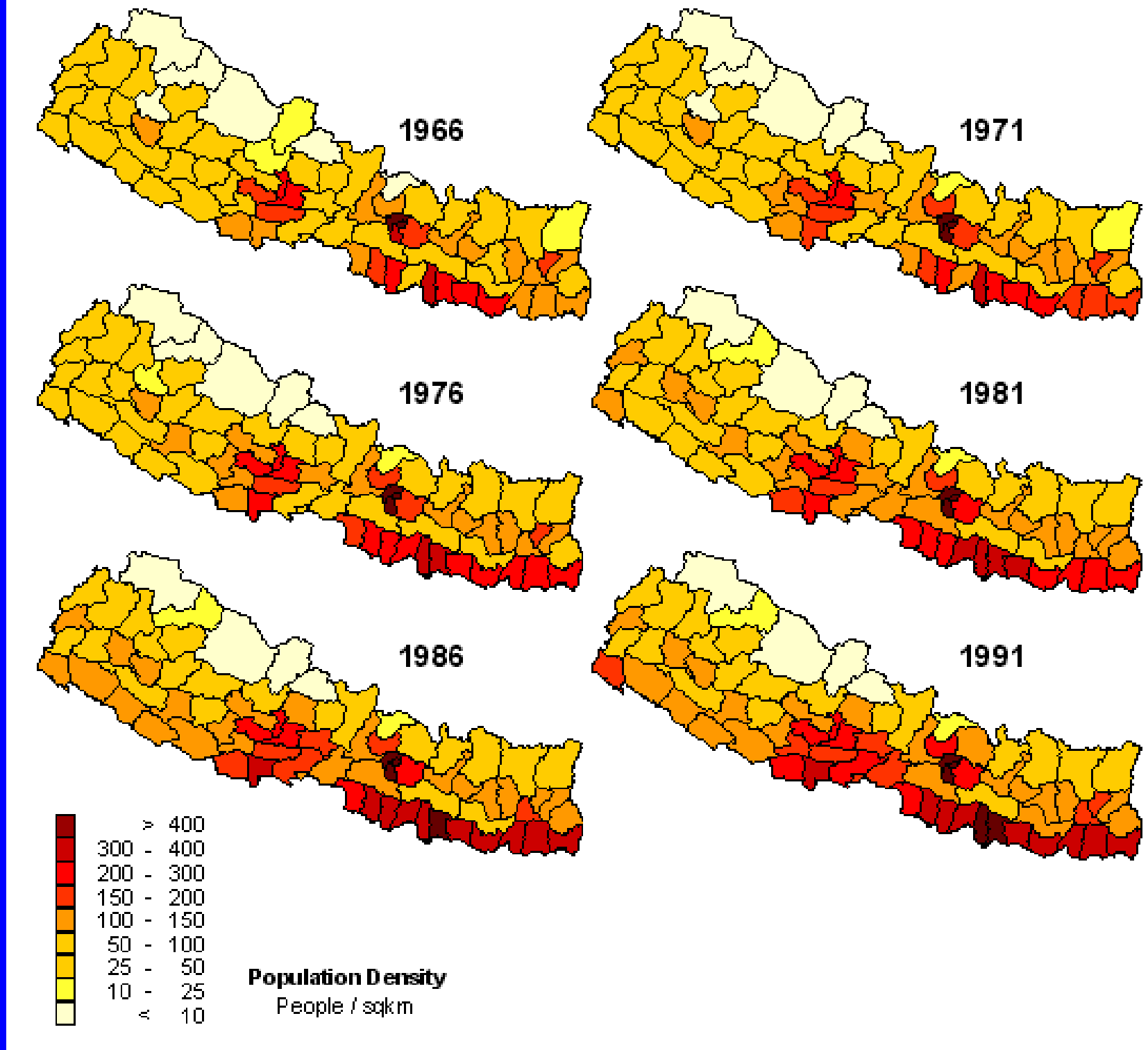
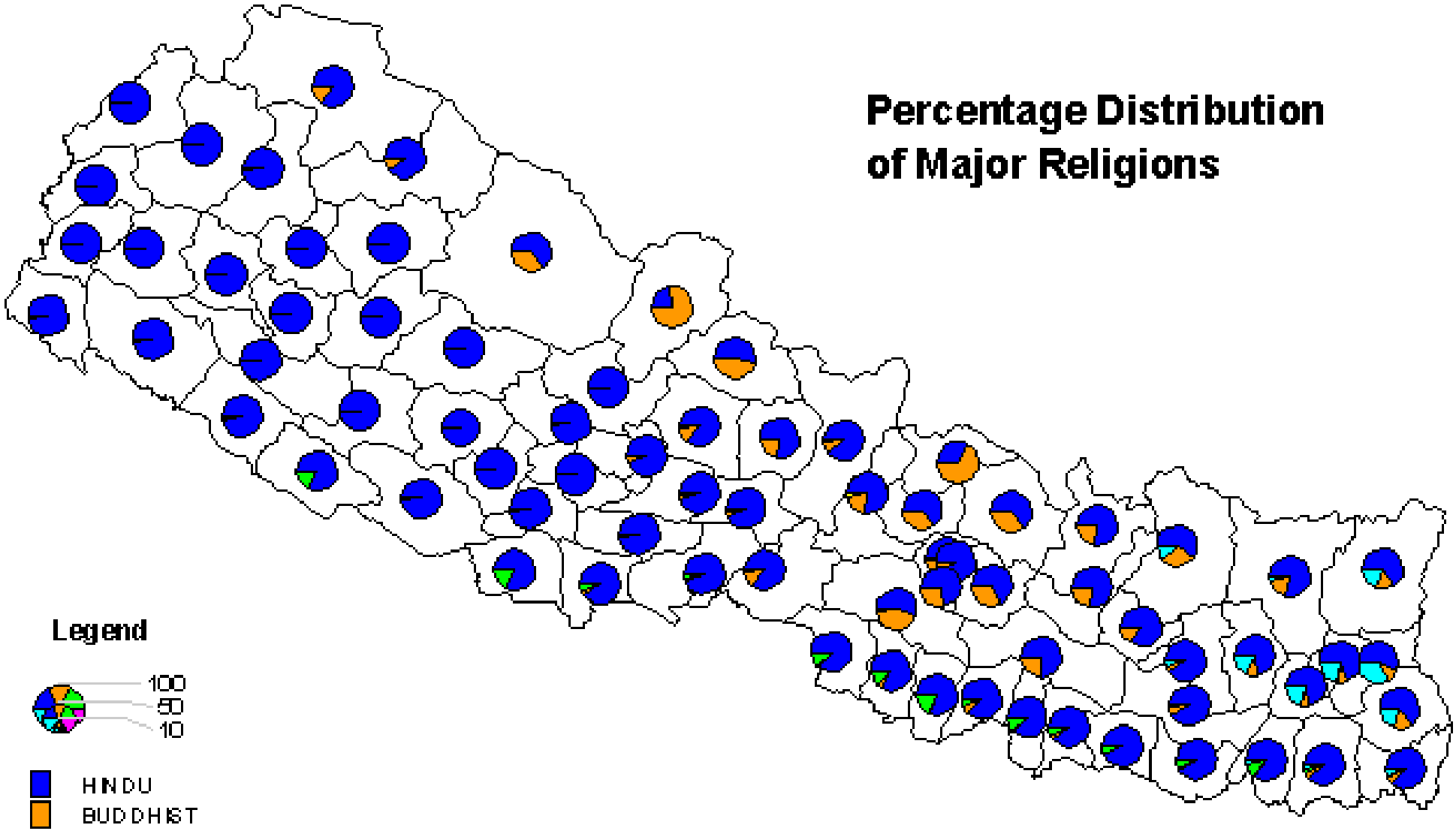
Example applications

Presentation of census data and related information

Case study: Nepal

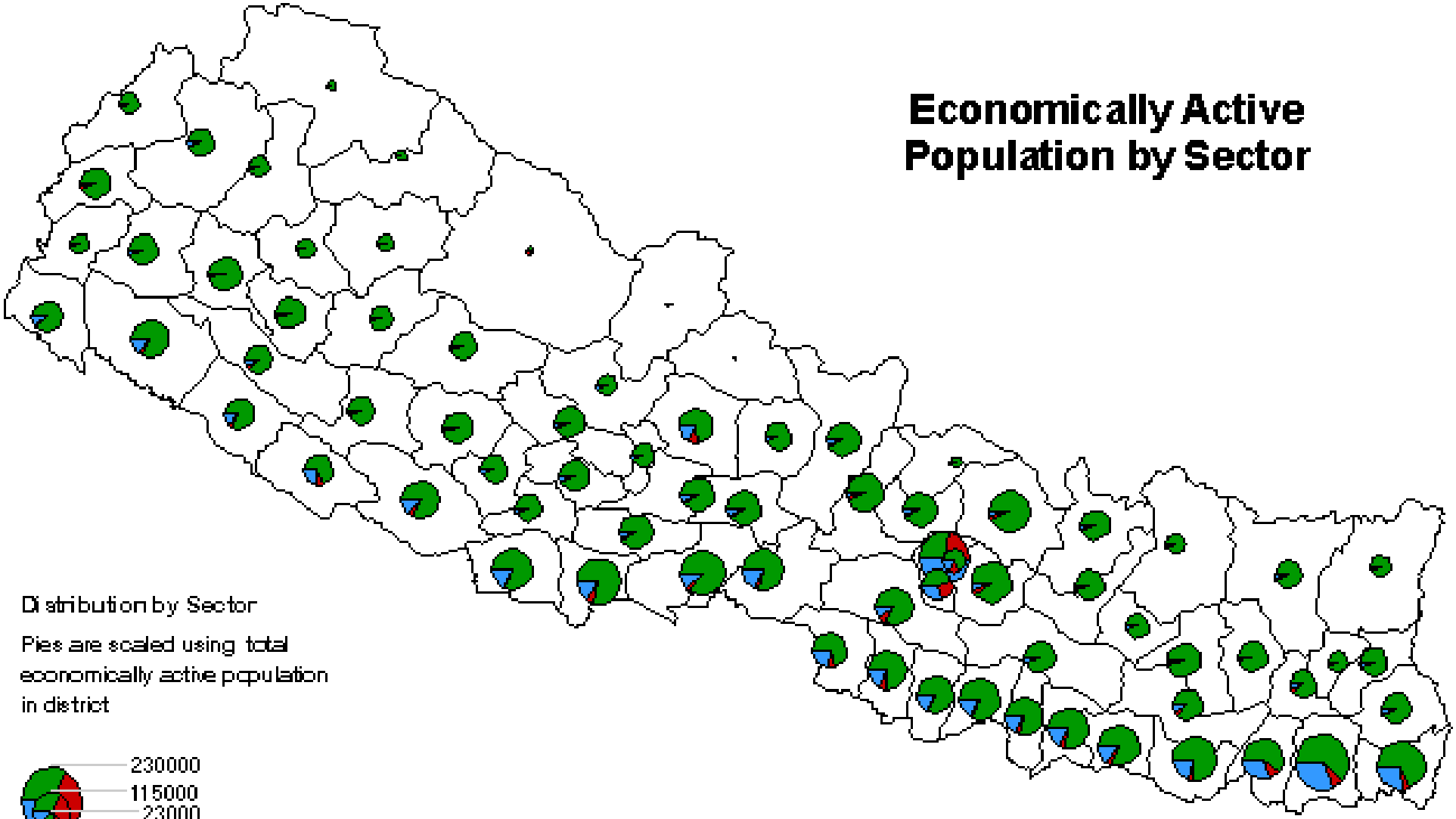

1966
1971
1976
1981
1986
1991
> 400
300 - 400
200 - 300
150 - 200
100 - 150
50 - 100
25 - 50
10 - 25
< 10
Population Density
People / sqkm

Percentage Distribution of Major Religions



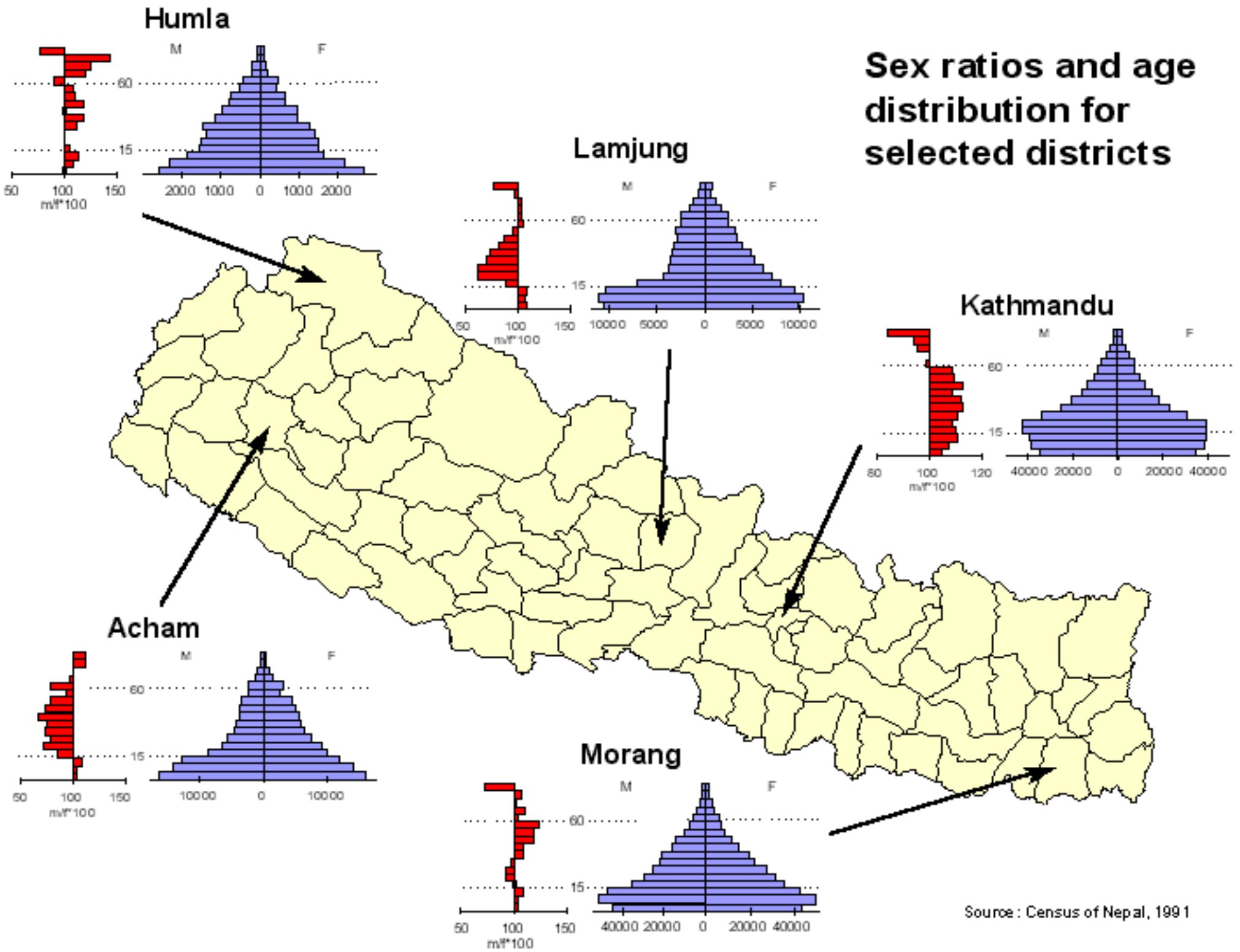
Source: Statistical Yearbook of Nepal, 1993

