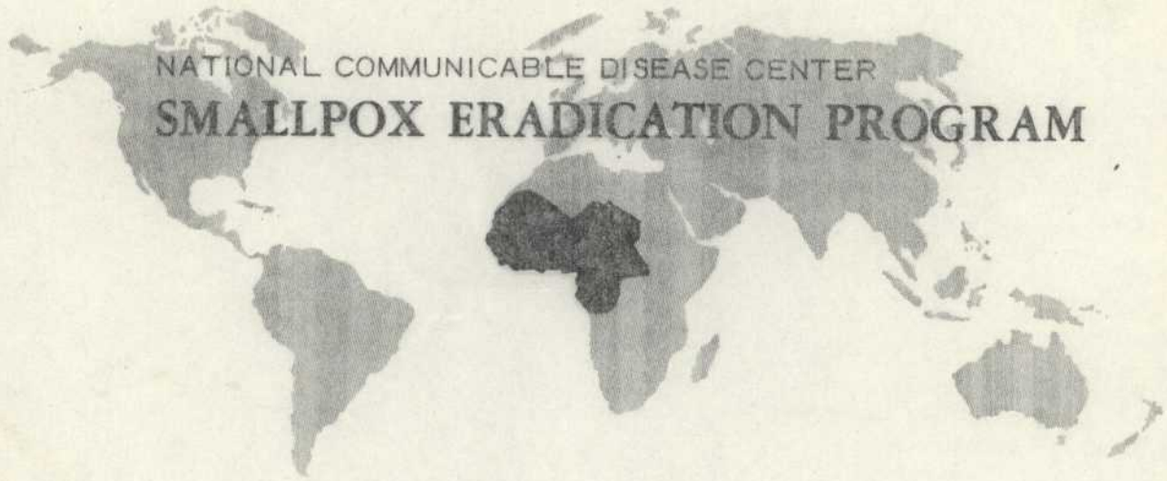

NATIONAL COMMUNICABLE DISEASE CENTER

# SMALLPOX ERADICATION PROGRAM

## MEASLES CONTROL IN AFRICA: A PRACTICAL AND THEORETICAL EPIDEMIOLOGICAL CHALLENGE

Presented at the
97th Annual Meeting of the
American Public Health Association
Philadelphia, Pennsylvania

November 12, 1969

by

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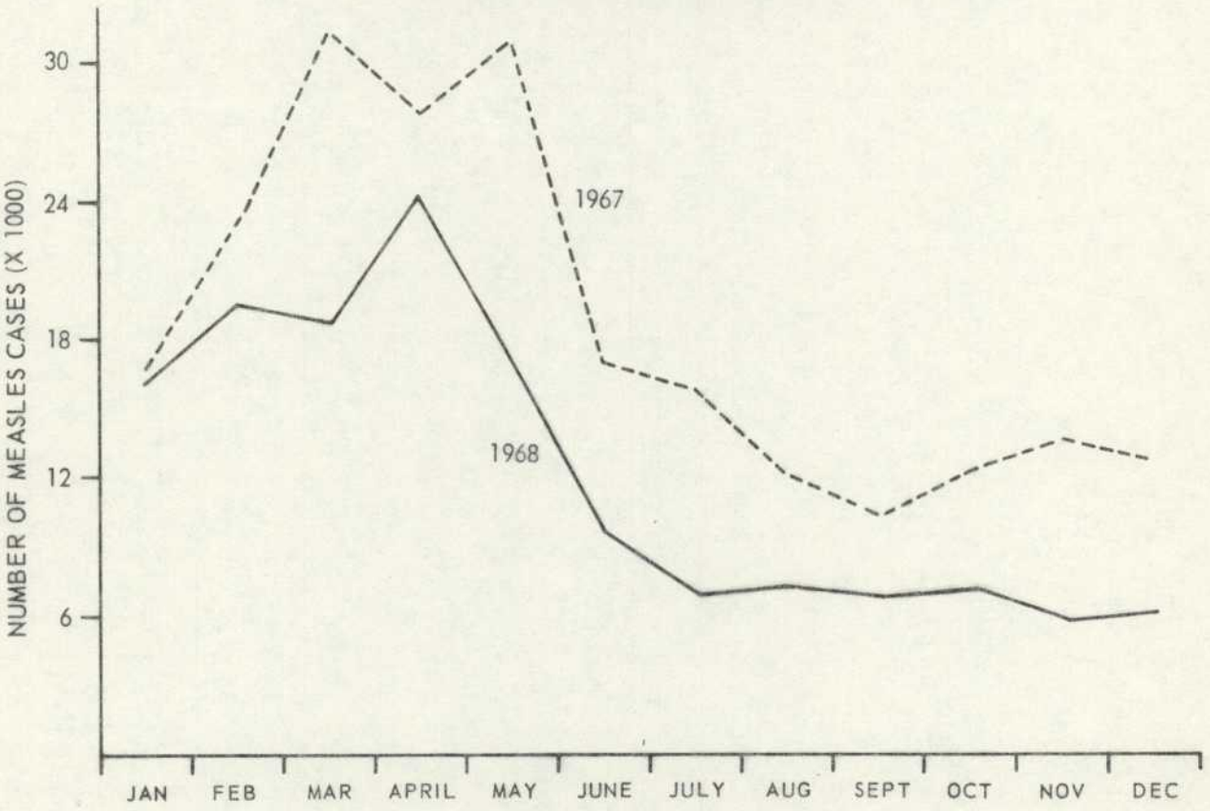
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

