Malaria in international border areas

Some reference has been made already to inter-country border distribution of malaria in the region. This has been identified in terms of location of total reported malaria cases, incidence of reported cases, confirmed cases and parasite species. Because they are nationally based, malaria control programs in the region understandably tend to focus on disease distribution within each country. However, the considerable dialogue that has evolved between neighboring programs over a number of years has led to some understanding of malaria that tends to concentrate on border areas themselves. Mapping detailed data serves to facilitate the dialogue and expand its effectiveness in identifying specific issues on which enhanced collaboration could be mutually beneficial.

Much of the data pertinent to border malaria is already available in preceding regional maps and there is advantage in applying that data to expanded shared border areas in turn. In this way cross-reference can readily be made between regional, national and border disease patterns. In the following 4 maps (Figures 21, 22, 23, 24) data for the 6 years 1996-2001 are presented as bar graphs showing the number of malaria cases reported in unit areas along the borders shared by two, three or four countries as the geographic situation determines. The data set for each unit area on each side of the respective borders consists of 6 standard colored bars, each coding for one of the 6 years. The height of the bars gives a measure of the number of total reported cases.

On this expanded scale the relative case numbers in unit areas facing each other along each border can be appreciated precisely. Along the Myanmar-Thai border (Figure 21) some paired unit areas exhibit substantial case numbers on both sides. Against modest variation over time bar heights tend to remain at similar levels over the 6 year period whether these heights are large or small. This observation suggests that factors determining malaria case numbers in these areas tend to recur year by year. In the unit areas along the Cambodia-Lao PDR-Thai borders (Figure 22) on the other hand there is considerable variation in bar height over the 6 year time period, particularly on the Lao PDR side, while on the Thai side in each case the numbers of reported cases are relatively fewer, both data sets implying variability in factors affecting malaria incidence right along the border region. Somewhat similar irregularity is seen in unit areas along the Cambodia-Lao PDR-Viet Nam borders (Figure 23). The scenario is rather different on the Yunnan-Myanmar-Lao PDR-Viet Nam borders respectively (Figure 24), where there are very few cases reported in any of the unit areas on the Chinese side even where there are substantial numbers in some other unit areas, particularly Myanmar and Viet Nam areas. In some Viet Nam unit areas however a continuing decrease in case numbers is seen in successive years as in other parts of Viet Nam.

The insets in Figures 21 and 22 show the average API over 11 years and average monthly API in the two border regions. The transmission along the Thai-Myanmar border peaked in May-July while along the Thai-Cambodian border transmission peaked in November-December. In 2001 the average API among the provinces located along the Thai side of the Thai-Myanmar border was 6 per 1,000 while that in the corresponding provinces situated along the Thai-Cambodian border was 2 per 1,000 per year.

Scaling up the maps of these border areas makes it easier to appreciate the differences in malaria burden among neighboring unit areas in the different countries and, while this process does not define the underlying factors which affect incidence therein, it does potentially enable those responsible locally for malaria control and malaria case management on each side of respective borders to collaborate in seeking answers and coordinating efforts. This can be effectively done if hot spots are identified at regional level, shifting to selected border area expansion, then focusing down at the micro level. At the latter level much of the value depends on the accuracy of data collection, on the frequency of ascertainment and rapidity of report transmission to the center where data coding is done and where data is shared across national boundaries. Of course the feasibility of such analyses in relation to disease control programs will hinge on perceived benefit/cost ratio.

The present regional data sharing is a starting point. The trans-border region map expansion is a further step forward towards more useful sharing of databases, but to be really effective will ultimately require consideration of more frequent data sharing over shorter time periods.