Economically Active Population by Sector

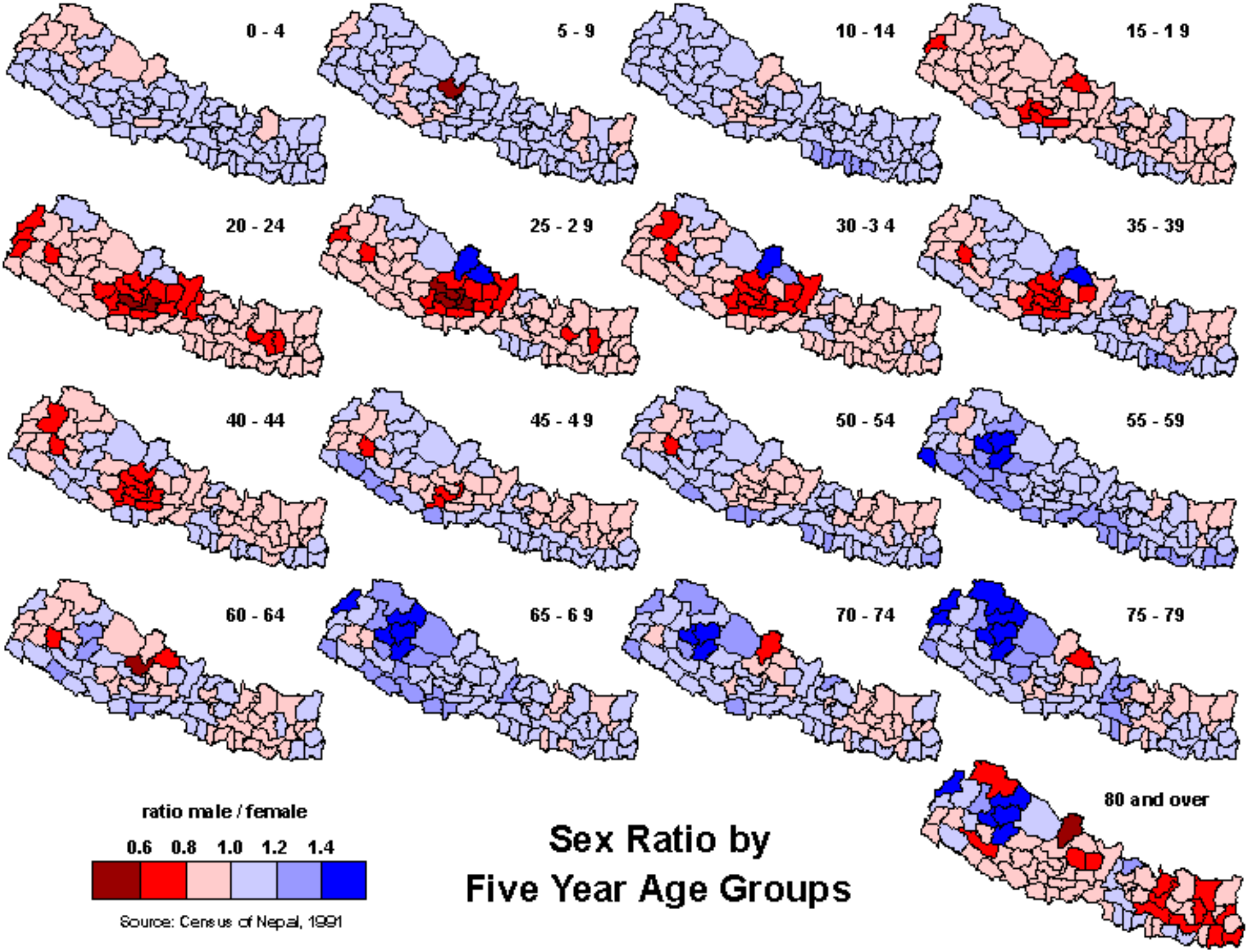


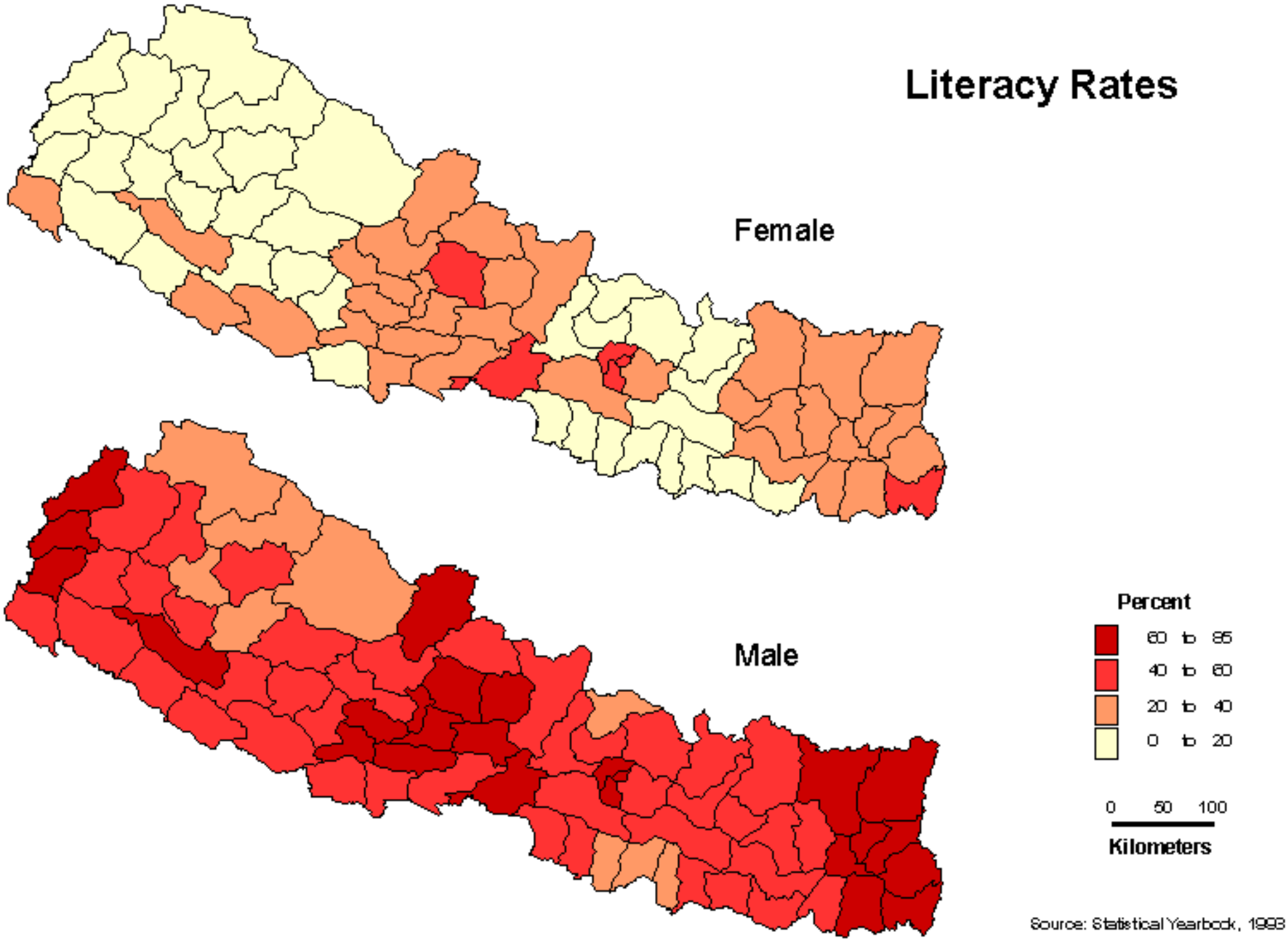
Source: Statistical Yearbook of Nepal, 1993

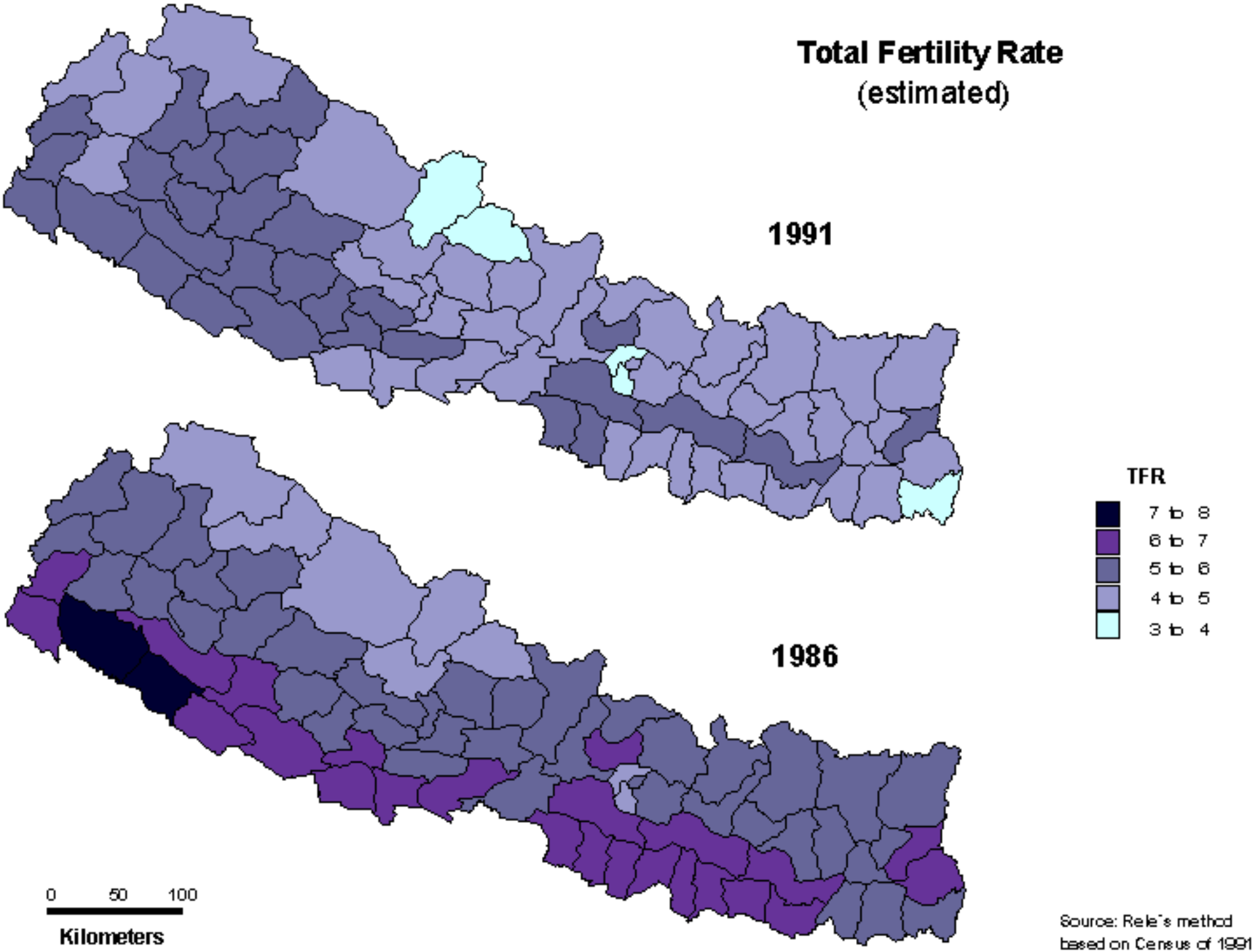
Sex ratios and age distribution for selected districts