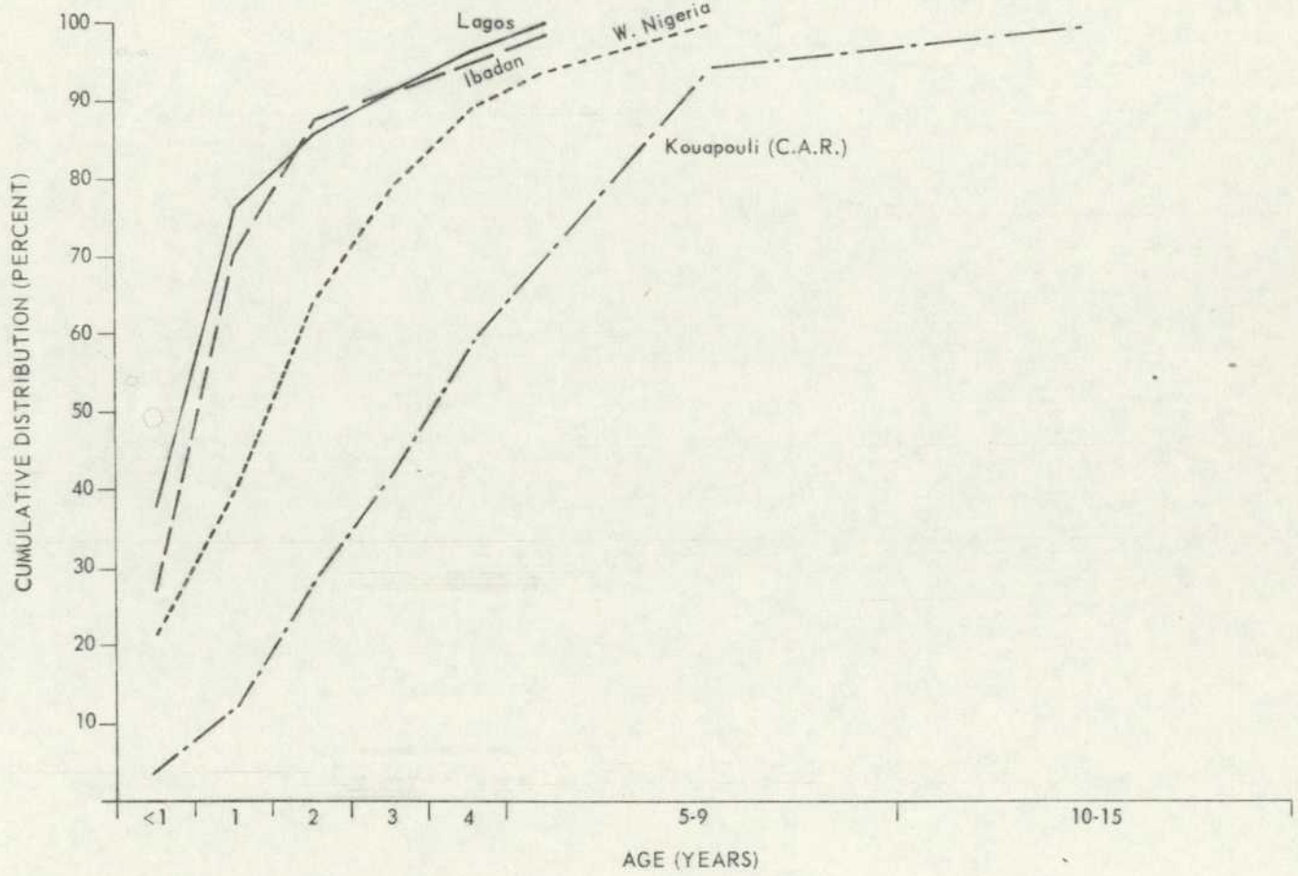
PUBLIC HEALTH SERVICE

FIGURE I. SEASONAL DISTRIBUTION OF REPORTED MEASLES, WEST AND CENTRAL AFRICA*




*The SEP Report, Vol. III, No. 1, February 1969.

**FIGURE II**
**PERCENT DISTRIBUTION OF MEASLES CASES BY AGE FOR FOUR AREAS[1,2,3,4]**




1. Grigsby, M., Personal Communication (Western Nigeria)
2. Grigsby, M., West Africa Regional Smallpox Eradication/Measles Control Program, Annual Meeting, May 1968, Abidjan, Ivory Coast (Ibadan, Western Nigeria)
3. E. A. Smith and S. O. Foster: To be published. Presented at the West Africa Regional Smallpox Eradication/Measles Control Program Annual Meeting, May 1968, Abidjan, Ivory Coast (Lagos)
4. Durand, B. and N. H. Ewen, *The SEP Report* 3:1, p. 21-26, Feb. 1969 (CAR)

Table 1

Measles Epidemic, Kouapouli, Central African Republic* (October 1967)
Percent Distribution of Cases by Age and Age Specific Attack Rates**

| Age (Yrs.) | Cases | Percent | Cumulative Percent | Total Residents | A/R(%) |
|---|---|---|---|---|---|
| < 1 | 11 | 3.4 | 3.4 | 34 | 32.4 |
| 1 | 28 | 8.8 | 12.2 | 32 | 87.5 |
| 2 | 51 | 16.0 | 28.2 | 57 | 89.5 |
| 3 | 45 | 14.2 | 42.4 | 53 | 84.9 |
| 4 | 53 | 16.7 | 59.1 | 62 | 85.5 |
| 5-9 | 112 | 35.2 | 94.3 | 179 | 62.6 |
| 10-15*** | 18 | 5.7 | 100.0 | 93 | 19.4 |
| Total | 318 | 100.0 | 100.0 | 510 | 62.4 |

* An Area of subprefecture of Nola (pop. density 1.1 persons/Km.$^2$)

** Durand, B. and N.H. Ewen, The SEP Report 3:1, p. 21-26, February 1969.

*** Excludes case in one 25 year old person.

Table 2

Measles, Cameroon (1965)
Cumulative Percent Distribution of Reported Cases by Age and Population Density of Reporting Area*

| Area Density ($per\ Km.^2$) | Cumulative Percent Distribution by Age | | | | Case Total |
|---|---|---|---|---|---|
| | <1 | 1-4 | 5-9 | 10+ | |
| < 10 | 15.5 | 62.2 | 89.8 | 100.0 | 19014 |
| 10-40 | 20.7 | 63.2 | 90.2 | 100.0 | 19337 |
| 40-80 | 22.7 | 73.4 | 90.9 | 100.0 | 9435 |
| 80+ | 26.8 | 84.6 | 94.9 | 100.0 | 16825 |

* Rosenbloom, A., presented at West African Regional Smallpox Eradication/Measles Control Program Annual Meeting, May 1968, Abidjan, Ivory Coast.

Table 3

Measles Epidemic
Kouapouli, Central African Republic* (October 1967)
Death/Case Ratios by Age**

| Age (Yrs.) | Cases | Deaths | Death/Case Ratio (%) |
|---|---|---|---|
| <1 | 11 | 3 | 27.3 |
| 1-2 | 79 | 11 | 13.9 |
| 3-5 | 134 | 7 | 5.2 |
| 6+*** | 94 | 0 | - |
| Total | 318 | 21 | 6.6 |

* An area of subprefecture of Nola (pop. density 1.1 persons/ Km.$^2$)

** Durand, B. and N.H. Ewen, The SEP Report 3:1, p. 21-26, February 1969.

*** Excludes case in one 25 year old person.

Table 4

Reduction of Measles Susceptibles by Vaccination on 3-Year Cycle*

| Program Cycle | Age | (E) Before Vaccination | (F) After 1st Yr. Vacc'n | (G) After 2nd Yr. Vacc'n | (H) After 3rd Yr. Vacc'n | (I) After 4th Yr. Vacc'n |
|---|---|---|---|---|---|---|
| Village in | 6 mo. | 443 | 62 | 443 | 443 | 62 |
| first phase | 1 yr. | 770 | 108 | 439 | 770 | 108 |
| of 3-year | 2 | 432 | 60 | 60 | 246 | 60 |
| cycle | 3 | 220 | 31 | 31 | 31 | 31 |
| | 4 | 97 | 14 | 14 | 14 | 14 |
| | 5 | 30 | 4 | 4 | 4 | 4 |
| Village in | 6 mo. | 443 | 443 | 62 | 443 | 443 |
| second phase | 1 yr. | 770 | 770 | 108 | 439 | 770 |
| of 3-year | 2 | 432 | 432 | 60 | 60 | 246 |
| cycle | 3 | 220 | 220 | 31 | 31 | 31 |
| | 4 | 97 | 97 | 14 | 14 | 14 |
| | 5 | 30 | 30 | 4 | 4 | 4 |
| Village in | 6 mo. | 443 | 443 | 443 | 62 | 443 |
| third phase | 1 yr. | 770 | 770 | 770 | 108 | 439 |
| of 3-year | 2 | 432 | 432 | 432 | 60 | 60 |
| cycle | 3 | 220 | 220 | 220 | 31 | 31 |
| | 4 | 97 | 97 | 97 | 14 | 14 |
| | 5 | 30 | 30 | 30 | 4 | 4 |
| Total of | 6 mo. | 1329 | | | 948 | 948 |
| three | 1 yr. | 2310 | | | 1317 | 1317 |
| villages | 2 | 1296 | | | 366 | 366 |
| | 3 | 660 | | | 93 | 93 |
| | 4 | 291 | | | 42 | 42 |
| | 5 | 90 | | | 12 | 12 |

*Gelfand, 1967

(E) = Column (D) from Table I.

(F) = Column (D) x 0.14 after vaccination, column (D) before vaccination.