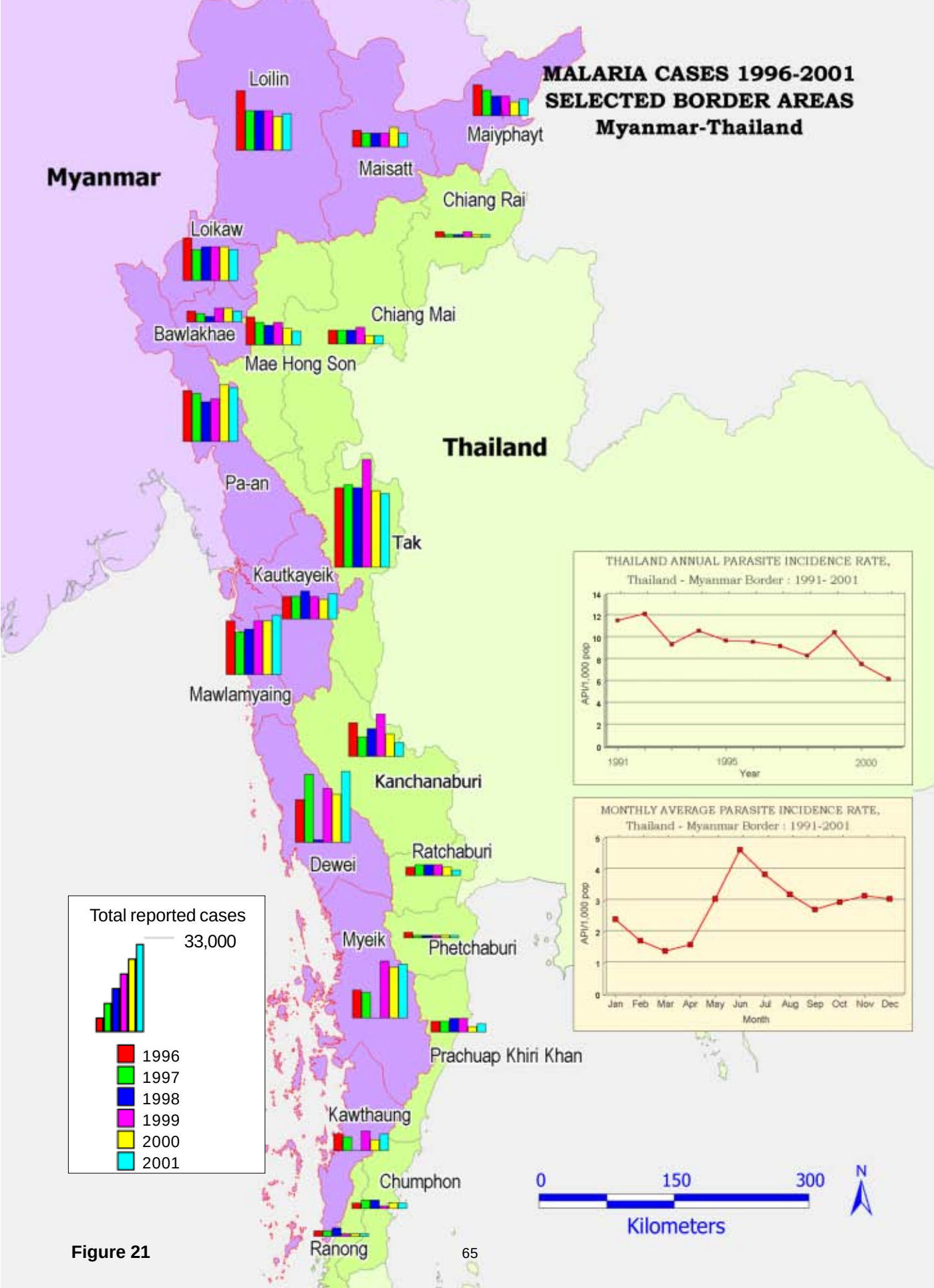
MALARIA CASES 1996-2001
SELECTED BORDER AREAS
Myanmar-Thailand
Myanmar
Thailand
Loilin
Maiyphayt
Maisatt
Chiang Rai
Loikaw
Chiang Mai
Bawlakhae
Mae Hong Son
Pa-an
Tak
Kautkayeik
Mawlamyaing
Kanchanaburi
Dewei
Ratchaburi
Myeik
Phetchaburi
Prachuap Khiri Khan
Kawthaung
Chumphon
Ranong
THAILAND ANNUAL PARASITE INCIDENCE RATE,
Thailand - Myanmar Border : 1991- 2001
API/1,000 pop
Year
MONTHLY AVERAGE PARASITE INCIDENCE RATE,
Thailand - Myanmar Border : 1991-2001
API/1,000 pop
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month
Total reported cases
33,000
1996
1997
1998
1999
2000
2001
0 150 300
Kilometers
N

