Malaria mortality

Knowing the parasite species distribution, the *Pf/Pv* ratio and malaria incidence patterns it is pertinent to examine the malaria mortality patterns expressed as deaths per 100,000 population per year over the 6 years 1996-2001 since almost all malaria deaths are *P. falciparum* related. In Figure 18a two years' data (1996, 2001) covering a 6-year period are given to compare the mortality over time. In most areas, there has been a marked reduction in malaria mortality, with exceptions in some parts of Myanmar.

In 1996, Cambodia, Lao PDR and Myanmar showed high malaria mortality (7.3-12.3 per 100,000) compared with Viet Nam, China/Yunnan and Thailand (0.04 - 1.5 per 100,0000). Compared with 1996, in 2001 there was a significant reduction (2 to 3 fold) in mortality rate in LaoPDR and Cambodia as shown in Figure 18b.

Striking features of the map picture (Figure 18a) are the uneven distribution of malaria deaths among unit areas of the countries, and the decrease in deaths shown over that 6-year period in a substantial proportion of the affected unit areas and the increases in others.

The clustering of mortality is perhaps more easily grasped by overlaying single year case data on the background of forest cover, using data from each of the 6 years 1996-2001 (Figure 19a-f). The mortality clusters are generally forest-associated in remote areas, with the largest such cluster in 2001 in an area on the Thai-Myanmar border.

It is most likely that the underlying cause of mortality clusters is multi-factorial in nature, requiring high overall malaria incidence, high falciparum species prevalence, factors related to the logistics of time lapse between onset of fever and seeking treatment, delayed species diagnosis, appropriateness of drug treatment, access to good disease management in a hospital and related issues. Age (*e.g.* children) and occupation (*e.g.* forest environment) are also likely to be factors. Health facility/resources mapping is required to extend the geographical dimension provided by disease mapping. High transmission of *P. falciparum* is surely one factor. Genetic variation among isolates has been described in various global locations and virulent strains may account for some foci of mortality. Molecular epidemiologic analysis could perhaps help to clarify the matter. Possibly drug policy modulation in relation to remote locations of living could be relevant.