(G),(H),(I) = Same as (F) but carry over from (E) in those age groups newly entering the population without prior vaccination. Note that in one- and two-year olds after vaccination, half the population consists of vaccinated children and half unvaccinated children (but only in the first year in which unvaccinated children enter these age groups).

Table 5

Percentage Program Effectiveness after Third Year on 3-Year Cycle *

| Age | (N) Susceptibles Before MC Program | (O) Susceptibles Just Before Vaccination | (P) Susceptibles Just After Vaccination | (Q) Average Number of Susceptibles | (R) Susceptibles Prevented | (S) Percentage Effective |
|---|---|---|---|---|---|---|
| 6 mo. | 1329 | 1329 | 948 | 1139 | 190 | 14 |
| 1 yr. | 2310 | 1979 | 1317 | 1648 | 662 | 29 |
| 2 | 1296 | 738 | 366 | 552 | 744 | 57 |
| 3 | 660 | 187 | 93 | 140 | 520 | 79 |
| 4 | 291 | 42 | 42 | 42 | 249 | 86 |
| 5 | 90 | 12 | 12 | 12 | 78 | 86 |
| All | 5976 | 4287 | 2778 | 3533 | 2443 | 41 |

(N) = Sum of 3 phases of cycle in (E)

(O) = Sum of 3 phases of cycle in (J)

(P) = Sum of 3 phases of cycle in (K)

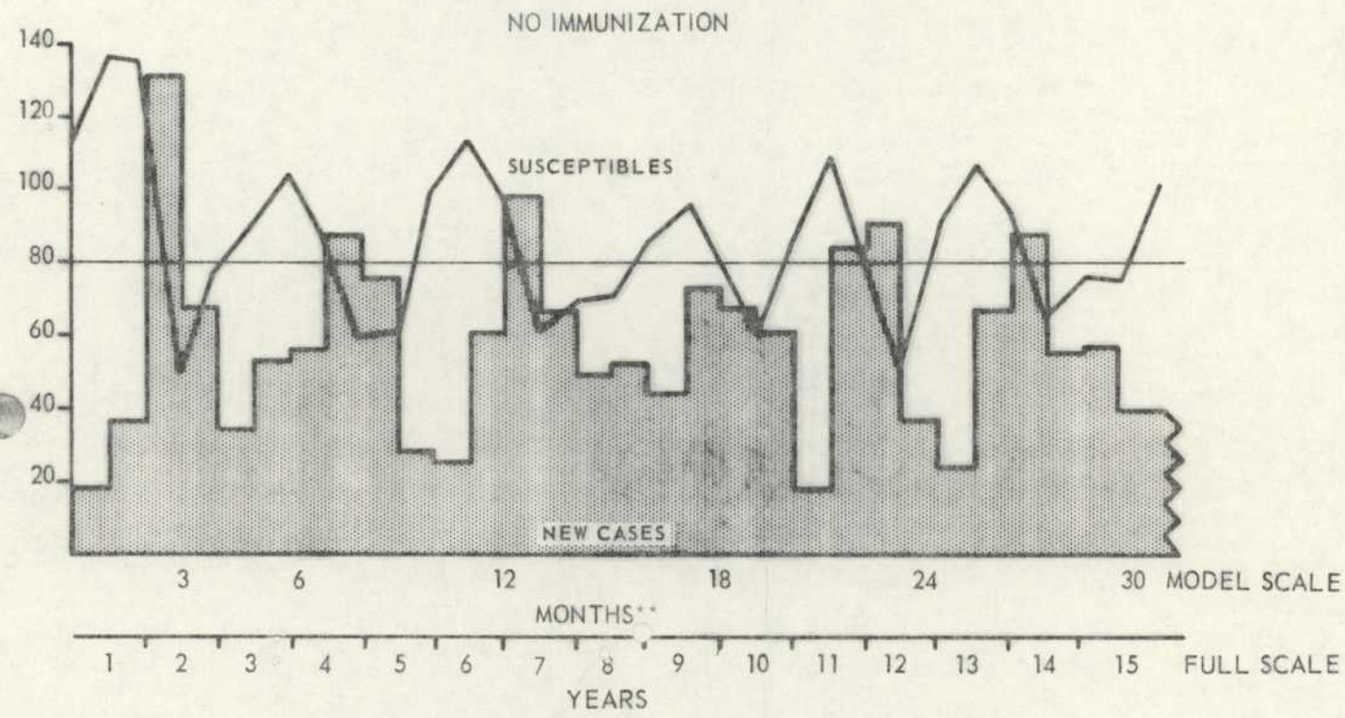
(Q) = Average of columns (O) and (P)

(R) = (N) minues (Q)

(S) = (R) divided by (N)

