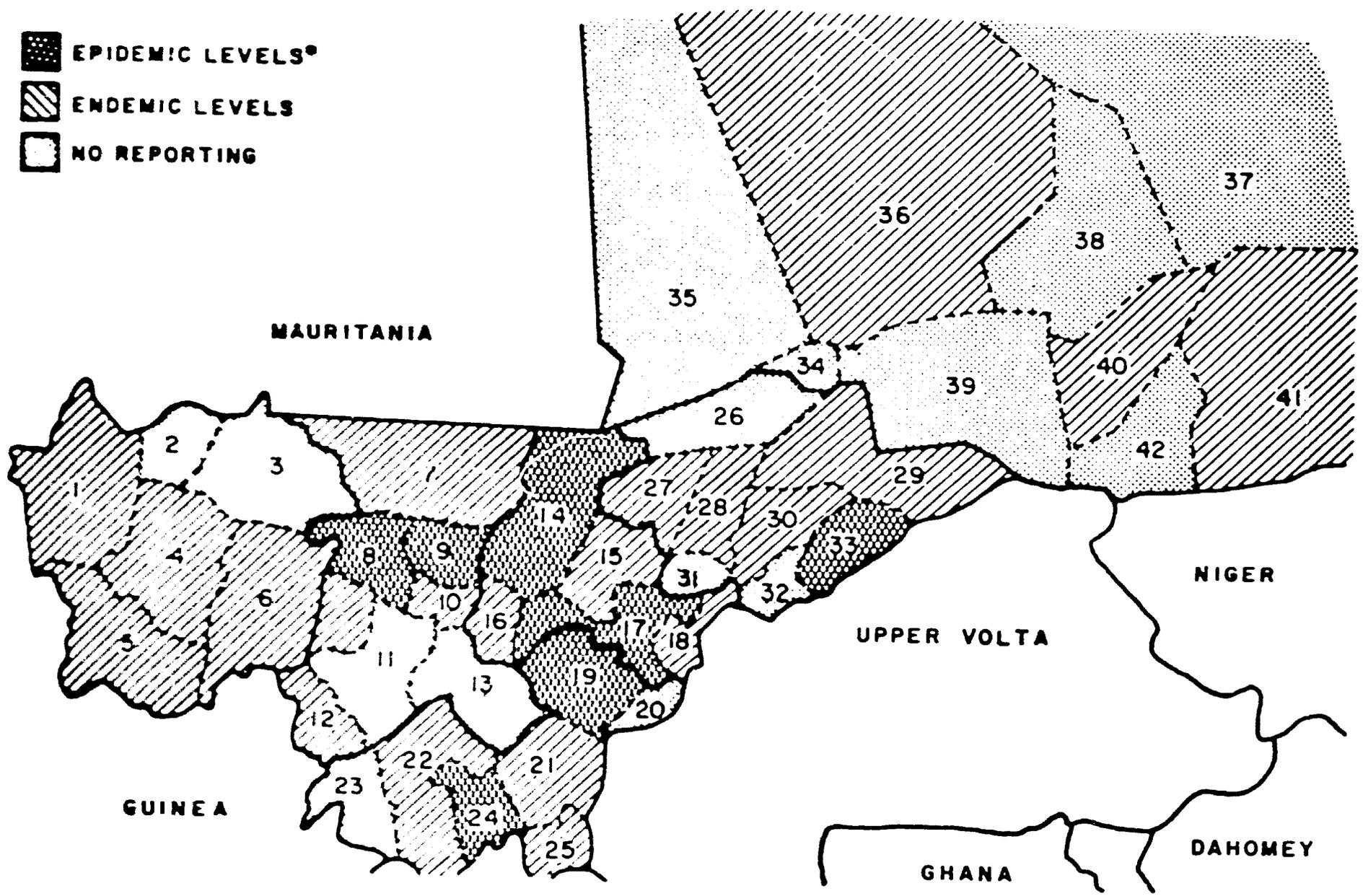
**Fig. 3** MENINGITIS CASES, LAZARET HOSPITAL, BAMAKO  
JANUARY 1 - APRIL 18, 1981



**Age Specific Attack Rates and Death-to-Case Ratios  
for Meningitis Cases, Lazaret Hospital  
1/1-3/24/81**

<u>Age</u>	<u>Population</u>	<u>Cases</u>	<u>Attack Rate/10<sup>h</sup></u>	<u>Deaths</u>	<u>Death-to- Case Ratio (%)</u>
0-4	125,889	136	10.8	26	19.1
5-9	100,039	123	12.3	6	4.9
10-14	76,058	114	15.0	7	6.1
15-19	78,379	135	17.2	7	5.2
20-24	69,632	63	9.1	2	3.1
25-29	54,835	43	7.8	1	2.3
30-34	43,046	12	2.8	0	0.0
<u>≥35</u>	123,061	28	2.3	7	25.0
<b>TOTAL</b>	<b>670,939</b>	<b>654</b>	<b>9.7</b>	<b>56</b>	<b>8.6</b>

**Fig. 4** MENINGOCOCCAL MENINGITIS OUTBREAK, MALI, 1981



• > 2 CASES / 10,000 POPULATION / MONTH