Malaria Control and Population Pressure in Ceylon

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THE HISTORY of Ceylon is frequently cited as an example of the demographic effects of malaria control. A reduction in the death rate (for all causes of death) from 20.3 in 1946 to 14.3 in 1947 has been attributed to malaria control through the residual spraying of insecticides (*1–8*). The reduction in the death rate with a relatively constant birth rate has led to the widely publicized conclusion that malaria control had caused a "population explosion" (*4–11*), which in turn has led to predictions of impoverishment and famine in Ceylon as ultimate results of malaria control (*6*, *10*).

The conclusion that malaria control was primarily responsible for the reduction in the death rate of Ceylon in 1947 arose from the coincidence of the drop in the death rate with the extension of residual spraying of insecticides. This conclusion implied that the control, as well as the problem of malaria, affected a major proportion of the population. However, surveys conducted prior to the campaign indicate that 62 percent of the population of Ceylon resided in essentially nonmalarious districts, whereas residual spraying was confined to the area with endemic malaria (table 1).

The first year that a substantial proportion of the population exposed to malaria was protected for a full year was 1947. Those protected in that year represented 28 percent of the population of Ceylon. But the semiannual death rates of Ceylon indicate that the most dramatic reduction in the death rate (all causes) had already taken place in the second half of 1946, when only 18 percent of the national population had been protected from malaria. The protection of 18 percent of the population of Ceylon does not seem to explain the 25 percent reduction in the death rate of all Ceylon from 21.3 in the second semester of 1945 to 15.4 in the second semester of 1946 (table 2).

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The pronounced decline in the death rate in the second semester of 1946 invited a comparison of the mortality experience in the malarious and nonmalarious areas of Ceylon at that time. The number of deaths (all causes) in the second semester of 1946, when compared with the number of deaths in the second semester of 1945, declined 24 percent in the unprotected nonmalarious area and 26 percent in the malarious area, or 25 percent overall. The difference between the 25 percent decline in mortality for all Ceylon and the 24 percent decline in mortality in the unprotected nonmalarious area of Ceylon is insufficient to establish malaria control as the significant factor for the dramatic decline in mortality for Ceylon during the second semester of 1946 (tables 3 and 4). Further comparisons of the mortality experience in the malarious and nonmalarious areas fail to provide evidence that malaria control had been the sole or major factor in the postwar decline in mortality in Ceylon (tables 3 and 4).

The death rate (all causes) of Ceylon had been displaying a downward trend at least since 1905. The downtrend was interrupted during the latter part of the Second World War and in 1935, when a disastrous drought was associated with a sharp rise in mortality, attributed

Table 1. Population, area, and population density of districts of Ceylon grouped by the endemicity of malaria in the districts

Endemicity of malaria	Spleen rates[1] (percent)	Population[2]		Area		Population density per square mile
		Number	Percent	Square miles	Percent	
Not endemic	0–9	4, 142, 889	62	5, 113	20	810
Moderately endemic	10–24	1, 207, 569	18	5, 271	21	229
Highly endemic	25–49	994, 495	15	8, 460	33	118
Hyperendemic	50–74	312, 466	5	6, 489	26	48

[1] Average of surveys in 1939 and 1941.
[2] 1946 census.

SOURCES: Ceylon Department of Census and Statistics, Census of Ceylon, 1946, and reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.

to malaria acting singly or in combination with dysentery and famine. Following are the annual death rates (all causes), based on the estimated population in the respective years, for Ceylon from 1905 through 1953.

Years	*Death rates*	*Years*	*Death rates*
1905–1914	31. 0	1943	21. 4
1915–1924	29. 1	1944	21. 3
1925–1934	23. 6	1945	22. 0
1934	22. 9	1946	20. 3
1935	36. 6	1947	14. 3
1936	21. 8	1948	13. 2
1937	21. 7	1949	12. 6
1938	21. 0	1950	12. 6
1939	21. 8	1951	12. 9
1940	20. 6	1952	12. 0
1941	18. 8	1953	10. 9
1942	18. 6		

SOURCE: Reports of the Registrar General on Vital Statistics, Ceylon.