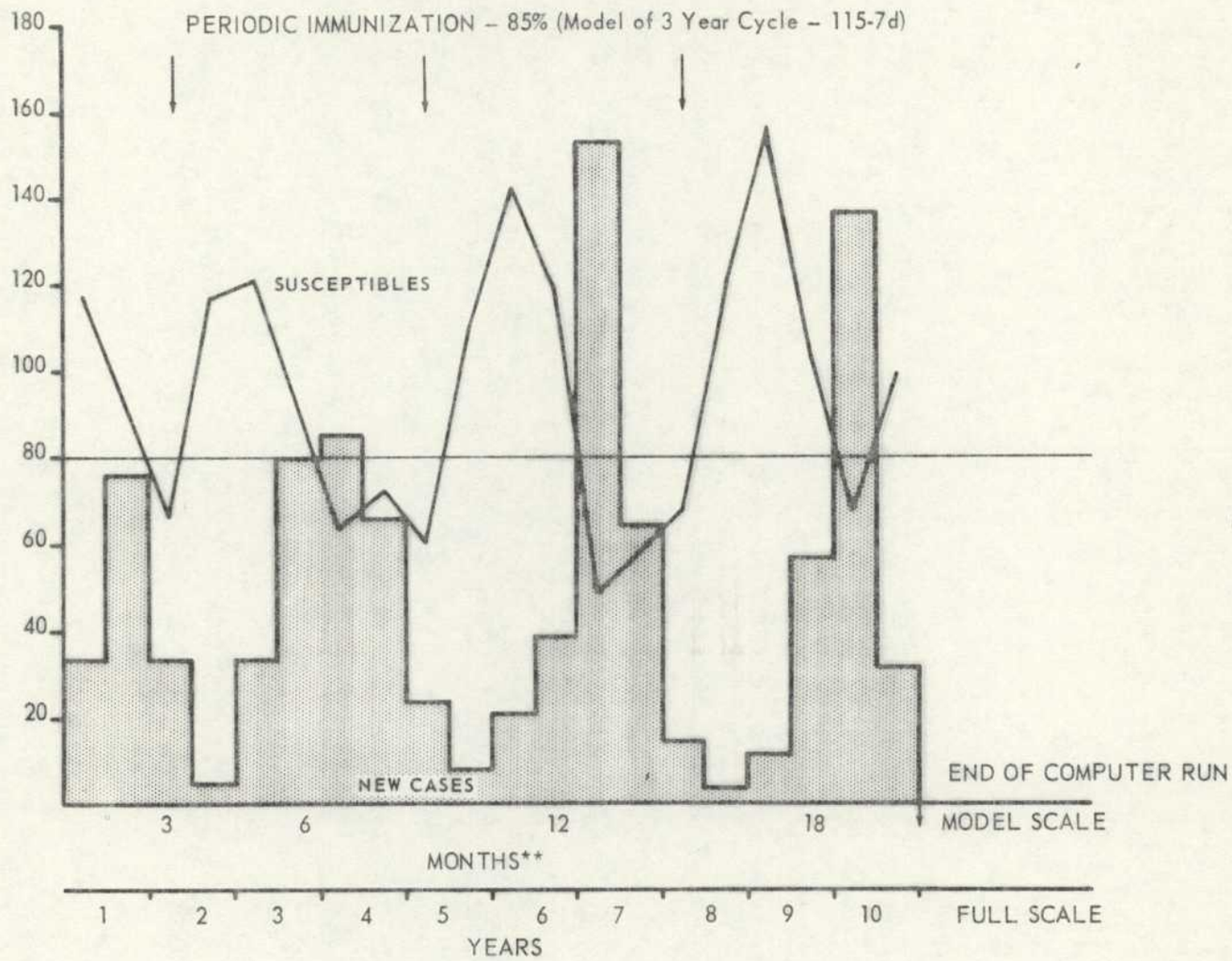
* Gelfand, 1967

FIGURE III
THEORETICAL MEASLES MODEL*



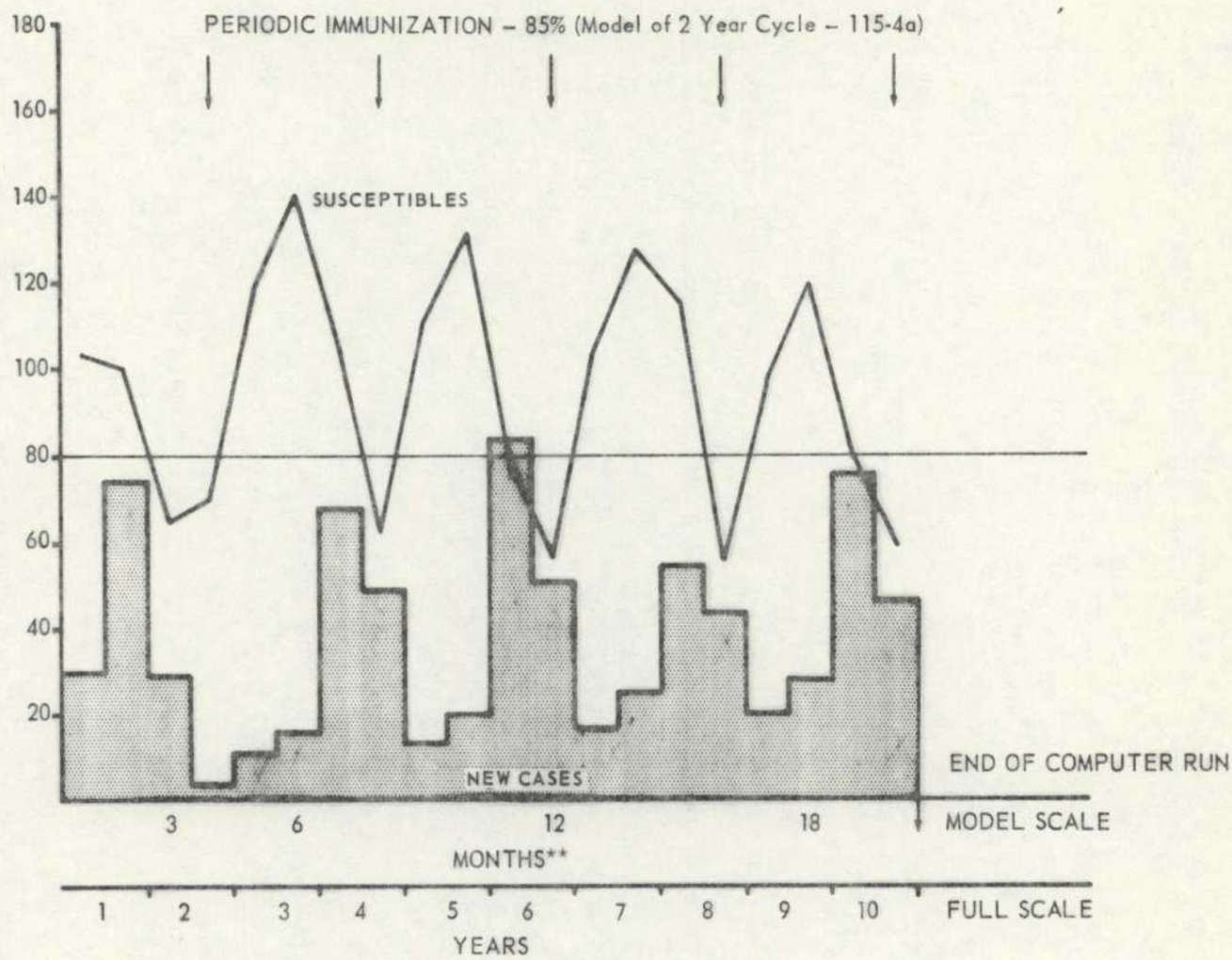

*Macdonald, G., 1967.
**Model Scale – 3 months equivalent to 18 months in reality.

FIGURE IV
THEORETICAL MEASLES MODEL*



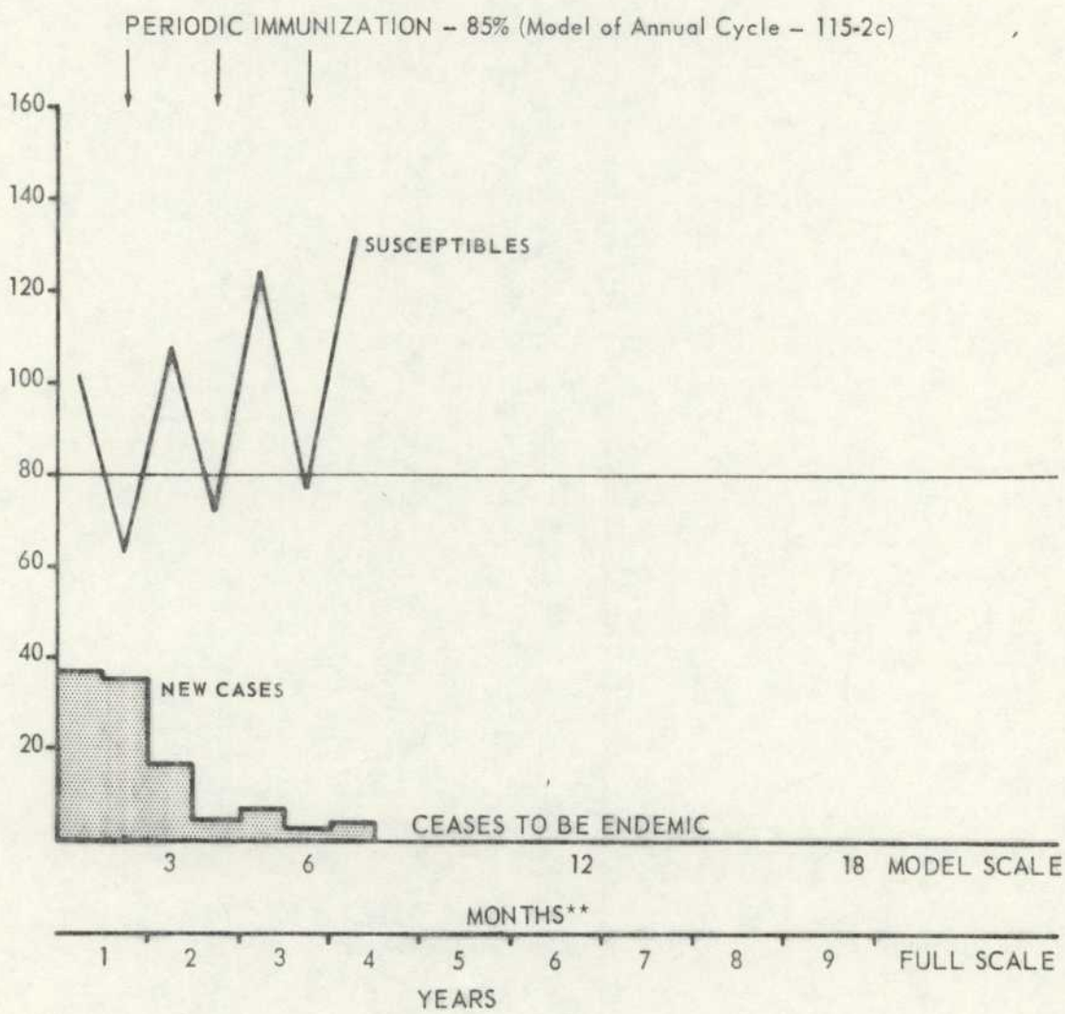

*Macdonald, G., 1967.
**Model Scale – 3 months equivalent to 18 months in reality.