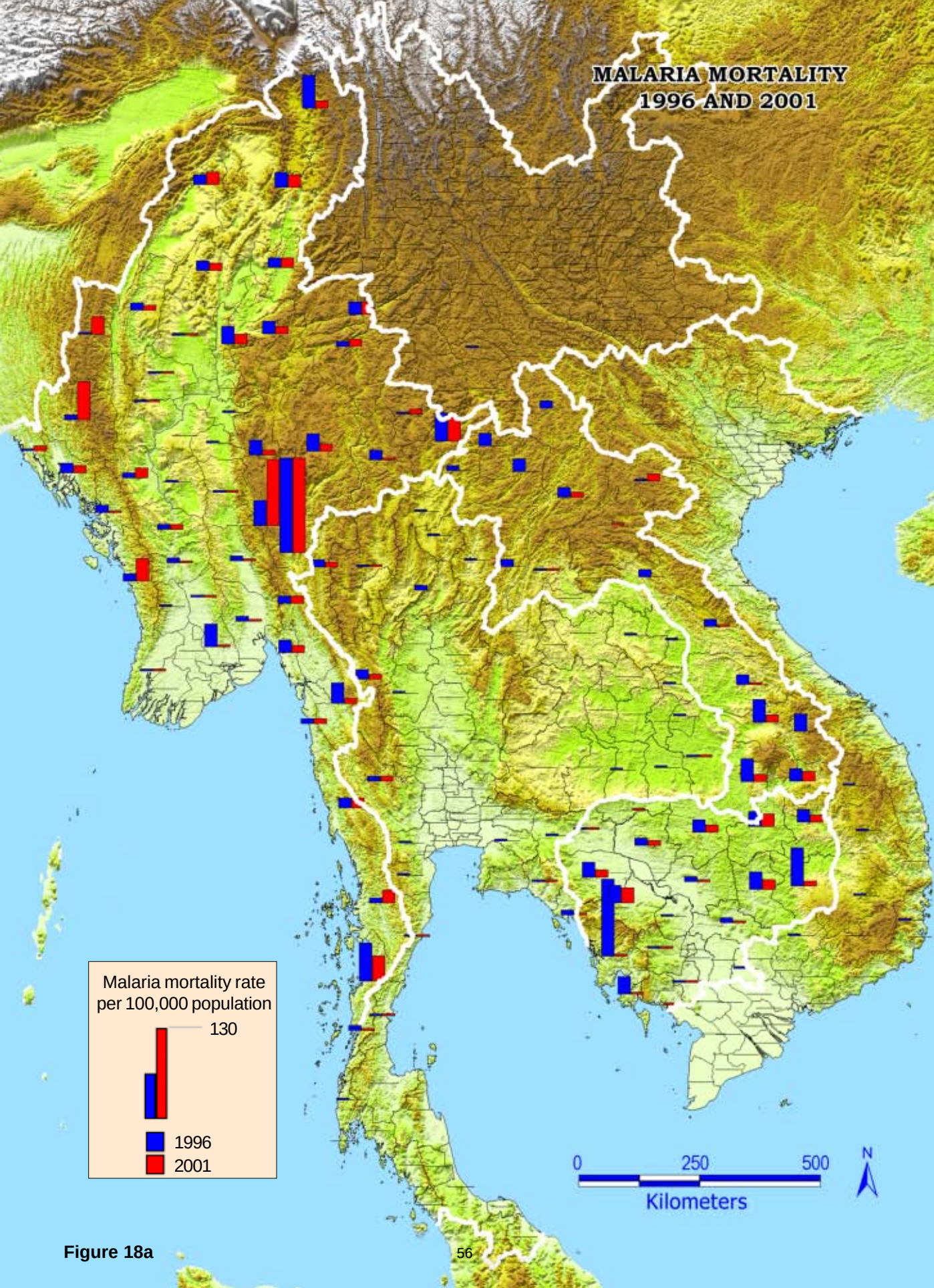
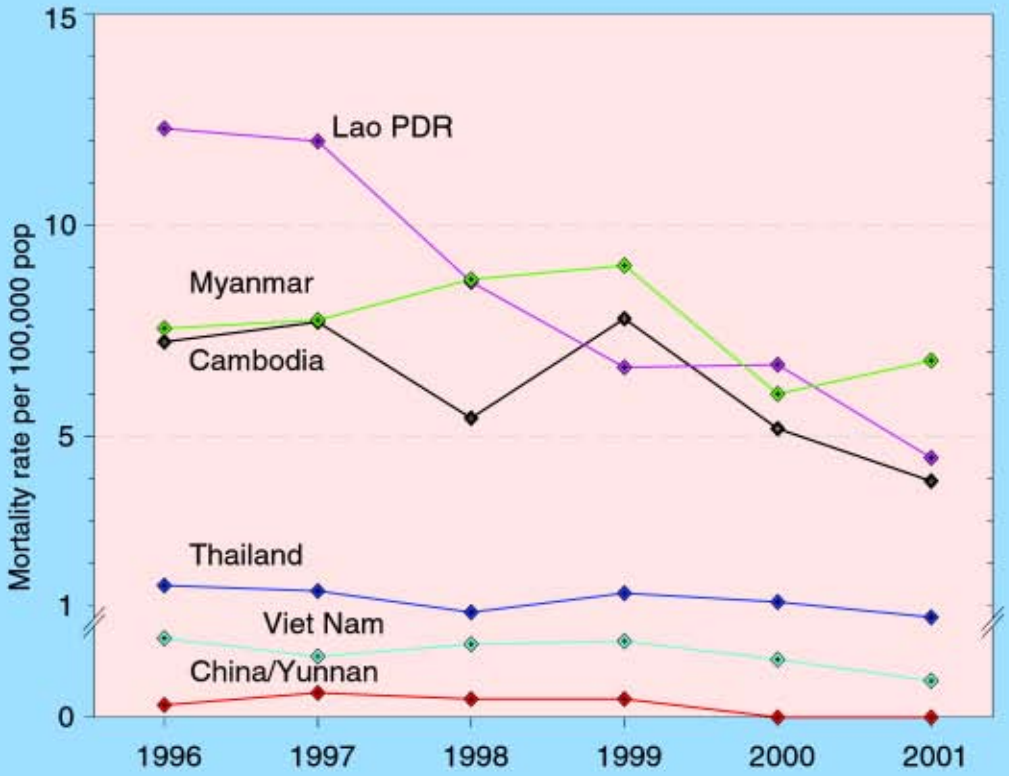