Comparison of population density and malaria endemicity reveals a reciprocal distribution of population and malaria in Ceylon. The population density of the nonmalarious area was 17 times that of the area with hyperendemic malaria (table 1). The ancient civilization of Ceylon had centered in the area with hyperendemic malaria. The ruins of 10,000 dams testify to the level and magnitude of this civilization in successive stages of history. Decay of the ancient order was associated with collapse of the irrigation systems, emergence of conditions that favored transmission of malaria, and retreat of the Singhalese to the nonmalarious area of the island.

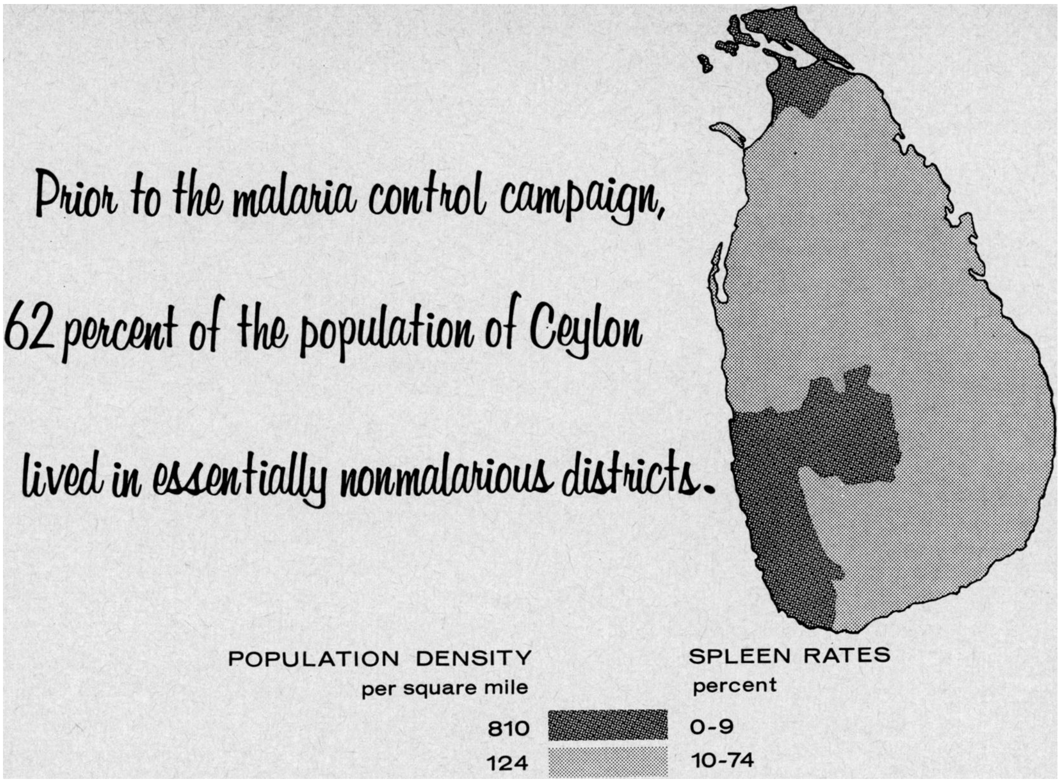
Elimination of endemic malaria, which had become a barrier to resettlement and development of the major part of Ceylon, may serve to reduce the population pressure in the congested area by removing the disease which had restricted the majority of the population to one-fifth of the island territory (table 1). Malaria control will permit full use of the resources in the area which is relatively underpopulated and underdeveloped (see chart).

Table 2. Percentage of population protected against malaria by residual spraying of insecticides and semestral death rates (all causes), Ceylon, 1944–53

Year	Semiannual death rates[1]		Percent of population protected
	First semester	Second semester	
1944	21. 6	21. 1	0
1945	22. 6	21. 3	3
1946	25. 1	15. 4	18
1947	15. 2	13. 2	28
1948	13. 5	13. 2	40
1949	13. 0	12. 1	36
1950	12. 3	12. 9	35
1951	13. 1	12. 7	36
1952	12. 3	11. 7	38
1953	10. 8	11. 1	36

[1] Based on estimated population in the respective years.