FIGURE V
THEORETICAL MEASLES MODEL*



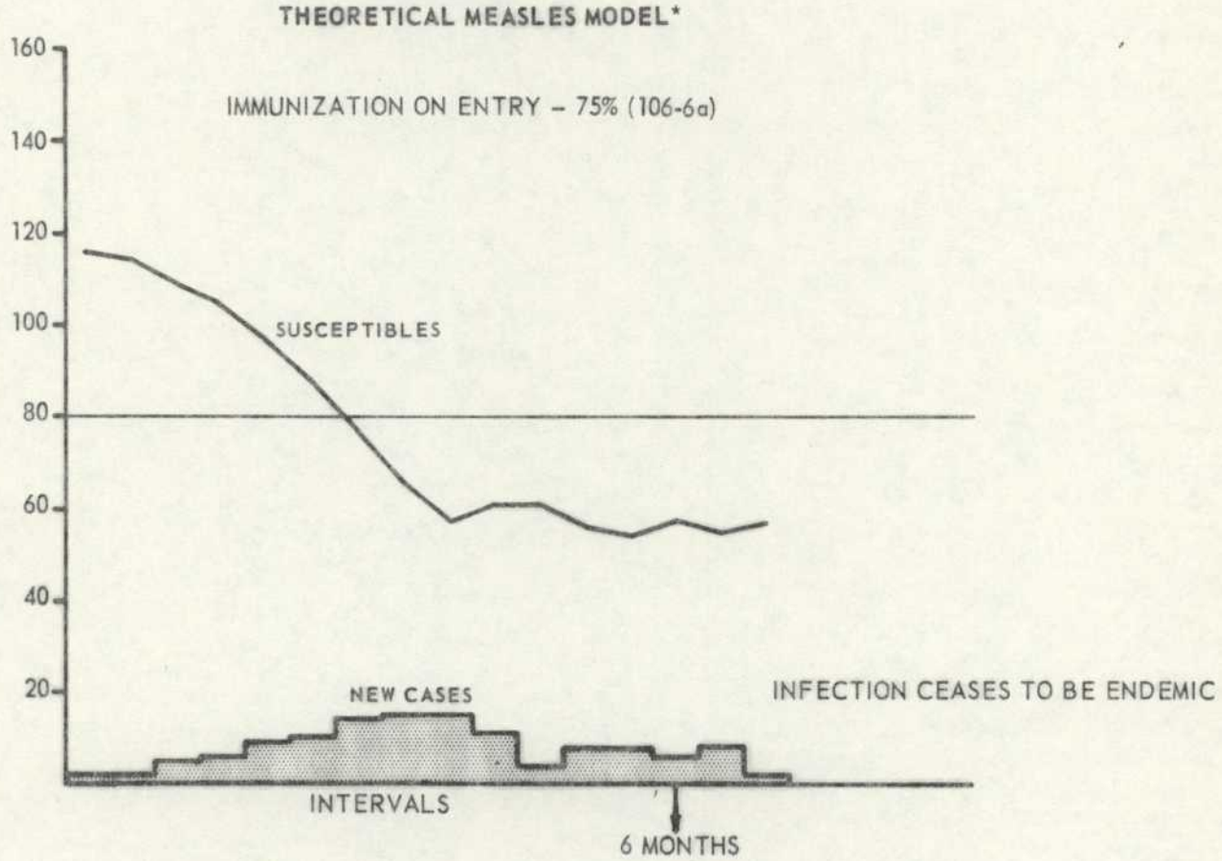

*Macdonald, G., 1967.
**Model Scale – 3 months equivalent to 18 months in reality.

FIGURE VI
THEORETICAL MEASLES MODEL*




*Macdonald, G., 1967.
**Model Scale – 3 months equivalent to 18 months in reality.

**FIGURE VII**
**THEORETICAL MEASLES MODEL***




*Macdonald, G., 1967.

Table 6

Theoretical Measles Model
Efficacy Various Periodic Mass Campaign Models in Interrupting
Transmission in Three Vaccination Rounds or Less

| Method | Round Frequency | % Effectiveness | Duration 3 Rounds | No. Computer Runs | No. Interruptions | Percent |
|---|---|---|---|---|---|---|
| A | 3 yrs. | 85 | 9 yrs. | 5 | 2 | 40.0 |
| B | 2 yrs. | 85 | 6 yrs. | 5 | 1 | 20.0 |
| C | 18 mos. | 85 | 4½ yrs. | 5 | 4 | 80.0 |
| D | 1 yr. | 85 | 3 yrs. | 5 | 5 | 100.0 |

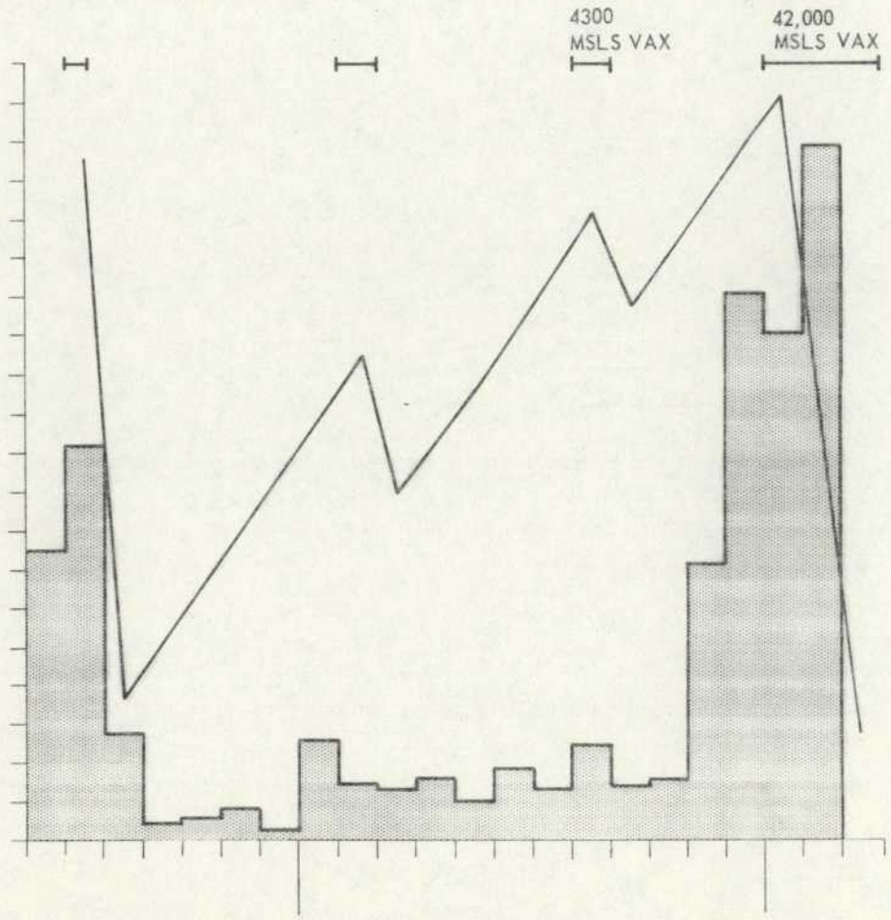
Table 7

Theoretical Measles Model
Morbidity Reduction in Programs
Not Interrupting Transmission*

| Method | Round Frequency | Coverage | No. New Cases |
|---|---|---|---|
| None | - | 0.0 | 1193 |
| A | 3 yrs. | 85.0 | 970 |
| B | 2 yrs. | 85.0 | 762 |
| C | 18 mos. | 85.0 | 511 |