MALARIA MORTALITY
1996 AND 2001
Malaria mortality rate
per 100,000 population
130
1996
2001
0
250
500
Kilometers
N

Figure 18a

TREND IN MALARIA MORTALITY RATE IN MEKONG COUNTRIES 1996-2001



Cambodia	7.24	7.71	5.54	7.79	5.19	3.95
China/ Yunnan	0.04	0.08	0.06	0.06	0.00	0.00
Lao PDR	12.29	11.99	8.66	6.64	6.70	4.50
Myanmar	7.56	7.76	8.72	9.05	6.01	6.80
Thailand	1.48	1.35	0.85	1.30	1.09	0.73
Viet Nam	0.26	0.20	0.24	0.25	0.19	0.12

Figure 18b

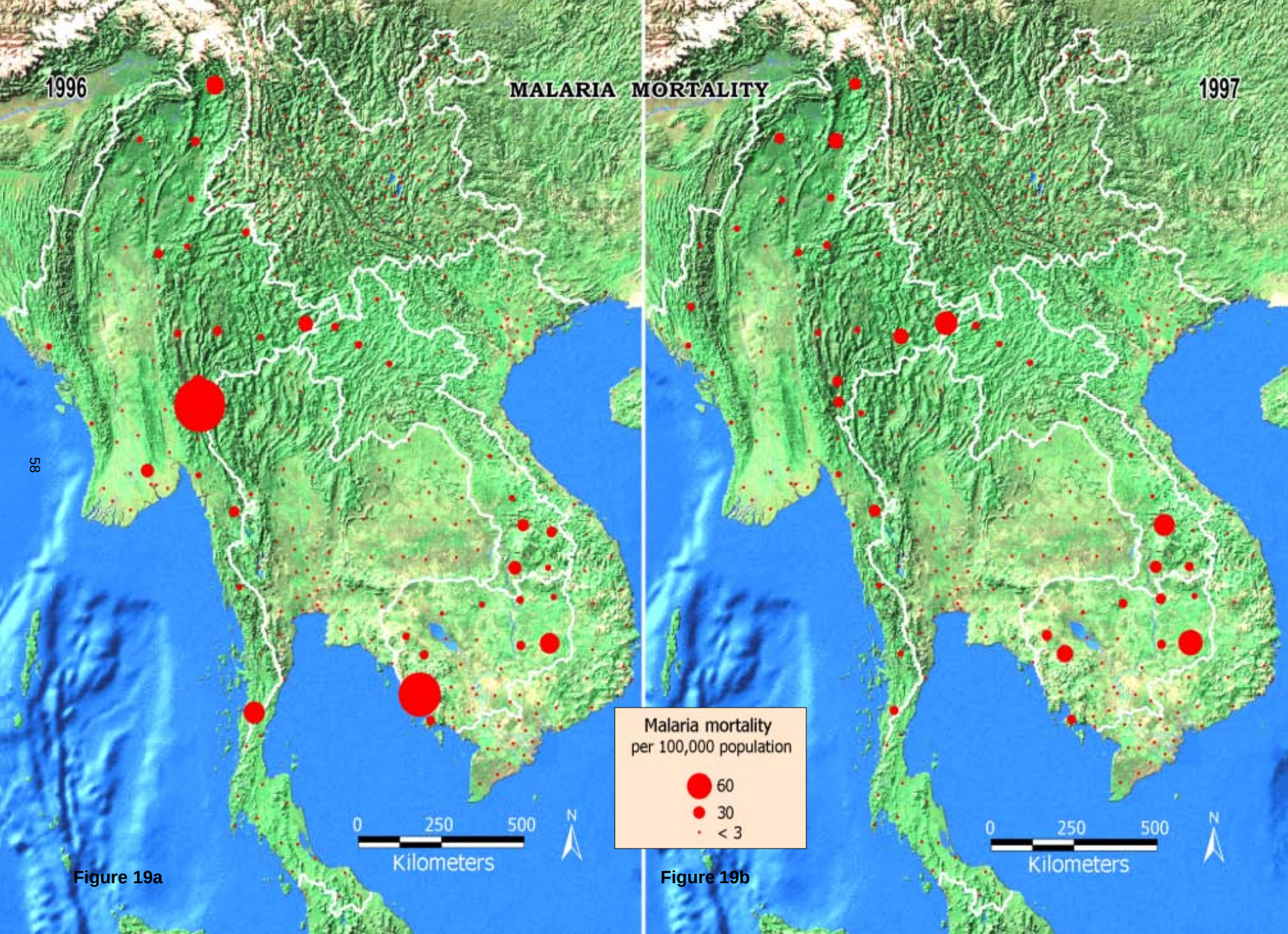


Figure 19a

Figure 19b

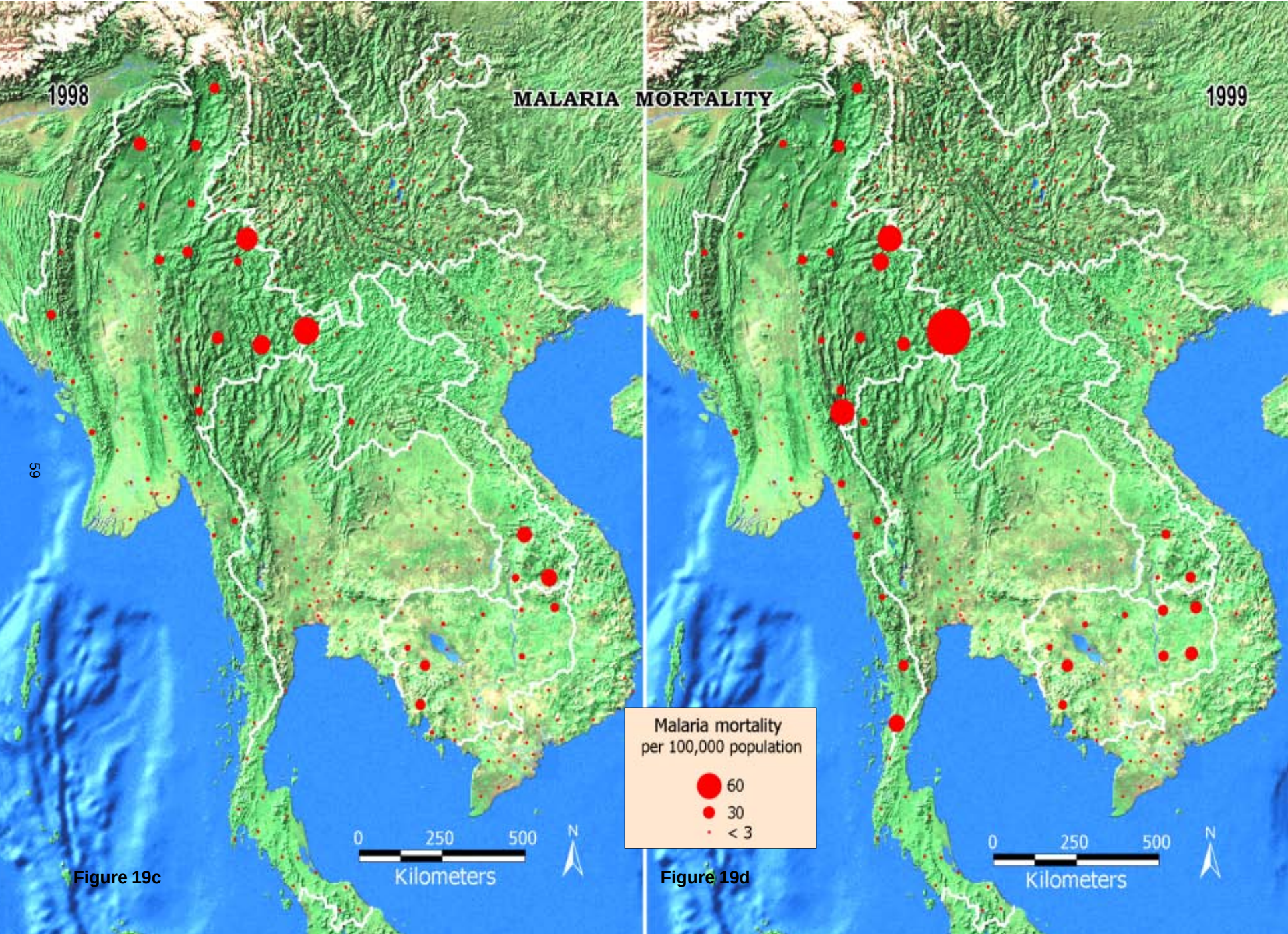


Figure 19c

Figure 19d

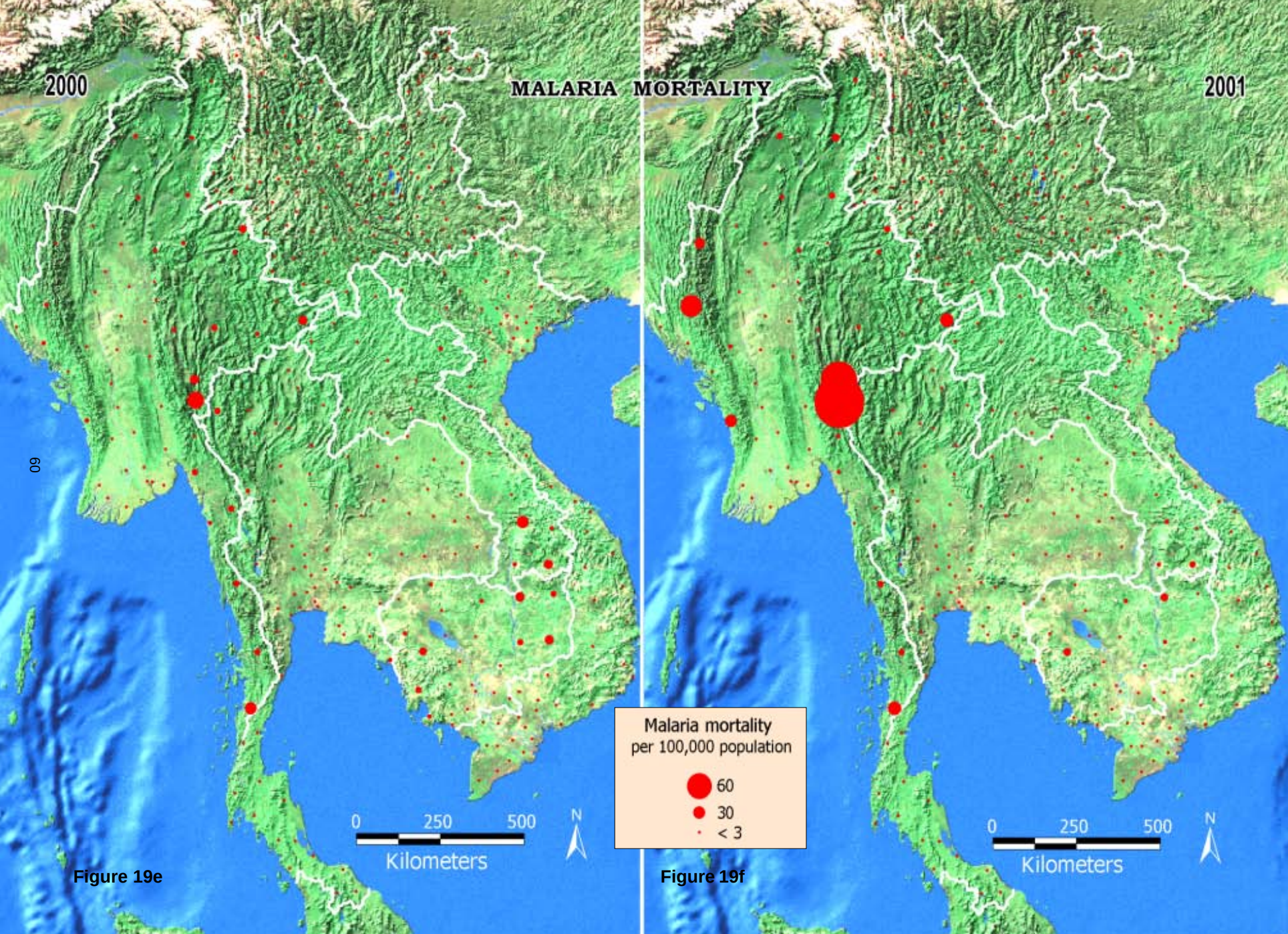


Figure 19e

Figure 19f