SOURCES: Reports of the Registrar General on Vital Statistics, Ceylon, and reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.



"Although Ceylon is a small country which is primarily agricultural, nearly two-thirds of the Island has been uncultivable chiefly owing to the dreaded disease, malaria. With the removal of malaria today, a serious menace to the country, it will be possible to open up these vast tracts of land considerably to improve the living conditions of the people, the majority of whom hitherto have been living in poverty and misery" (*12*).

This analysis of mortality in Ceylon should quiet unfounded fears that malaria control in-

Table 3. Deaths (all causes) in the malarious and nonmalarious areas of Ceylon during the second semesters, 1944–48 and 1953

Second semester	Malarious area [1]	Non-malarious area [2]	Ceylon
1944	26, 346	39, 842	66, 188
1945	29, 932	39, 466	69, 398
1946	22, 186	30, 058	52, 244
1947	18, 389	28, 310	46, 699
1948	17, 126	29, 175	46, 301
1953	17, 511	27, 667	45, 178

[1] Districts with spleen rates from 10 to 74 percent (surveys of 1939 and 1941).
[2] Districts with spleen rates from 0 to 9 percent (surveys of 1939 and 1941).

Sources: Same as for table 2.

Table 4. Death rates (all causes) in the malarious and nonmalarious areas of Ceylon during the second semesters, 1944–48 and 1953

Second semester	Malarious area [1]	Non-malarious area [2]	Ceylon
1944 [3]	21. 0	19. 2	19. 9
1945 [3]	23. 8	19. 1	20. 8
1946 [3]	17. 6	14. 5	15. 7
1947 [3]	14. 6	13. 7	14. 0
1948 [3]	13. 6	14. 1	13. 9
1953 [4]	10. 9	11. 3	11. 2

[1] Districts with spleen rates from 10 to 74 percent (surveys of 1939 and 1941).
[2] Districts with spleen rates from 0 to 9 percent (surveys of 1939 and 1941).
[3] Based on census population of 1946.
[4] Based on census population of 1953.

Sources: Ceylon Department of Census and Statistics, Census of Ceylon, 1946 and 1953, and Reports of the Government of Ceylon submitted to the World Health Organization Malaria Conferences at Bangkok, September 1953, and Taipei, November 1954.

vites famine. The available evidence fails to establish malaria control as the sole or major cause of a population explosion in Ceylon. At the same time, malaria control has made habitable what was in ancient times the most populous and productive area of the island. It appears that in Ceylon the net demographic effect of malaria control for the present could be to reduce population pressure by providing more living space.

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New Diagnostic Test for Lupus Erythematosus

A simple diagnostic test which allows accurate screening of large numbers of patients for disseminated lupus erythematosus in a short time has been developed by public health scientists at the National Institutes of Health, Public Health Service.

A connective tissue disease related to rheumatoid arthritis, lupus erythematosus is far more common than indicated by past statistics. Manifestations may include blood, kidney, or nerve disorders, mental disease, arthritis, and butterfly rash of the face and may appear simultaneously. There may be no serious complications for years, but in its acute, disseminated form, it is frequently fatal.

The test, similar to that devised earlier for rheumatoid arthritis, consists of adding a drop of the patient's serum to bentonite sensitized by desoxyribonucleic acid. If the disease is present, flocculation occurs after about 15 minutes of agitation.

Clinical results are described by John Bozicevich, who heads the Basic Immunology Section, Laboratory of Immunology, and Dr. John P. Nasou and Dr. Donald E. Kayhoe of the Laboratory of Clinical Investigations in the National Institute of Allergy and Infectious Diseases, Public Health Service, reporting in the *Proceedings of the Society for Experimental Biology and Medicine*, March 1960.

Advantages of the test are the elimination of the need for fresh whole blood, required by the cell test, and its high specificity. Six persons with frank rheumatoid arthritis gave positive reactions for lupus with the former test, but all were found negative with the flocculation test. Tests on eight lupus patients were conducted with complete agreement in results with the older procedure. For controls, 138 serum specimens from normal individuals or from patients with related and unrelated diseases were appraised, with negative reactions.

More details of the test appear in the *New England Journal of Medicine* for July 7, 1960.