* Within 20 model months (120 full months)

REPORTED CASES, ESTIMATED SUSCEPTIBLES, AND MAINTENANCE VACCINATIONS




*Based on data presented by Grigsby, M., West African Regional Smallpox Eradication/Measles Control Program Annual Meeting, May 1968, Abidjan, Ivory Coast and MSLS Surveillance data, SEP, NCDC, Atlanta.

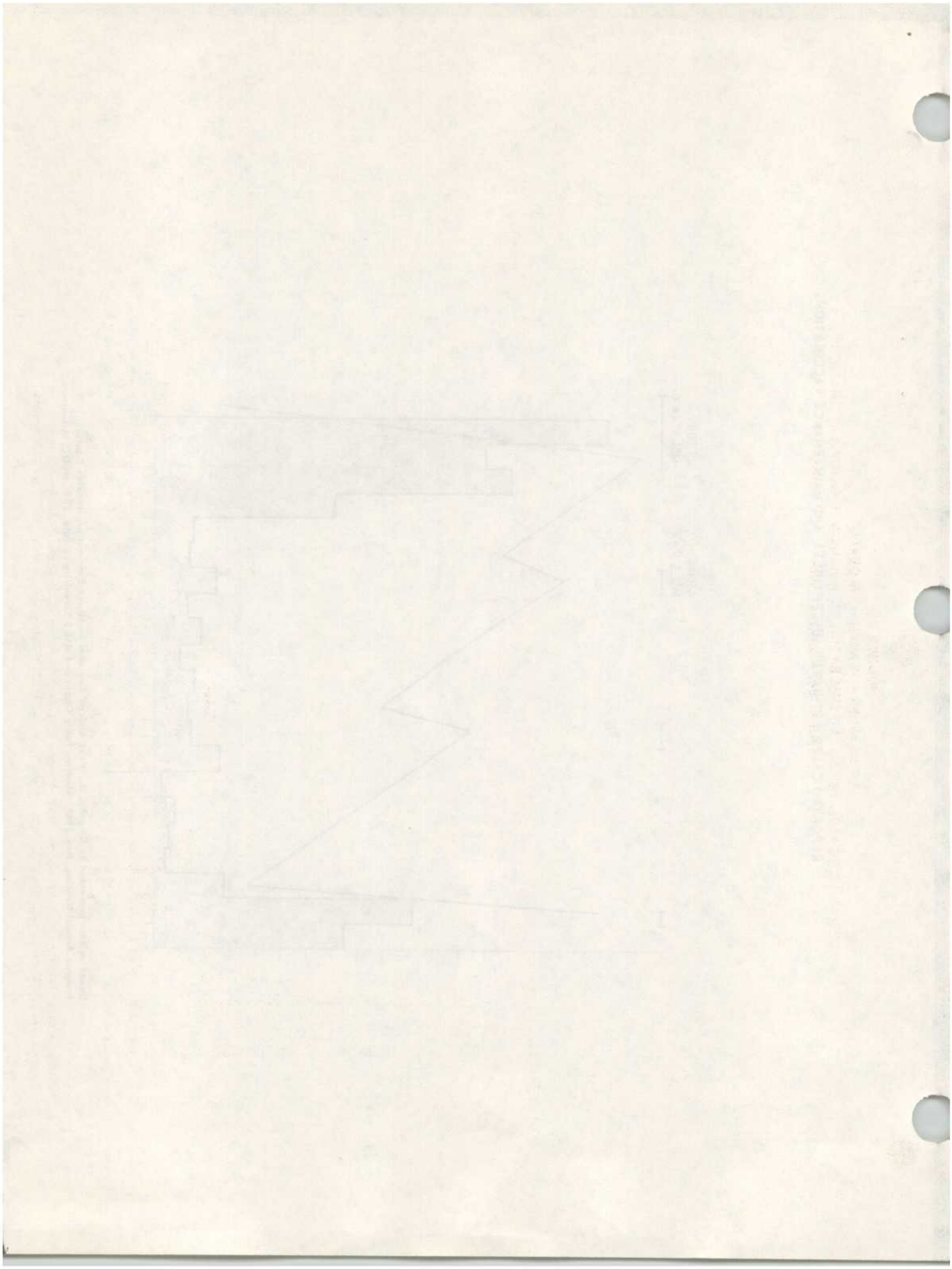
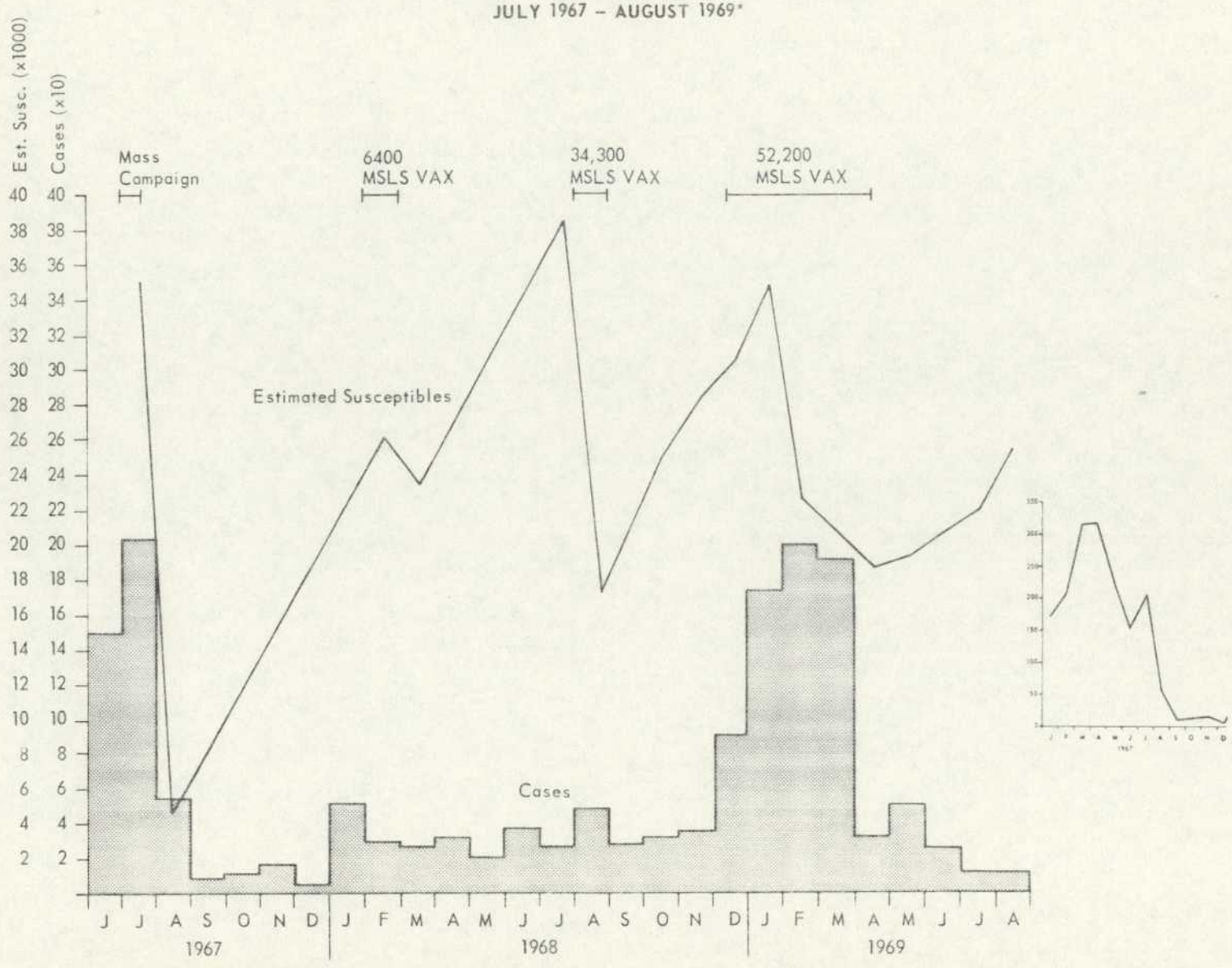