Figure 21

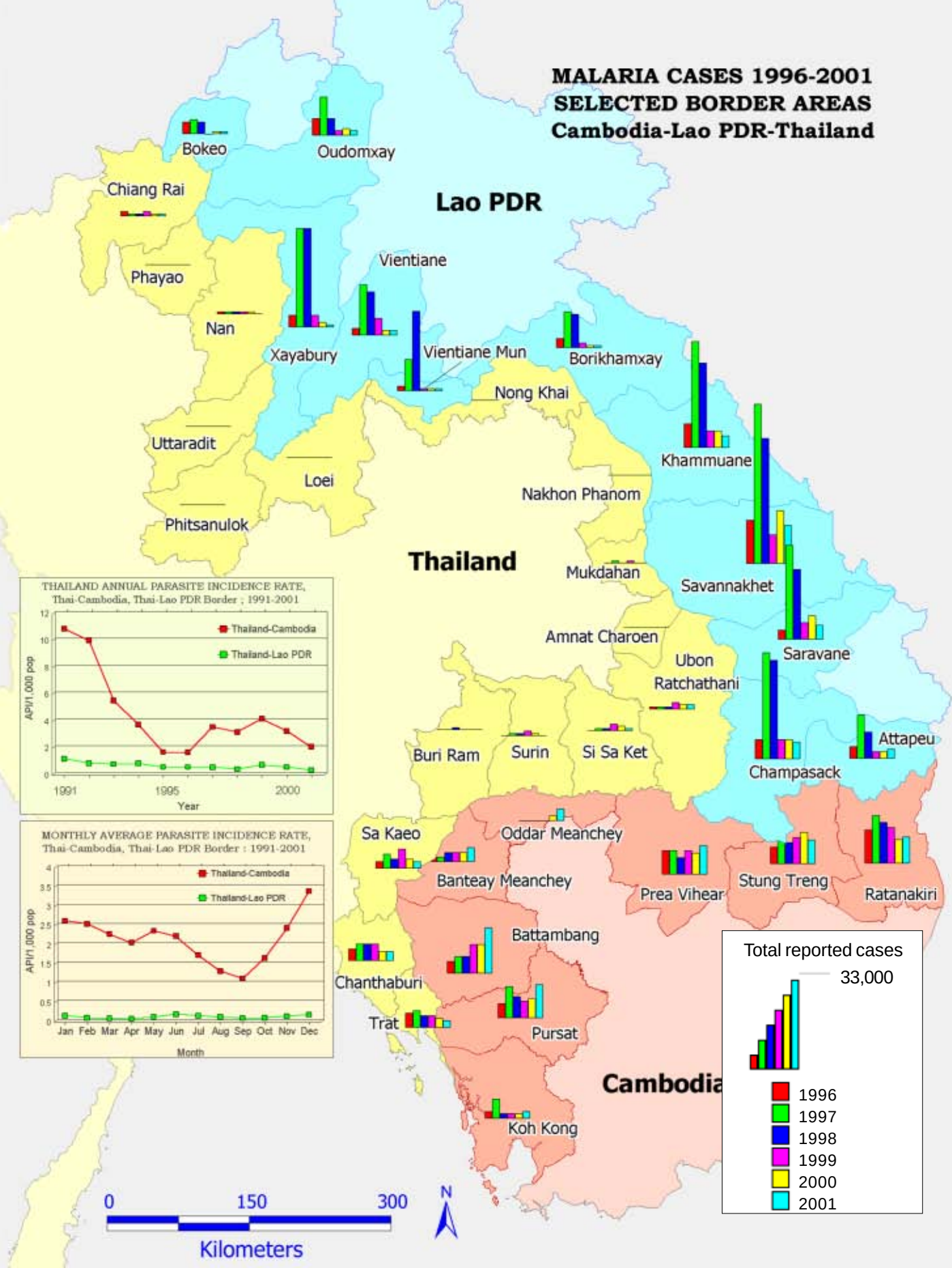
MALARIA CASES 1996-2001
SELECTED BORDER AREAS
Cambodia-Lao PDR-Thailand
Lao PDR
Thailand
Cambodia
Bokeo
Oudomxay
Chiang Rai
Phayao
Nan
Xayabury
Vientiane
Vientiane Mun
Borikhamxay
Nong Khai
Khammuane
Uttaradit
Loei
Phitsanulok
Nakhon Phanom
Mukdahan
Savannakhet
Amnat Charoen
Saravane
Ubon Ratchathani
Buri Ram
Surin
Si Sa Ket
Champasack
Attapeu
Sa Kaeo
Oddar Meanchey
Banteay Meanchey
Prea Vihear
Stung Treng
Ratanakiri
Battambang
Chanthaburi
Trat
Pursat
Koh Kong
THAILAND ANNUAL PARASITE INCIDENCE RATE,
Thai-Cambodia, Thai-Lao PDR Border ; 1991-2001
Thailand-Cambodia
Thailand-Lao PDR
API/1,000 pop
Year
1991
1995
2000
MONTHLY AVERAGE PARASITE INCIDENCE RATE,
Thai-Cambodia, Thai-Lao PDR Border : 1991-2001
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month
Total reported cases
33,000
1996
1997
1998
1999
2000
2001
0
150
300
Kilometers
N