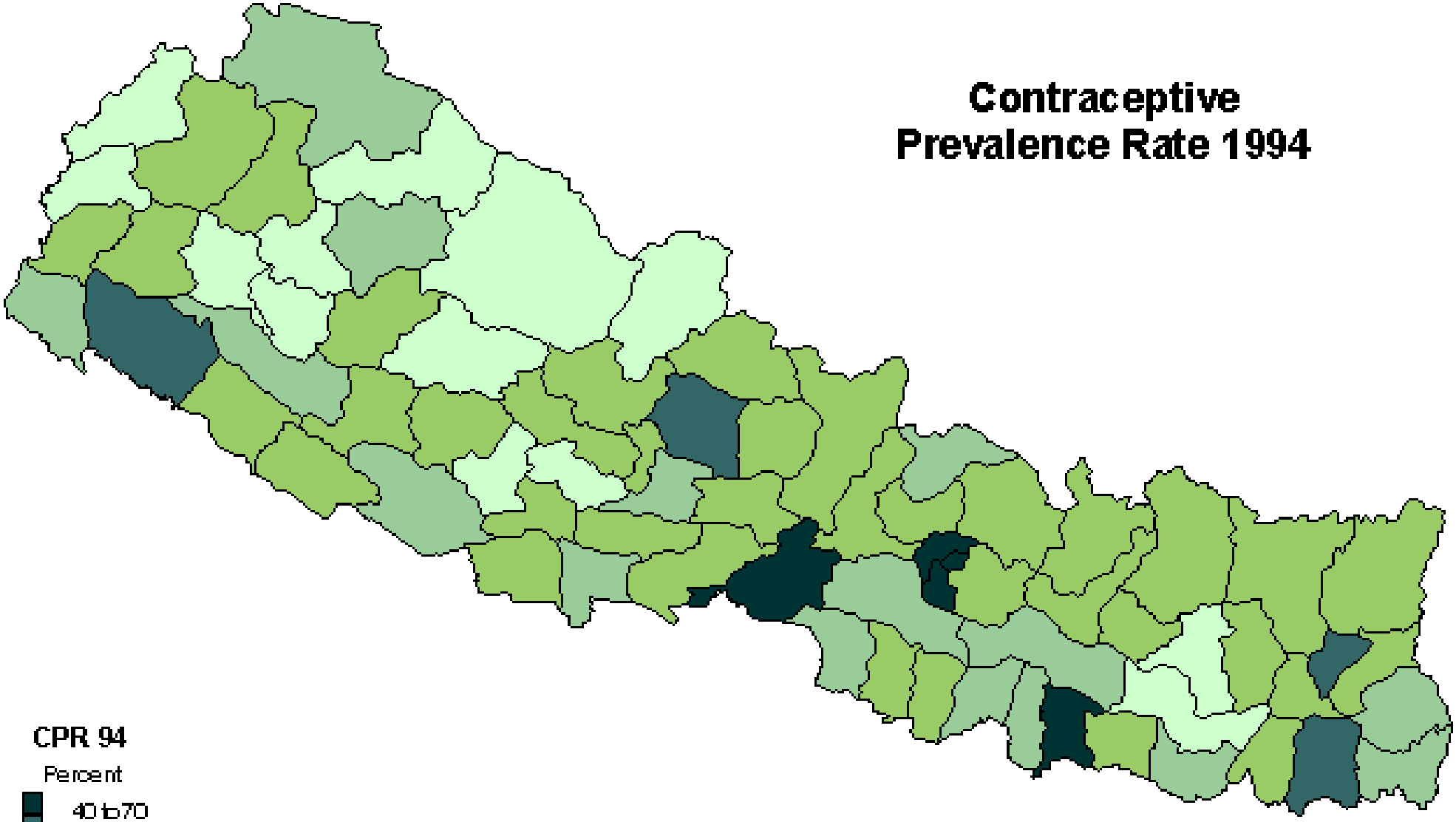
Source : Census of Nepal, 1991


0 - 4
5 - 9
10 - 14
15 - 19
20 - 24
25 - 29
30 - 34
35 - 39
40 - 44
45 - 49
50 - 54
55 - 59
60 - 64
65 - 69
70 - 74
75 - 79
80 and over
ratio male / female
0.6 0.8 1.0 1.2 1.4
Source: Census of Nepal, 1991
Sex Ratio by
Five Year Age Groups


Literacy Rates
Female
Male
Percent
60 to 85
40 to 60
20 to 40
0 to 20
0 50 100
Kilometers
Source: Statistical Yearbook, 1993

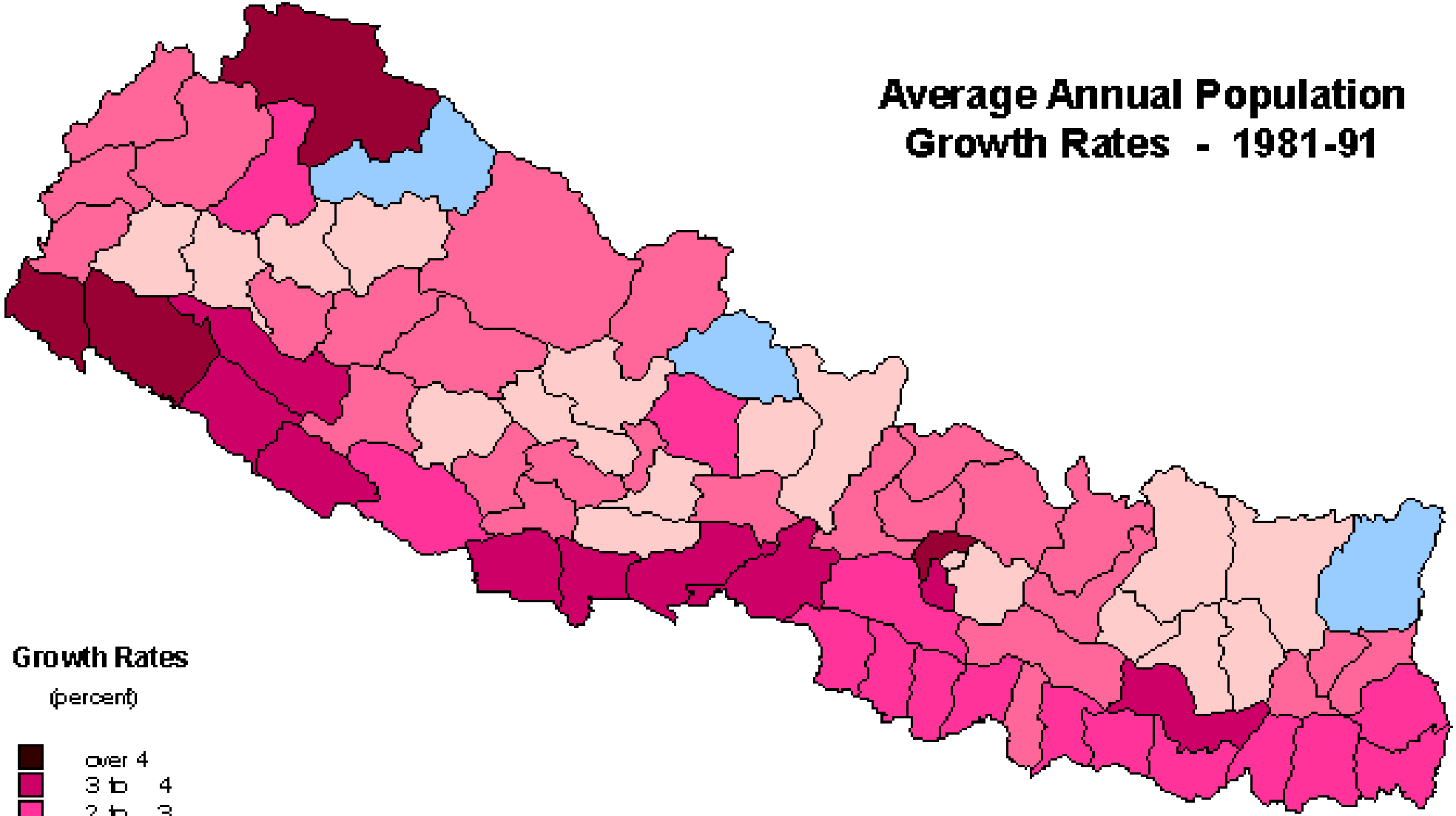

Total Fertility Rate
(estimated)
1991
1986
TFR
7 to 8
6 to 7
5 to 6
4 to 5
3 to 4
0
50
100
Kilometers
Source: Rele's method
based on Census of 1991