FIGURE VIII

MEASLES – IBADAN, W. NIGERIA

HOSPITALIZED CASES, ESTIMATED SUSCEPTIBLES, AND MAINTENANCE VACCINATIONS

JULY 1967 – AUGUST 1969*




*Based on data presented by Grigsby, M., West African Regional Smallpox Eradication/Measles Control Program Annual Meeting, May 1968, Abidjan, Ivory Coast and MSLS Surveillance data, SEP, NCDC, Atlanta

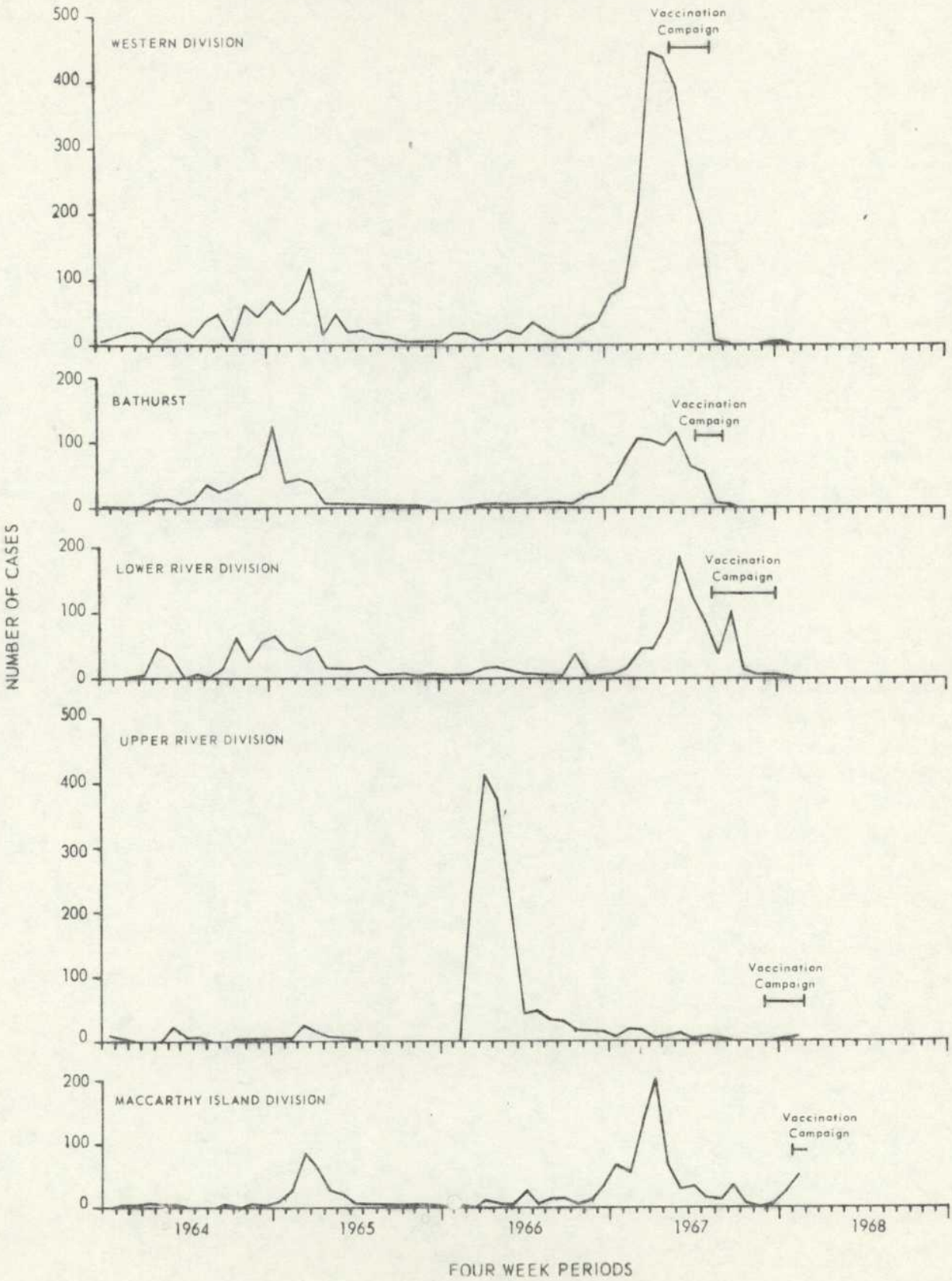
Table 8

Measles, The Gambia (1967 and 1968)
Reported Cases by Four-Week Periods*

| Weeks | 1967 | 1968 |
|---|---|---|
| 1-4 | 184 | 27 |
| 5-8 | 247 | 54 |
| 9-12 | 509 | 43 |
| 13-16 | 699 | 10 |
| 17-20 | 721 | 7 |
| 21-24 | 777 | 4 |
| 25-28 | 472 | 9 |
| 29-32 | 390 | 5 |
| 33-36 | 63 | 2 |
| 37-40 | 137 | 4 |
| 41-44 | 20 | 11 |
| 45-48 | 2 | 0 |
| 49-52 | 7 | 0 |

* Measles surveillance data, SEP, NCDC, Atlanta, Georgia.

## FIGURE IX
## SEQUENCE OF VACCINATION CAMPAIGN - THE GAMBIA*




*Foege, William, "Evaluation of Smallpox Eradication/Measles Control Program - The Gambia," June 1968.