Figure 22

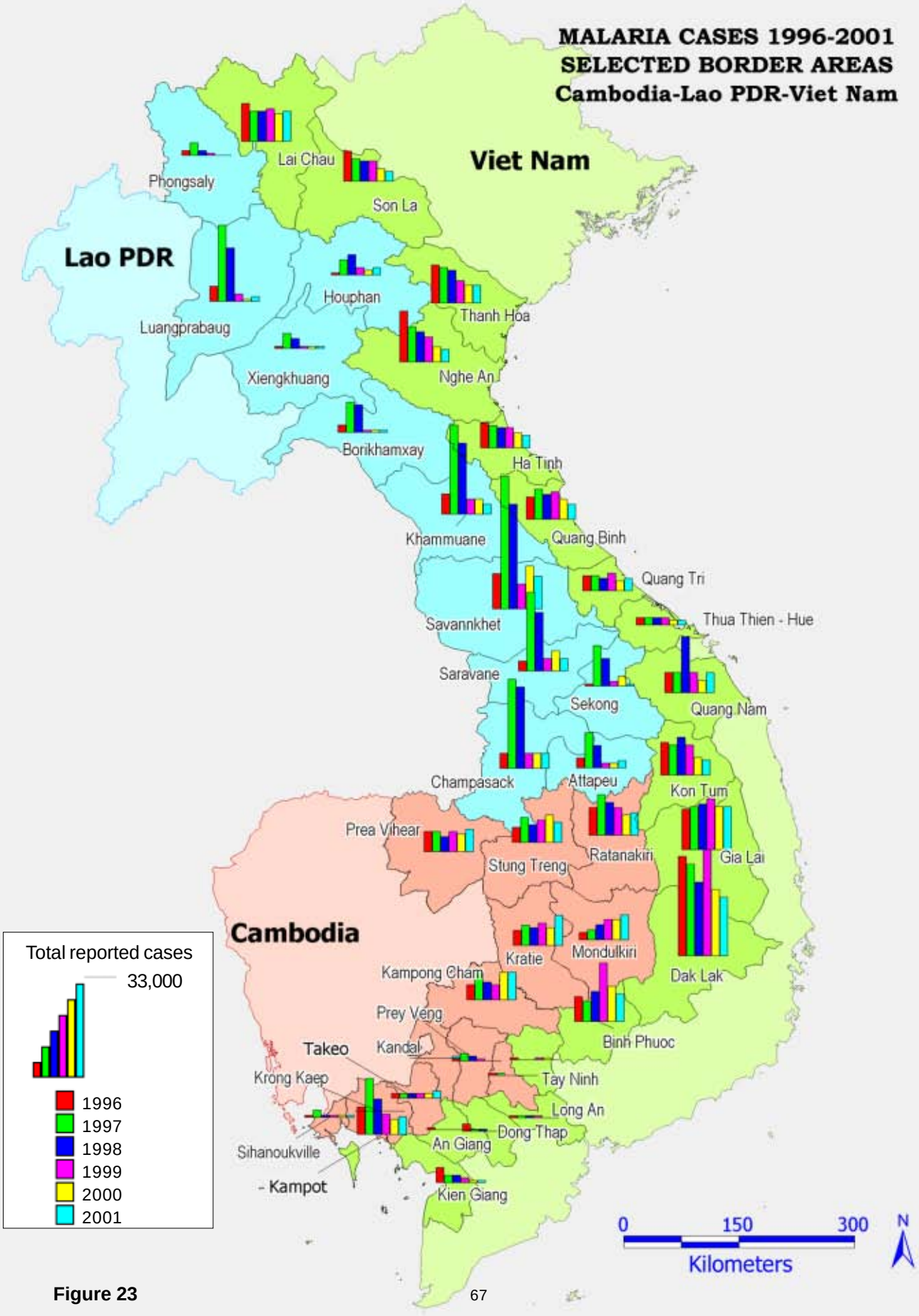
MALARIA CASES 1996-2001
SELECTED BORDER AREAS
Cambodia-Lao PDR-Viet Nam
Viet Nam
Lao PDR
Cambodia
Lai Chau
Phongsaly
Son La
Houphan
Thanh Hoa
Luangprabaug
Xiengkhuang
Nghe An
Borikhamxay
Ha Tinh
Khammuane
Quang Binh
Quang Tri
Thua Thien - Hue
Savannkhet
Saravane
Sekong
Quang Nam
Champasack
Attapeu
Kon Tum
Prea Vihear
Stung Treng
Ratanakiri
Gia Lai
Kratie
Mondulkiri
Kampong Cham
Dak Lak
Prey Veng
Takeo
Kandal
Binh Phuoc
Krong Kaep
Tay Ninh
Long An
Dong Thap
An Giang
Sihanoukville
- Kampot
Kien Giang
Total reported cases
33,000
1996
1997
1998
1999
2000
2001
0
150
300
Kilometers
N