Contraceptive Prevalence Rate 1994

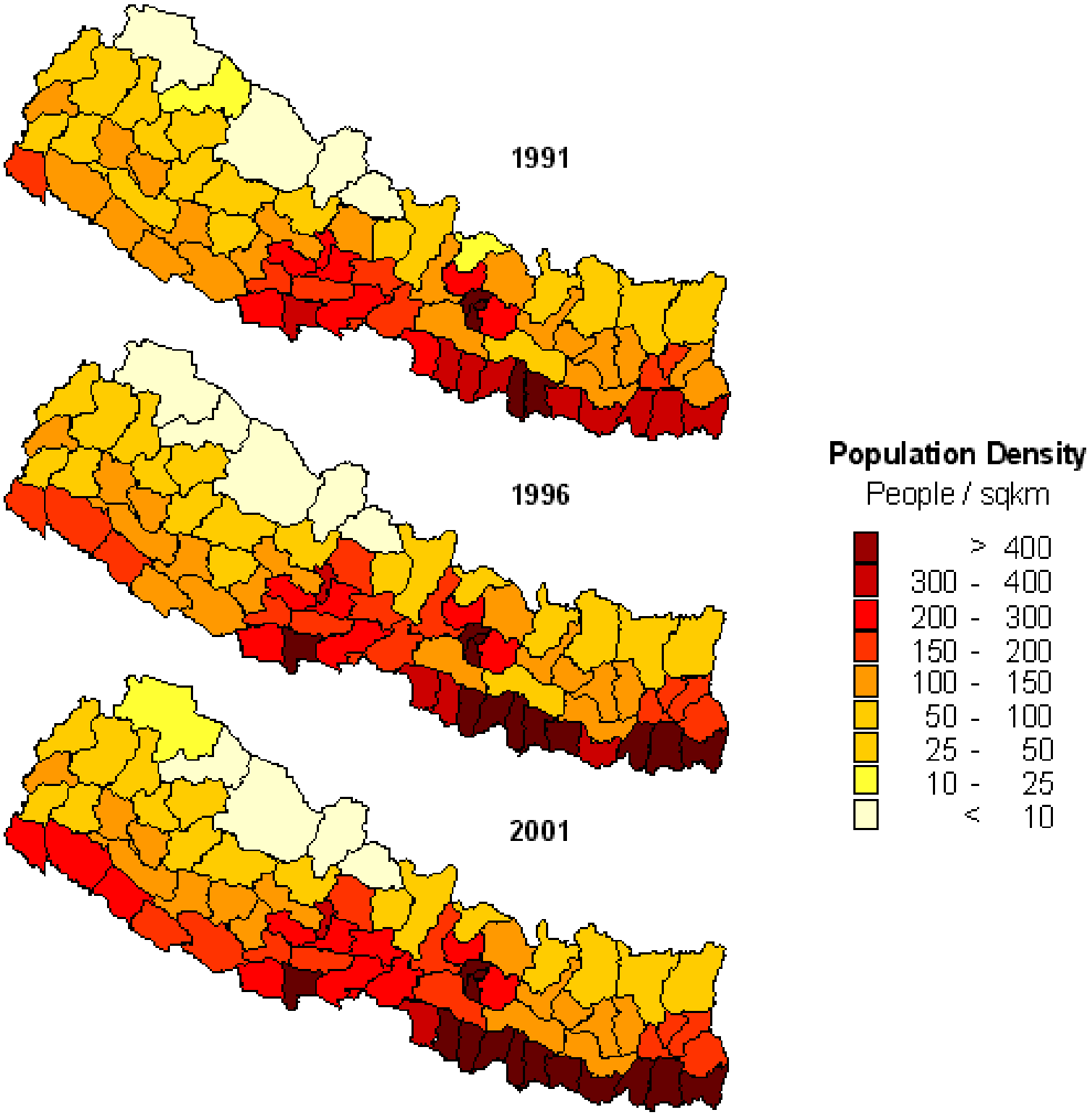


Source: Department of Health Services, HMG Nepal, 1994

Average Annual Population Growth Rates - 1981-91

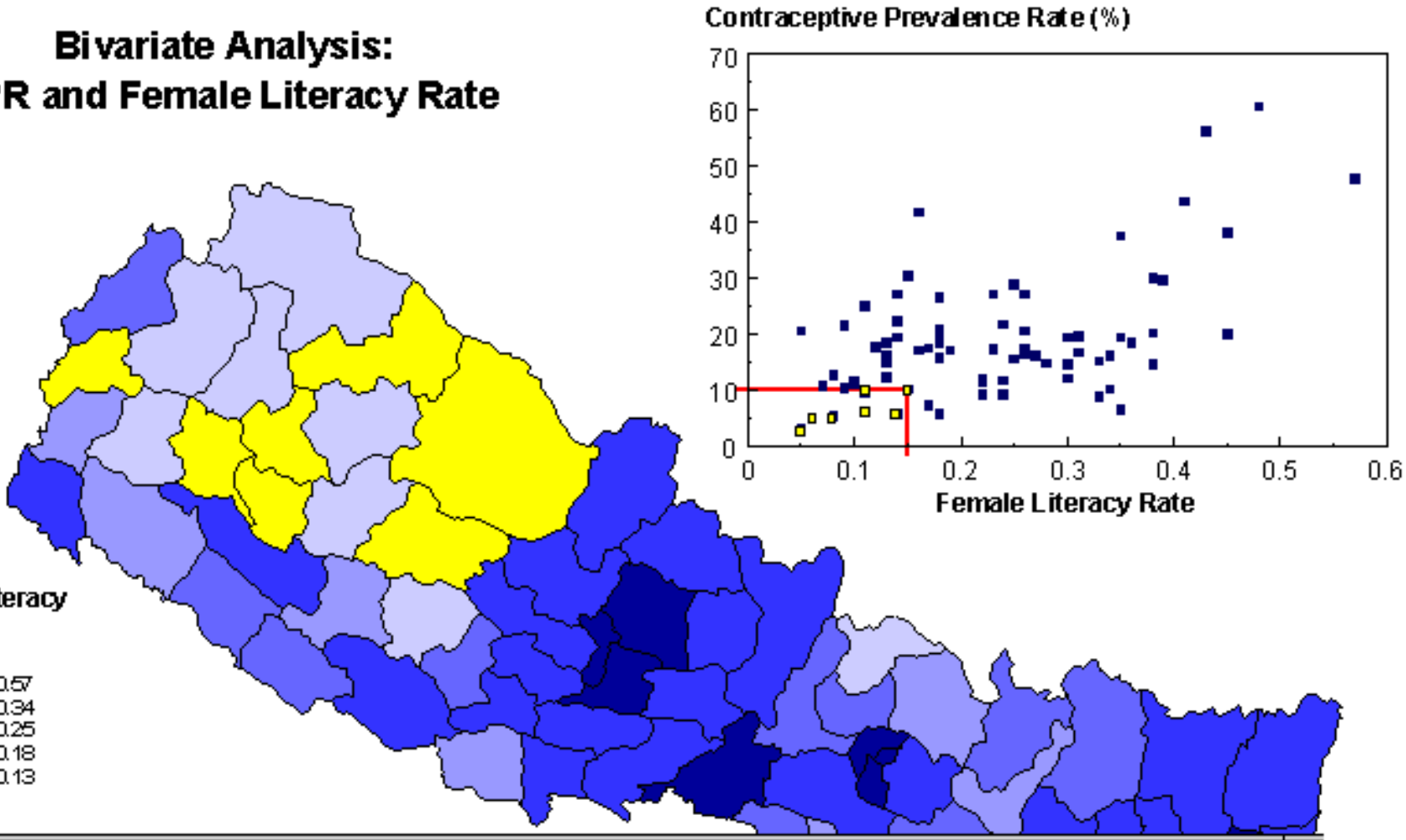


Source: Statistical Yearbook of Nepal, 1993


1991
1996
2001
Population Density
People / sqkm
> 400
300 - 400
200 - 300
150 - 200
100 - 150
50 - 100
25 - 50
10 - 25
< 10

Supporting the analysis of census and related information

Bivariate Analysis:
CPR and Female Literacy Rate



Female literacy rate

All
Selected

(femlitr < 0.15) and (cpr94 < 10)

	devreg	zone	dist	sqkm	pop71	pop81
10	MIDWEST	Karnali	Kalikot	1741	10017.00	87638.00
11	FAR WEST	Seti	Doti	2025	166070.00	153135.00
12	FAR WEST	Seti	Achham	1680	132212.00	185212.00
13	MIDWEST	Bheri	Dailekh	1502	156072.00	166527.00
14	MIDWEST	Bheri	Jajarkot	2230	86564.00	99312.00
15	MIDWEST	Rapti	Rukum	2877	96243.00	132432.00
16	MIDWEST	Rapti	Salyan	1462	141457.00	152063.00

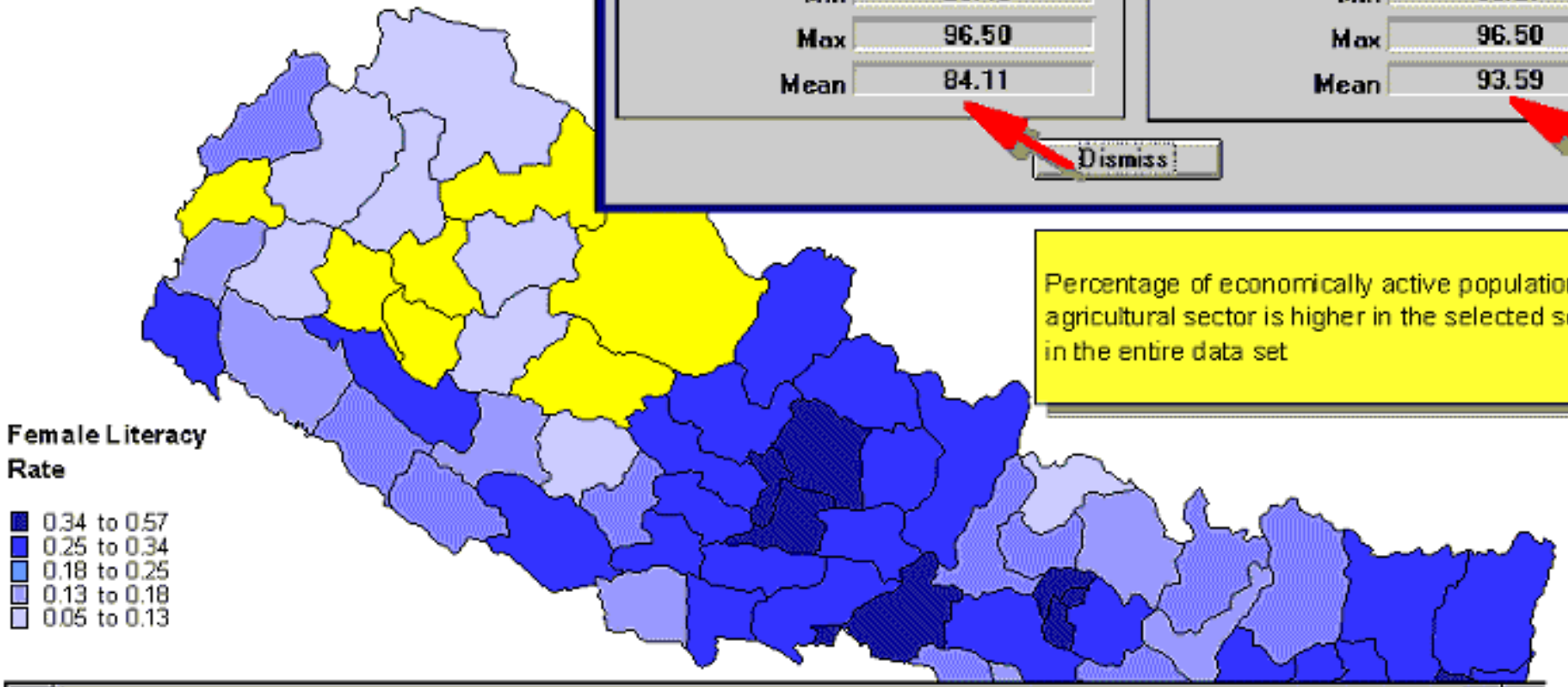
Multivariate Analysis: Rural versus Urban

Item	aglab	Kind	Floating Point

Records		Selected Records	
Count	75	Count	7
Sum	6308.23	Sum	655.15
Min	25.46	Min	90.27
Max	96.50	Max	96.50
Mean	84.11	Mean	93.59

Dismiss

Percentage of economically active population in the agricultural sector is higher in the selected set than in the entire data set



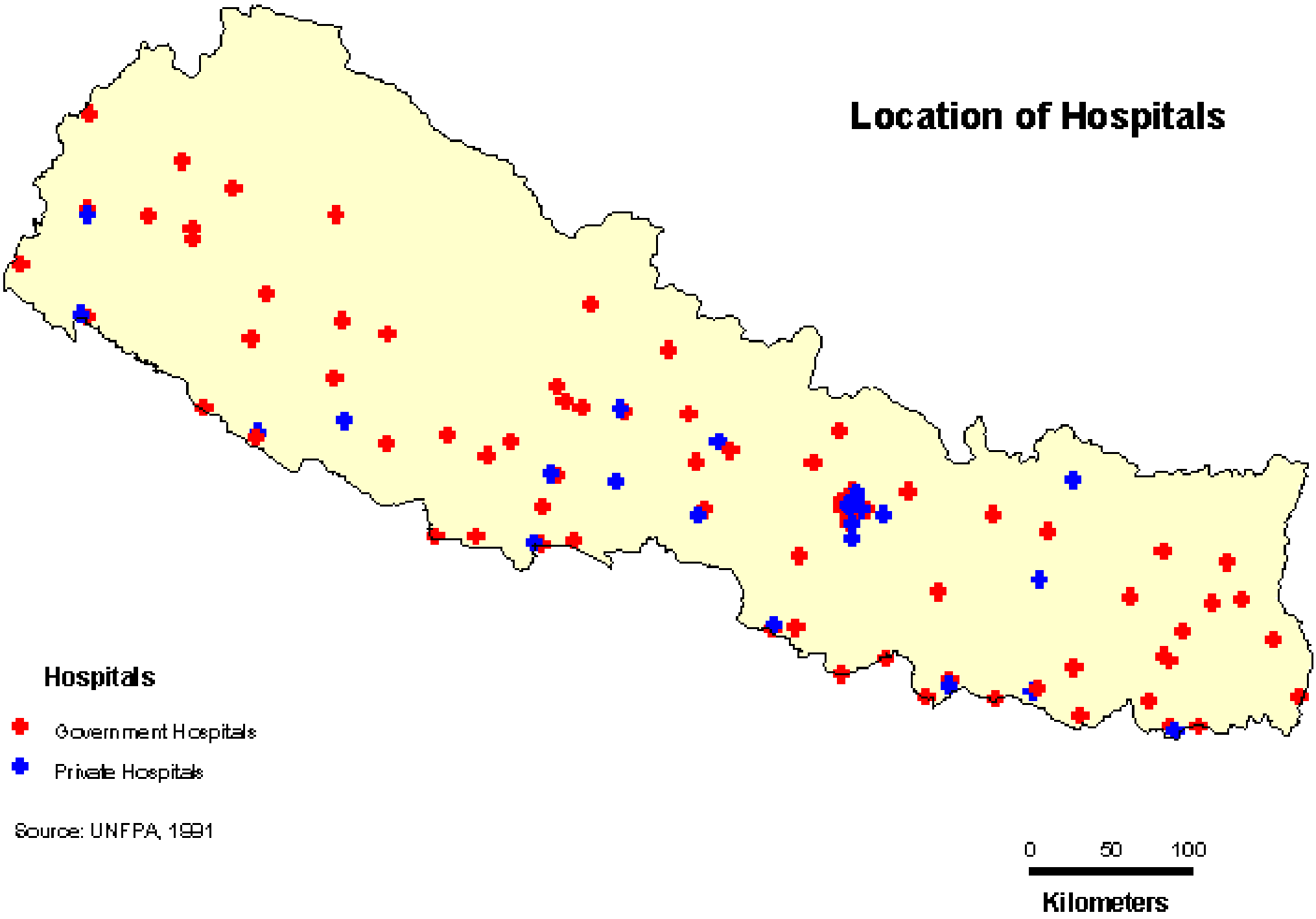
Female literacy rate

All
Selected

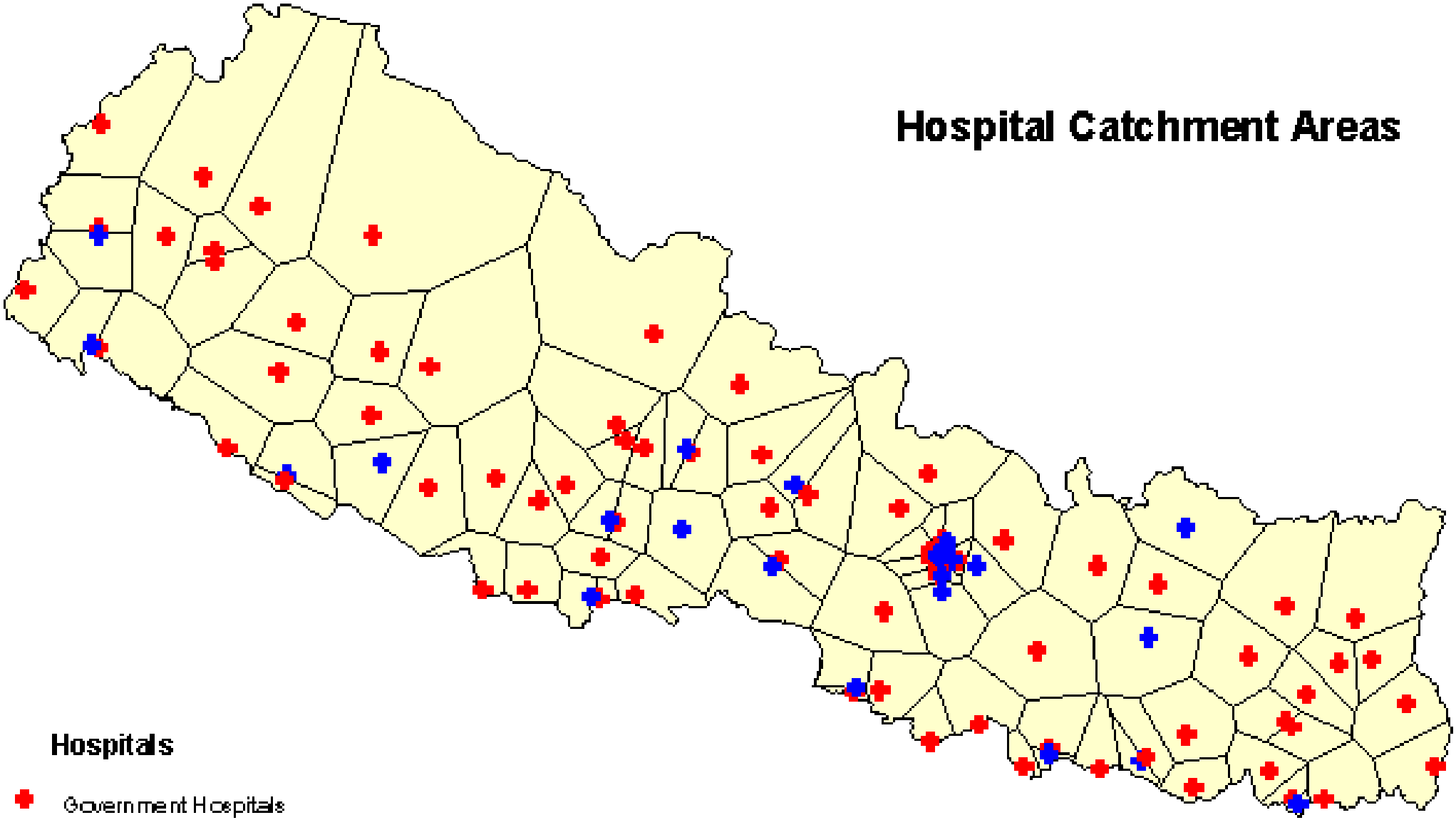
(femlitr < 0.15) and (cpi94 < 10)