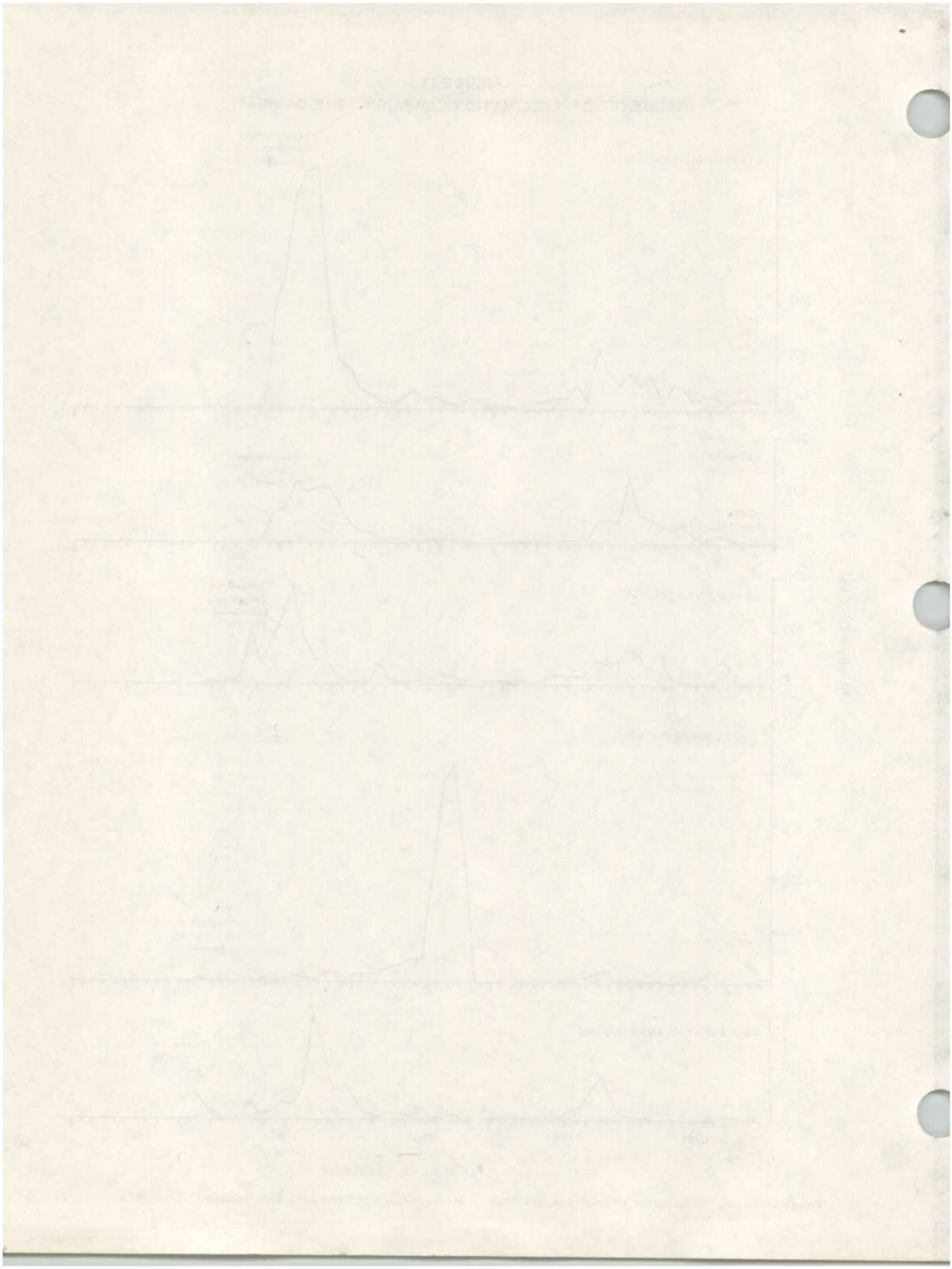
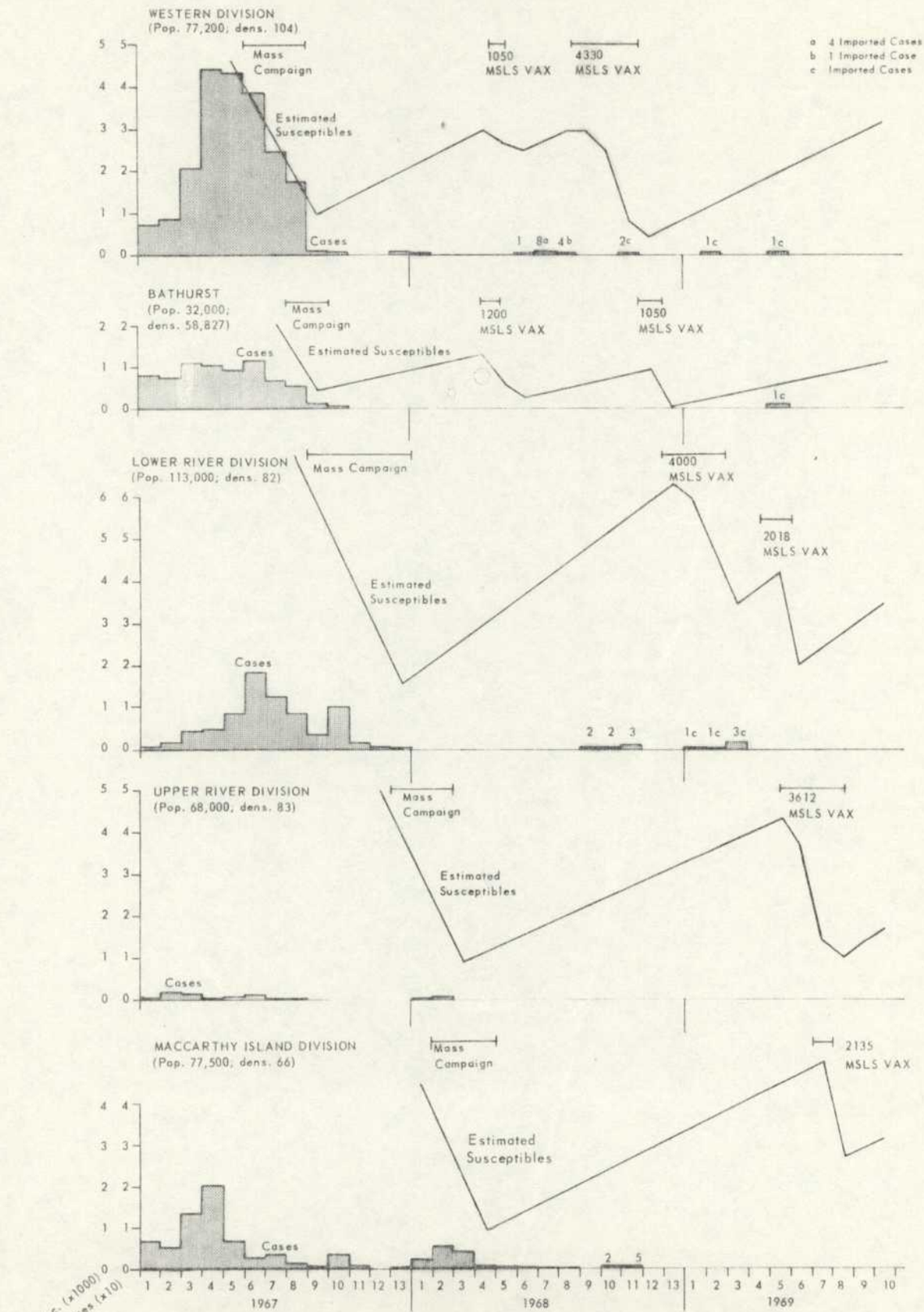


FIGURE X

MEASLES, THE GAMBIA (JANUARY 1967 – MARCH 1969)
REPORTED CASES, ESTIMATED SUSCEPTIBLES, AND MAINTENANCE VACCINATIONS
BY FOUR-WEEK PERIODS BY DIVISION*




*Based on data from Foege, Wm., "Evaluation of Smallpox Eradication/Measles Control Program – The Gambia", June 1968 and Measles Surveillance Data, SEP, NCDC, Atlanta.