Figure 23

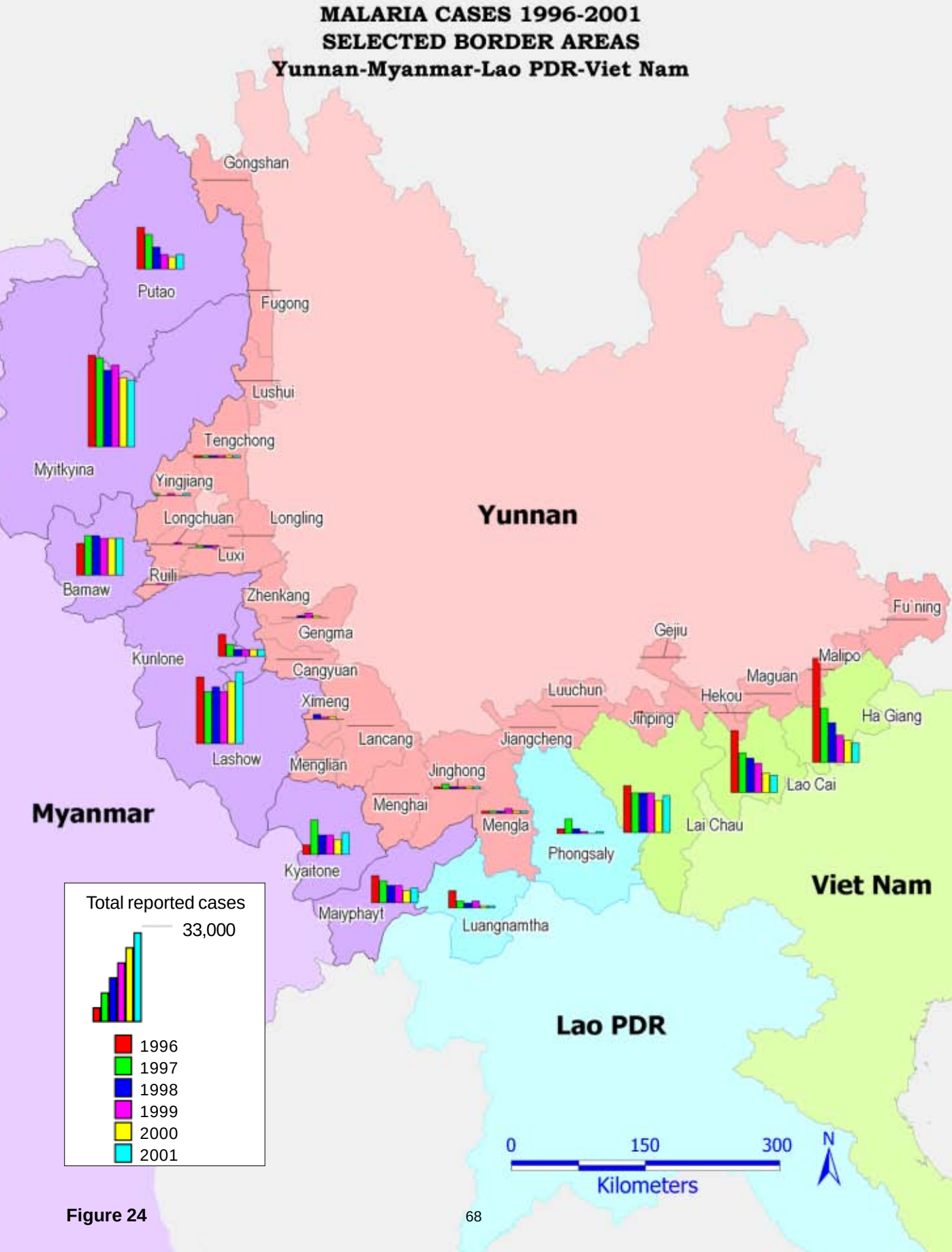
MALARIA CASES 1996-2001
SELECTED BORDER AREAS
Yunnan-Myanmar-Lao PDR-Viet Nam
Gongshan
Putao
Fugong
Lushui
Tengchong
Myitkyina
Yingjiang
Longchuan
Longling
Luxi
Ruili
Bamaw
Yunnan
Zhenkang
Gengma
Kunlone
Cangyuan
Ximeng
Lancang
Lashow
Menglian
Jinghong
Menghai
Mengla
Jiangcheng
Luuchun
Jinping
Gejiu
Hekou
Maguan
Malipo
Fu`ning
Ha Giang
Lao Cai
Lai Chau
Phongsaly
Myanmar
Viet Nam
Kyaitone
Maiyphayt
Luangnamtha
Lao PDR
Total reported cases
33,000
1996
1997
1998
1999
2000
2001
0
150
300
Kilometers
N

Figure 24