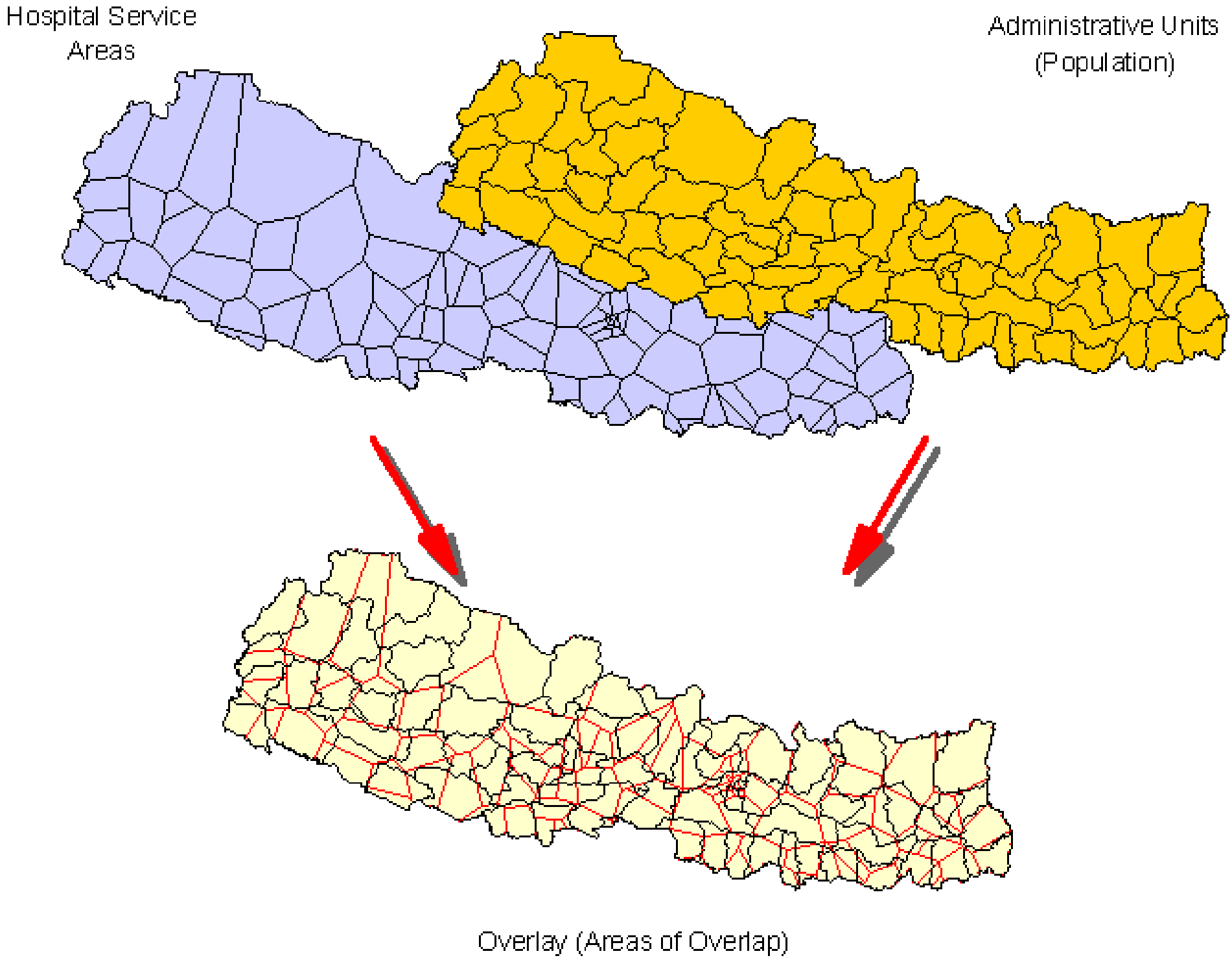
	nfish	product	othlab	aglab	indlab	servlab	hindu	bu
10	47908.00	978.00	158	95.01	1.94	2.55	99.09	
11	79221.00	1774.00	2444	89.64	2.01	5.05	99.67	
12	107456.00	576.00	451	96.50	0.52	2.34	99.84	
13	85680.00	1126.00	1133	93.87	1.23	3.42	99.76	
14	56669.00	1004.00	297	95.16	1.69	2.58	99.85	
15	71639.00	1591.00	431	93.69	2.08	3.55	99.70	
16	66207.00	2034.00	391	91.92	2.82	4.36	99.71	

Modeling of spatial data

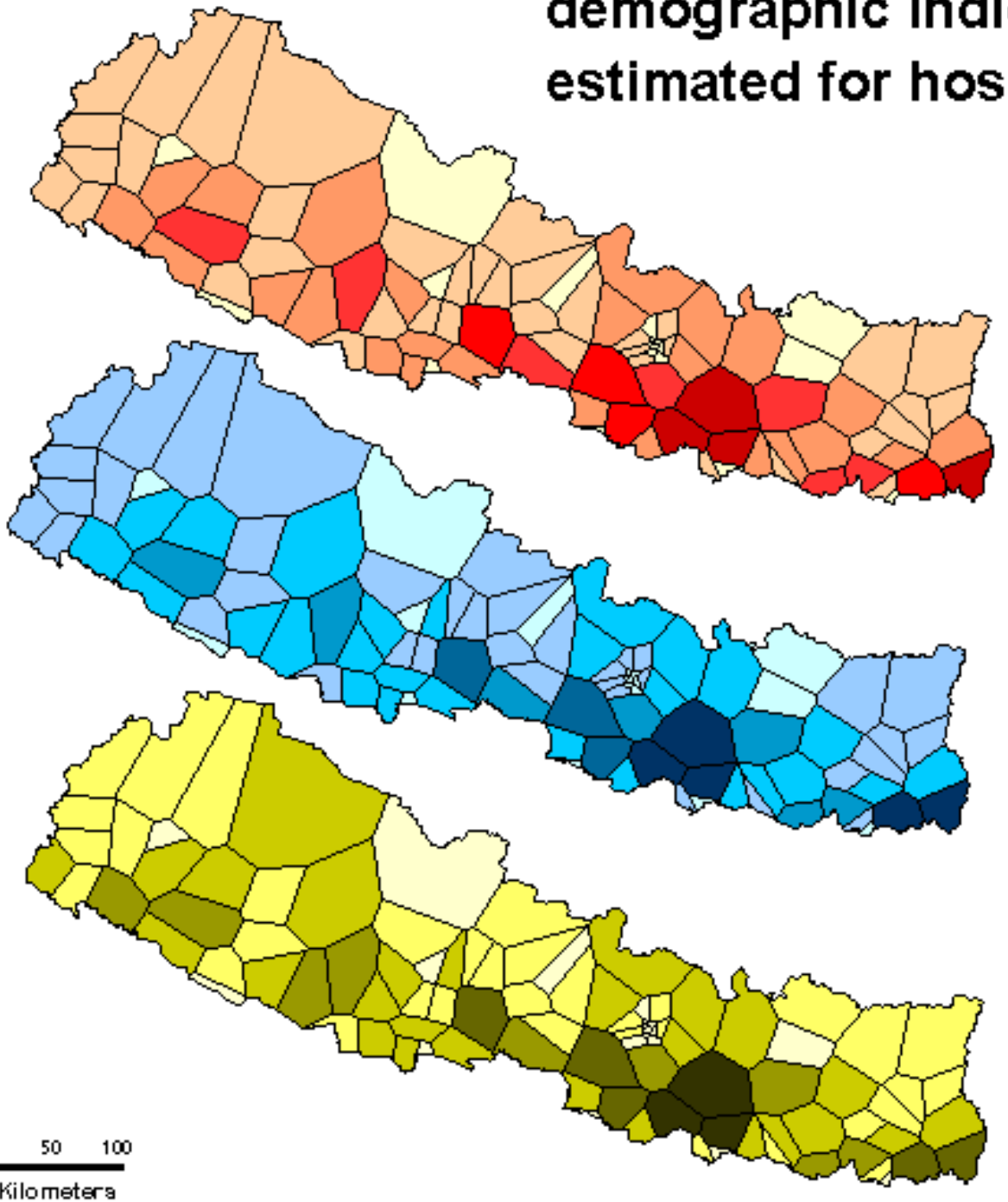

Location of Hospitals
Hospitals
Government Hospitals
Private Hospitals
Source: UNFPA, 1991
0
50
100
Kilometers

Hospital Catchment Areas




Hospital Service Areas
Administrative Units (Population)
Overlay (Areas of Overlap)

Using the areas of overlap as weights, demographic indicators can be estimated for hospital catchment areas



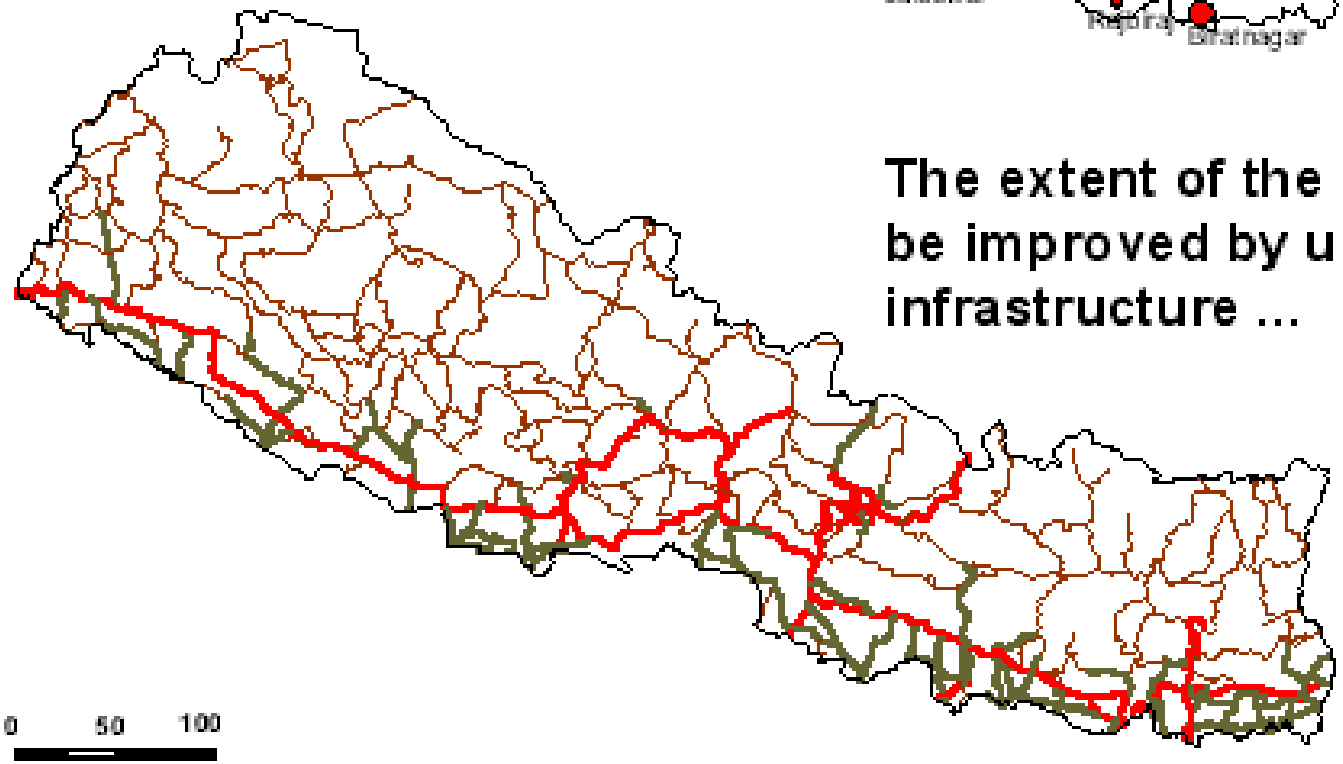
Estimates of population distribution can be improved by using information on the location of towns and cities.

City Size
(where available)

430000

215000

43000



The extent of the catchment areas can be improved by using information on infrastructure ...

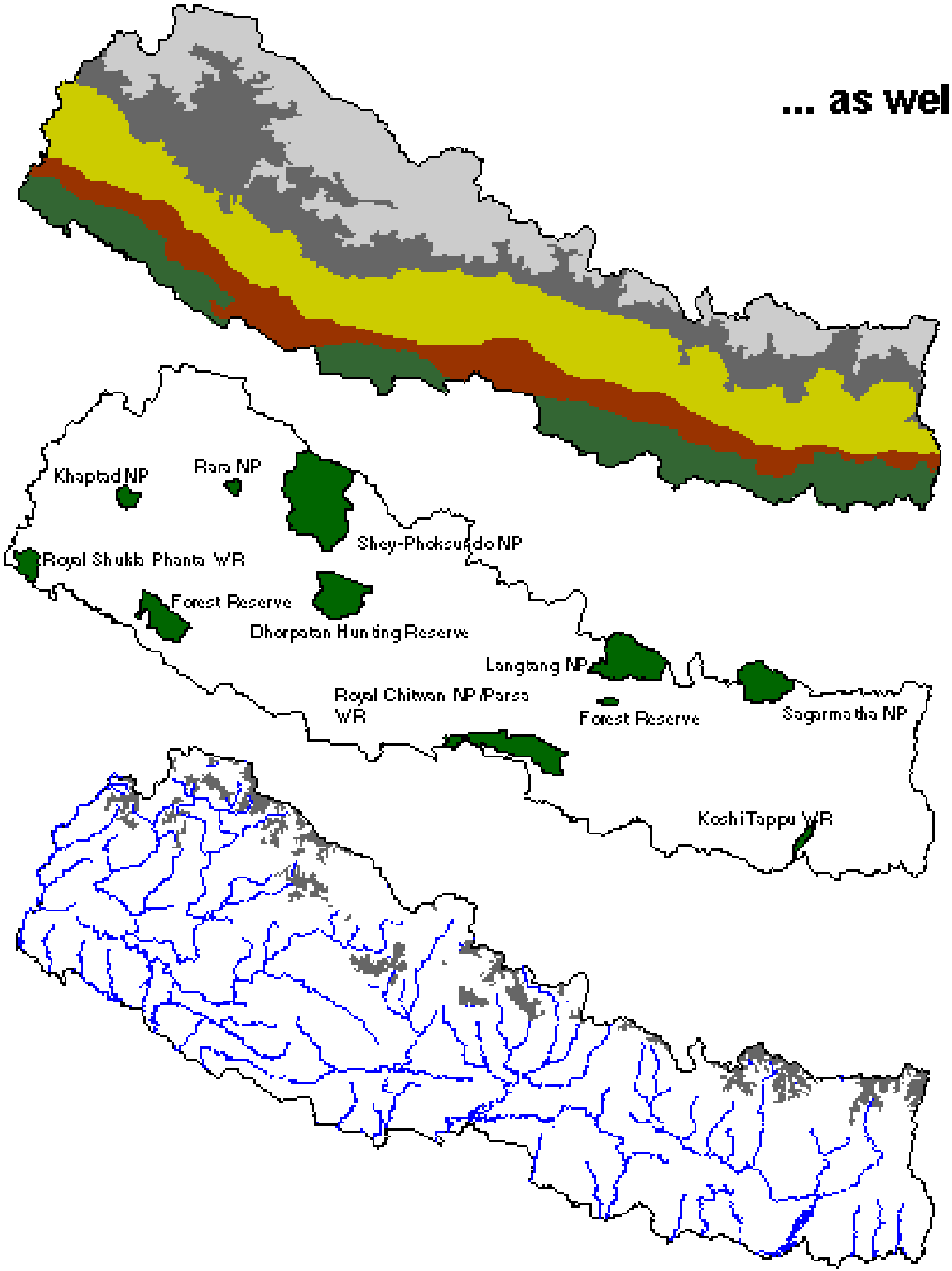
Transport Infrastructure

Trails
Dirt Roads
Paved Roads

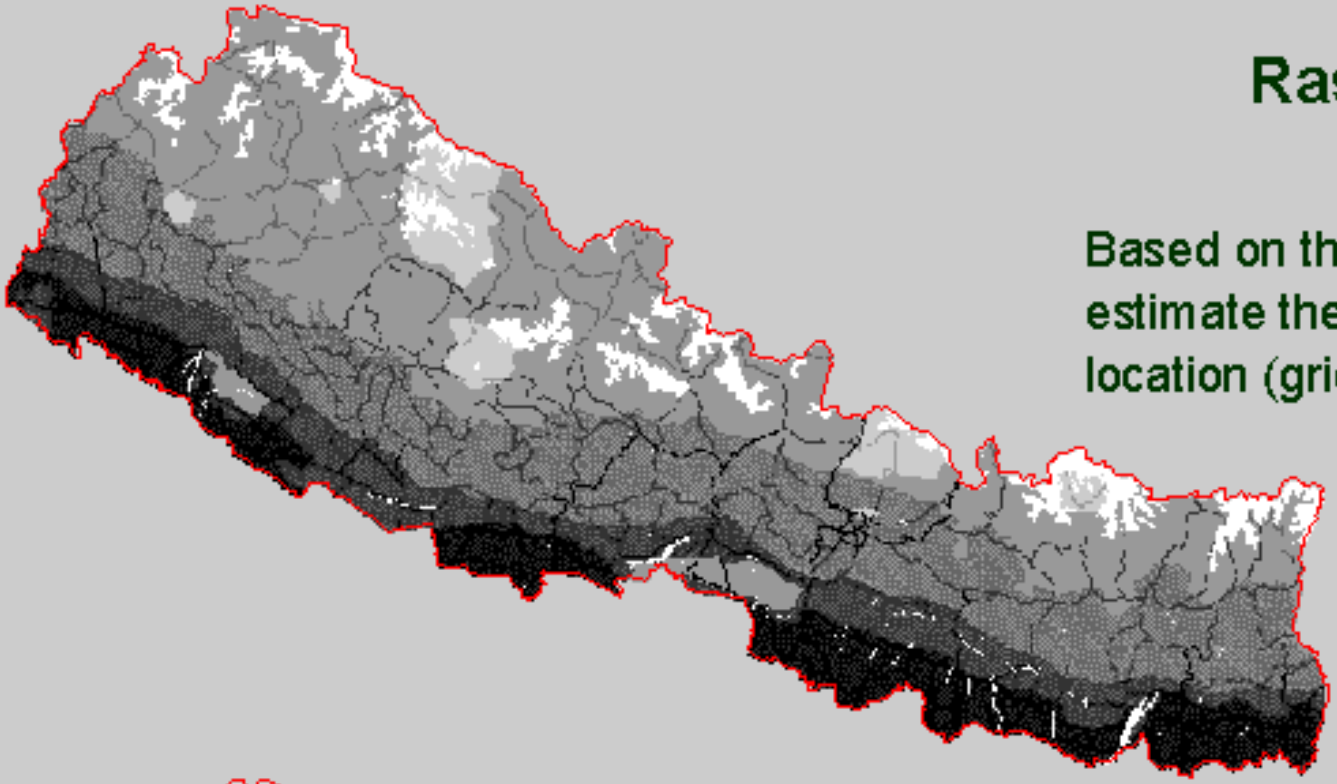
0 50 100

Kilometers

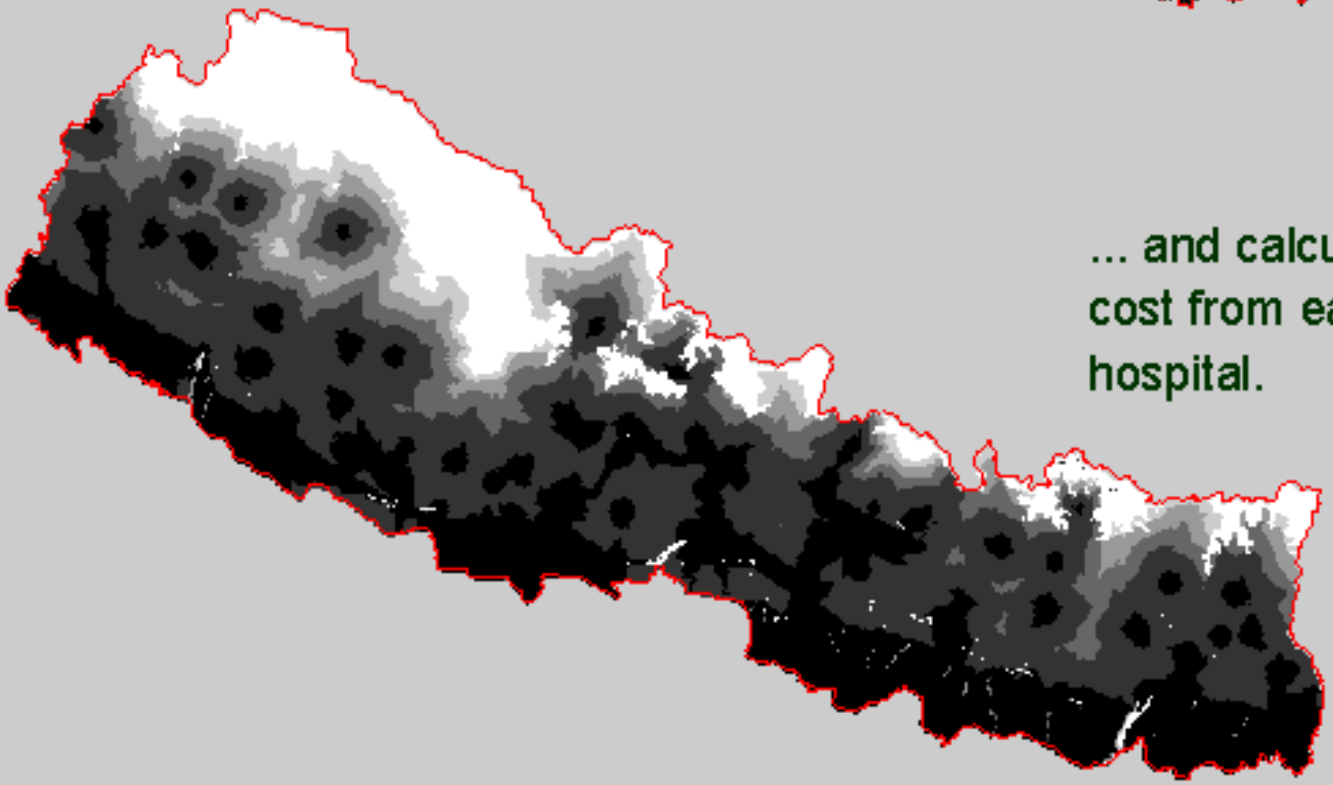
... as well as physiographic features



Raster Modeling



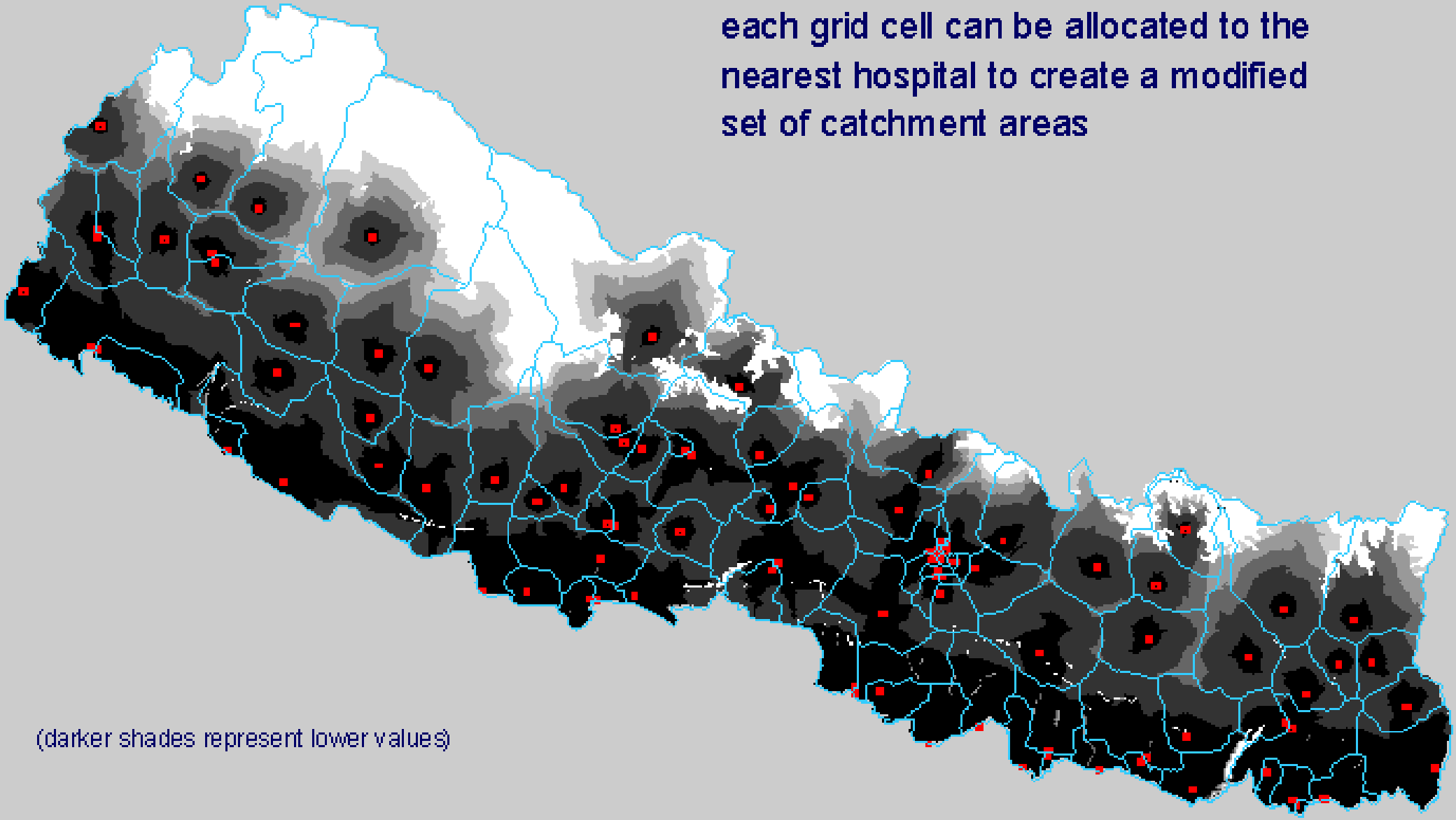
Based on the GIS layers, we can estimate the cost of traveling at each location (grid cell) ...



... and calculate the total travel cost from each location to the nearest hospital.

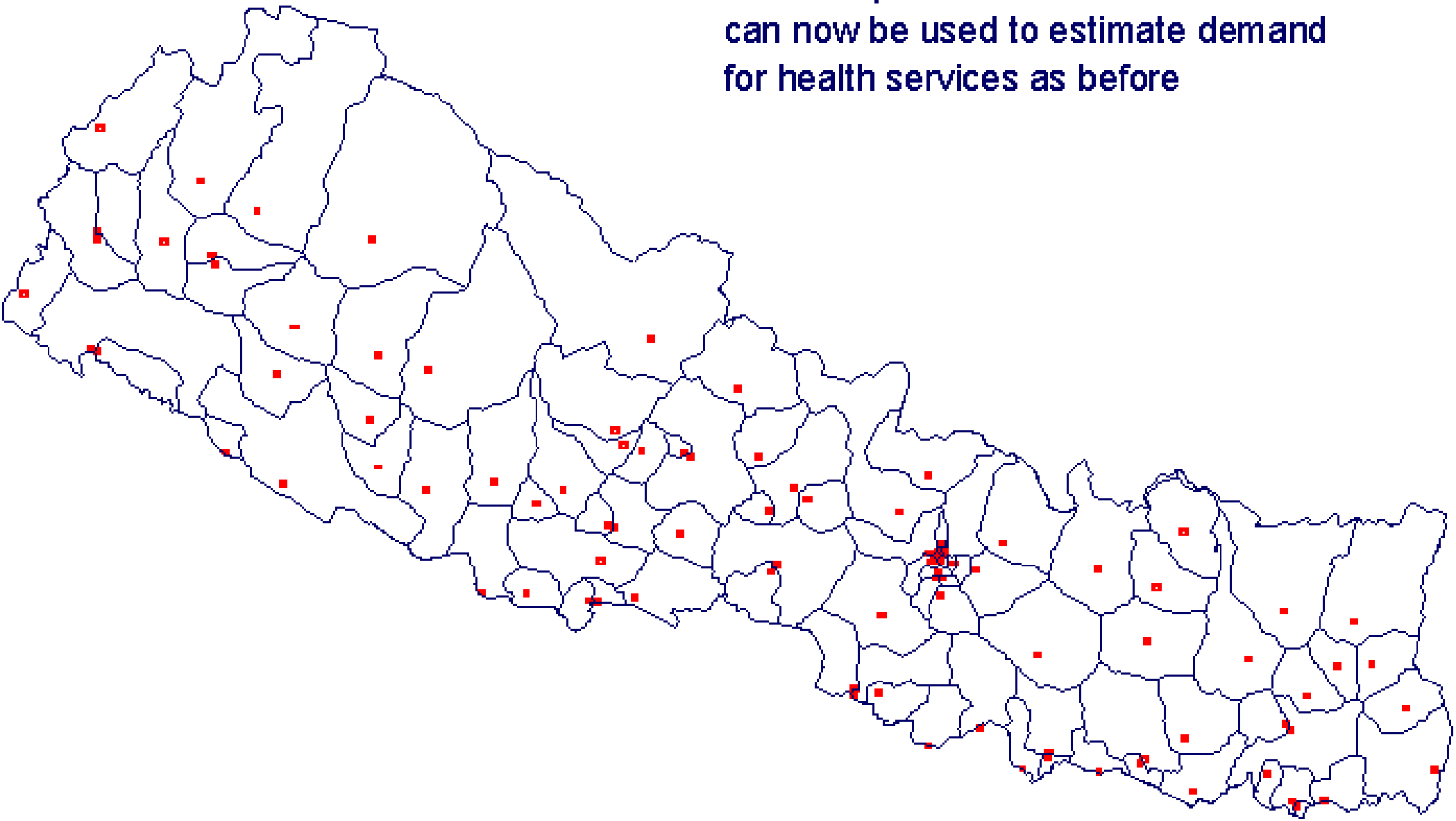
(darker shades represent lower values)

Based on the resulting cost surface, each grid cell can be allocated to the nearest hospital to create a modified set of catchment areas

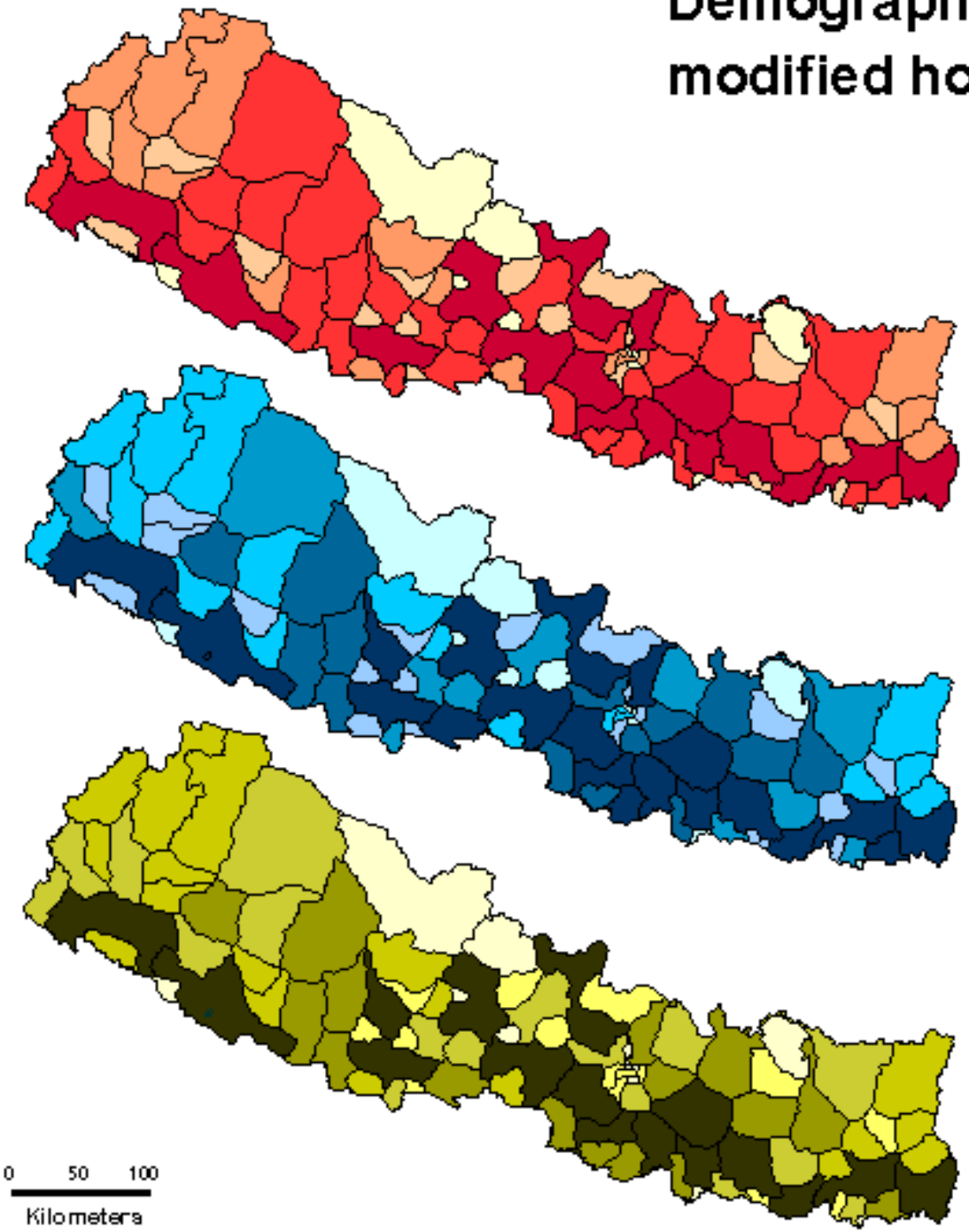


(darker shades represent lower values)

These improved catchment areas can now be used to estimate demand for health services as before



Demographic indicators for modified hospital catchment areas



Number of people per hospital 1991

- 305000 to 656000
- 210000 to 305000
- 139000 to 210000
- 111000 to 139000
- 57000 to 111000
- 0 to 57000

Number of women in reproductive age per hospital

- 62000 to 160000
- 48000 to 62000
- 34000 to 48000
- 28000 to 34000
- 14000 to 28000
- 0 to 14000

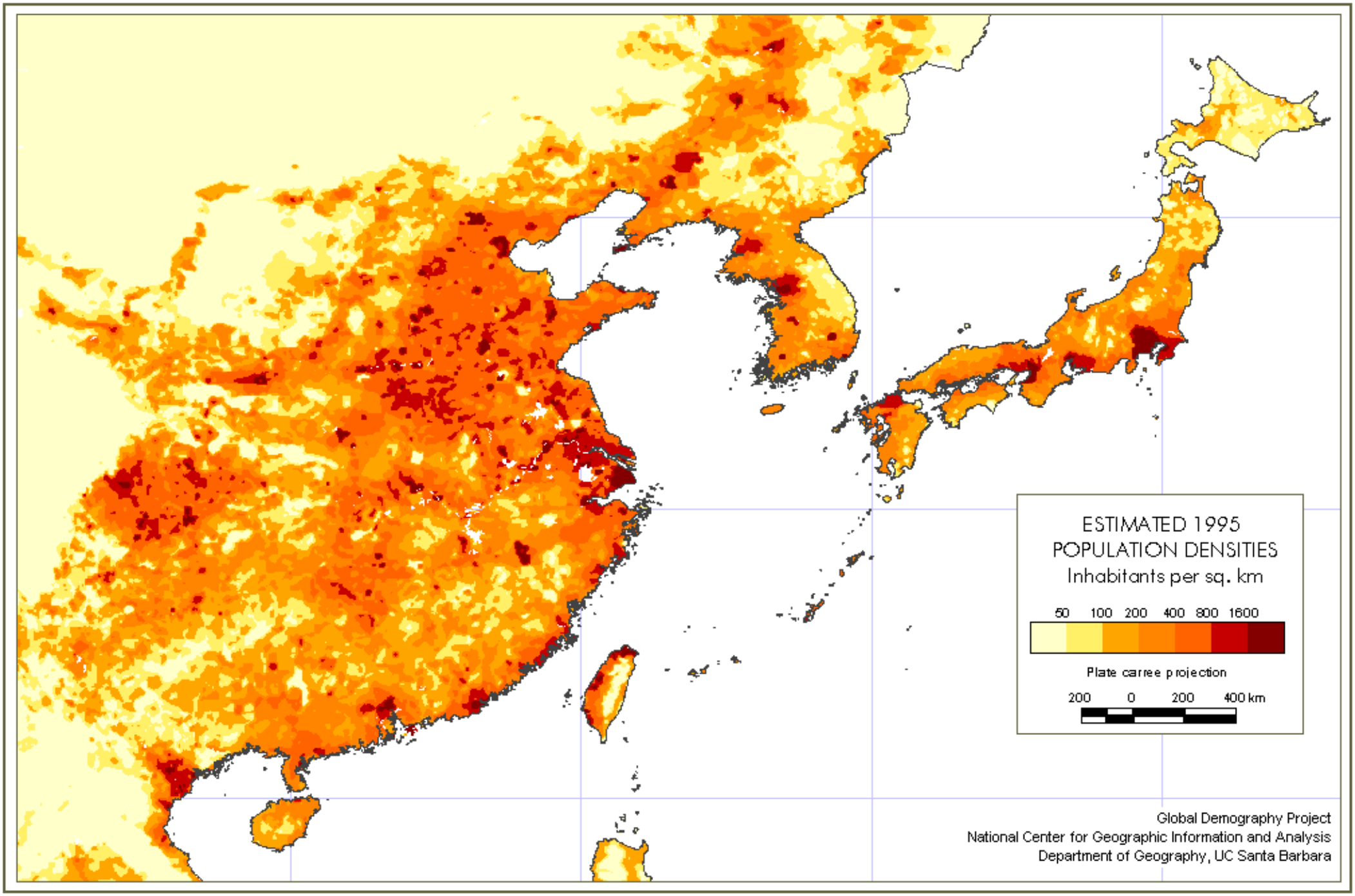
Number of children aged 0 to 4 per hospital

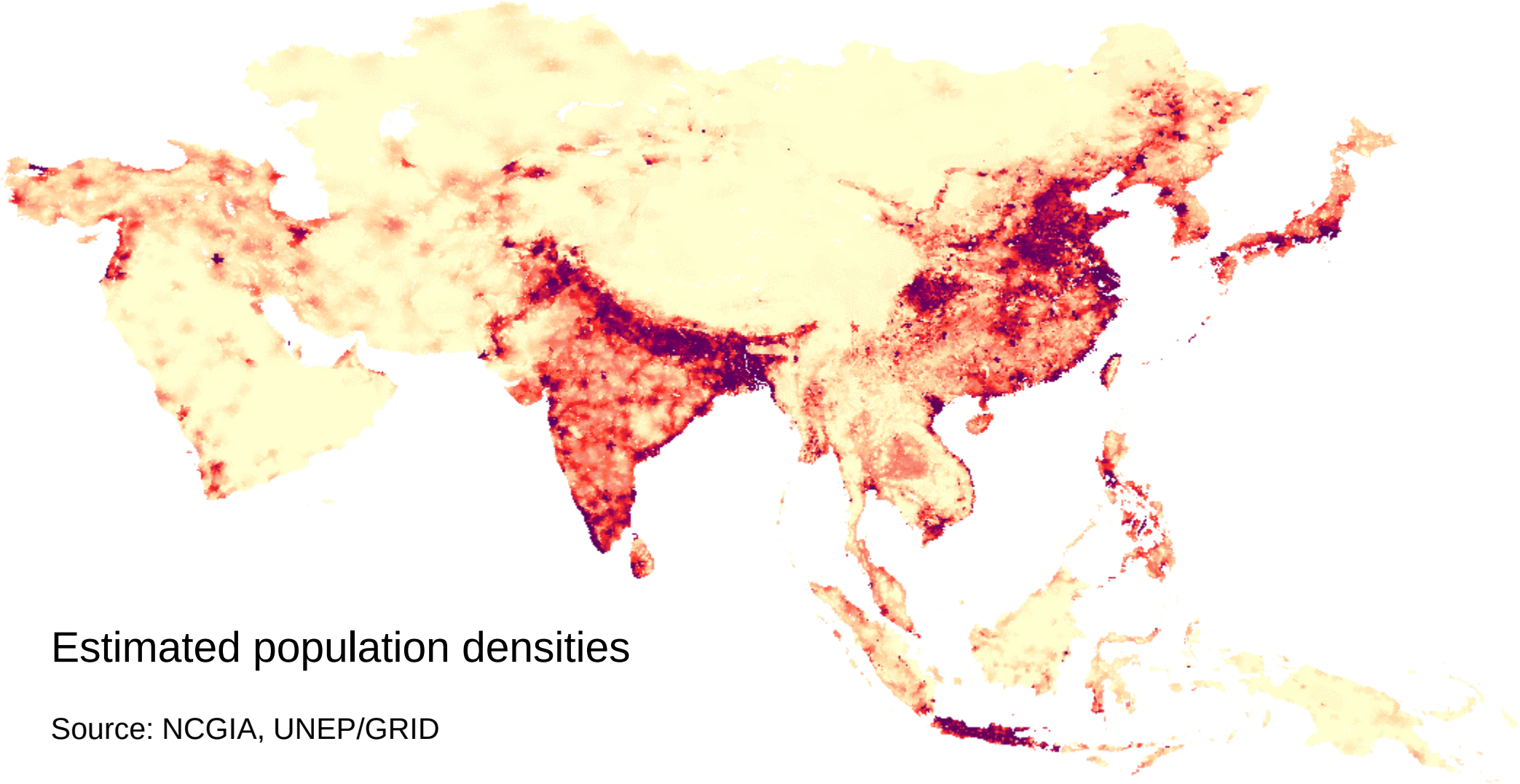
- 42700 to 92600
- 30700 to 42700
- 21200 to 30700
- 15200 to 21200
- 8200 to 15200
- 0 to 8200

0 50 100

Kilometers

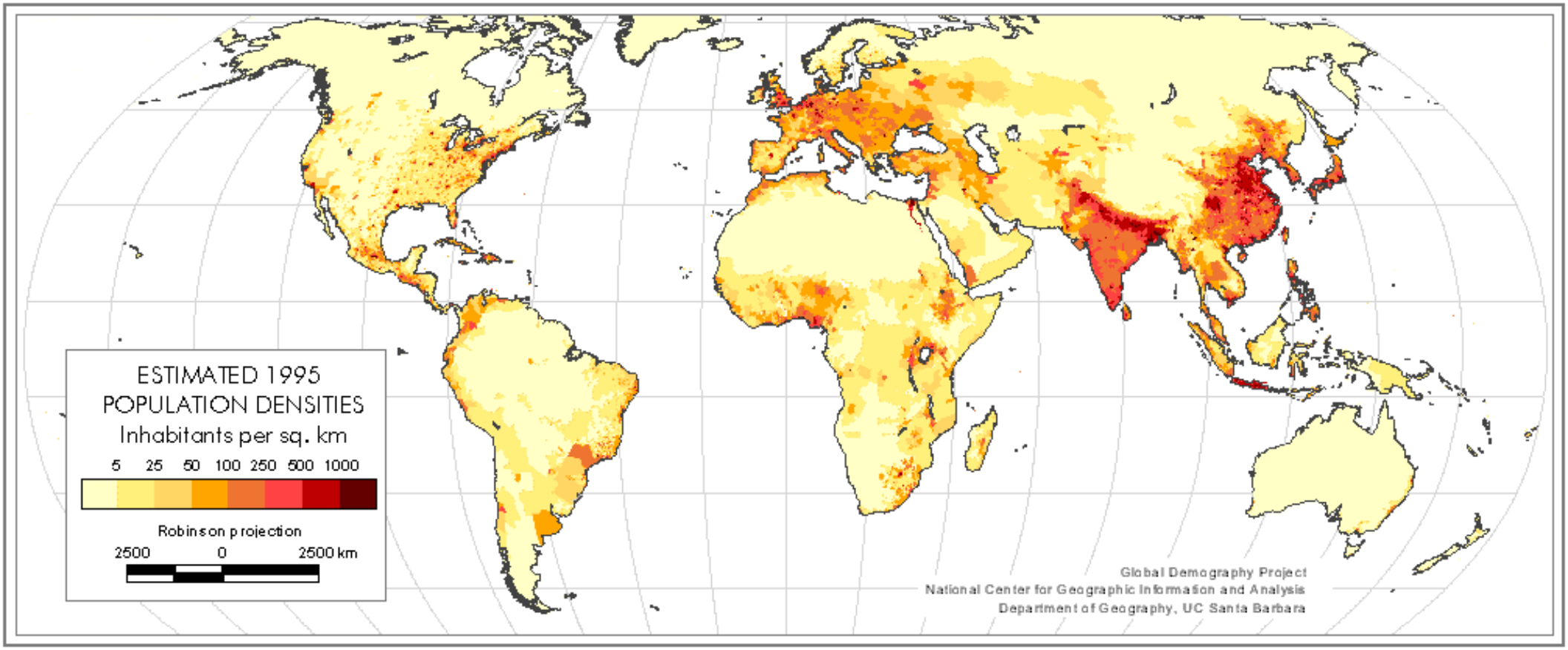
Estimating population distribution at continental and global scales


ESTIMATED 1995
POPULATION DENSITIES
Inhabitants per sq. km
50 100 200 400 800 1600
Plate carree projection
200 0 200 400 km
Global Demography Project
National Center for Geographic Information and Analysis
Department of Geography, UC Santa Barbara



Estimated population densities

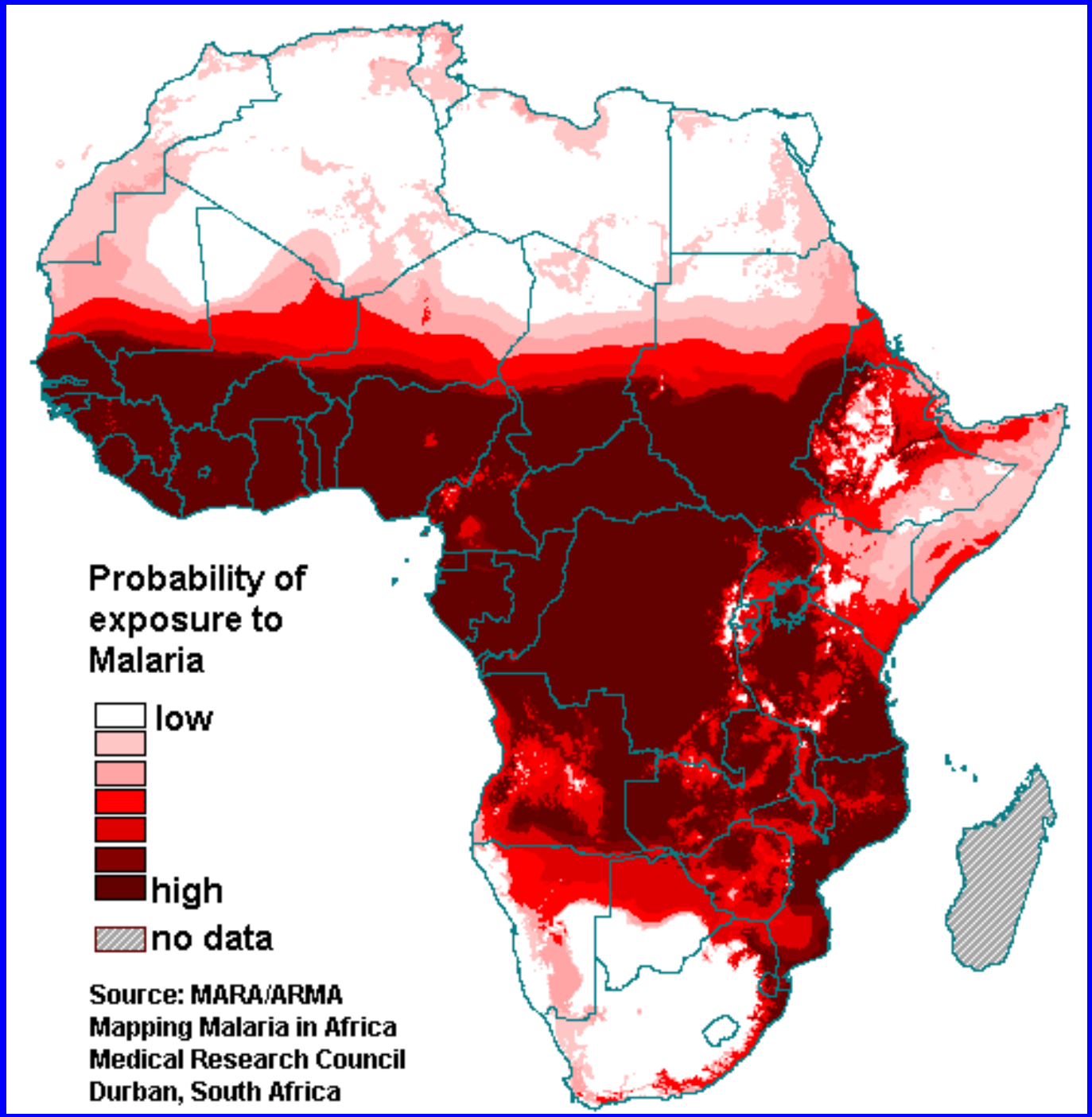
Source: NCGIA, UNEP/GRID


ESTIMATED 1995
POPULATION DENSITIES
Inhabitants per sq. km
5 25 50 100 250 500 1000
Robinson projection
2500 0 2500 km
Global Demography Project
National Center for Geographic Information and Analysis
Department of Geography, UC Santa Barbara

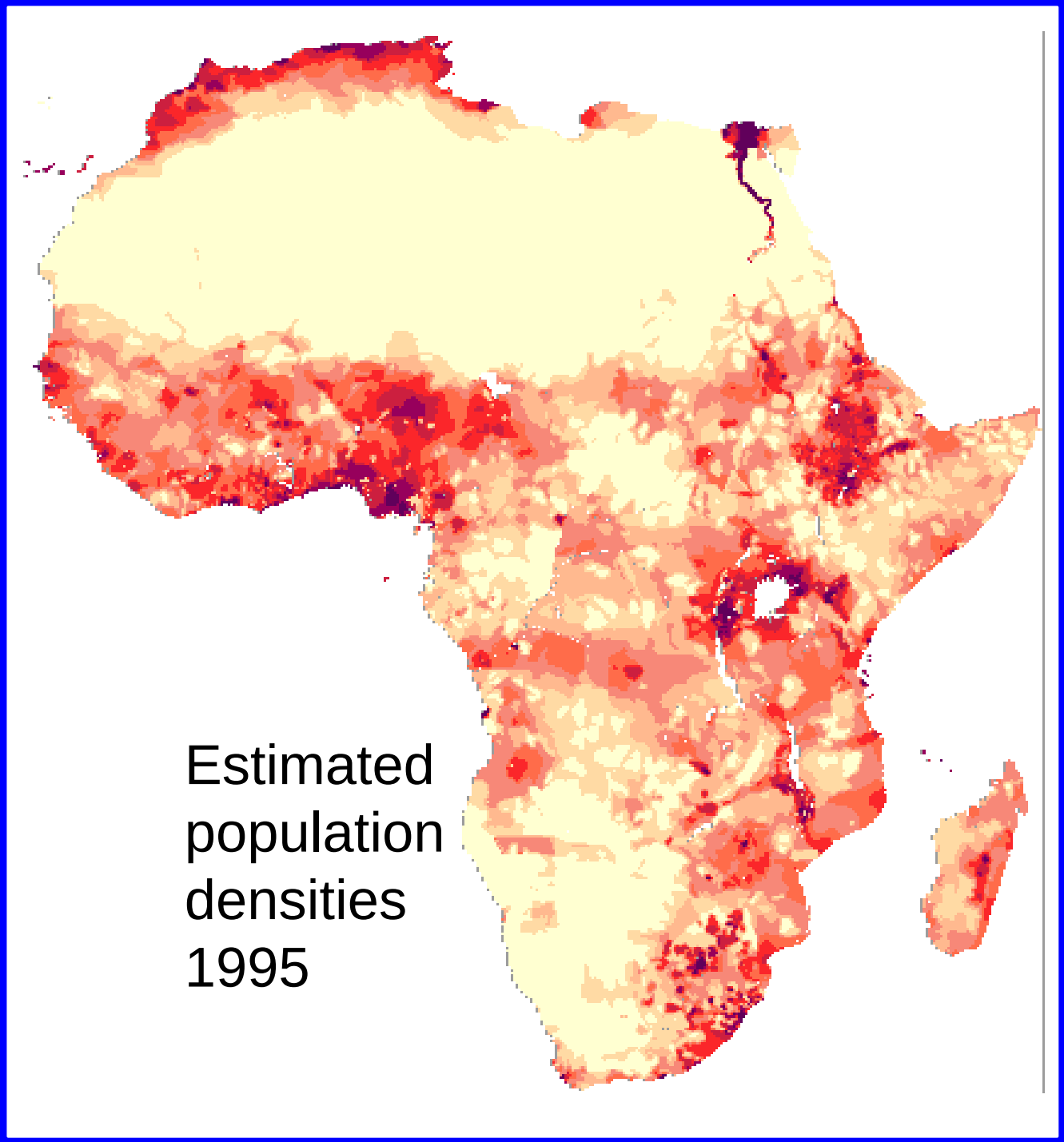
How many people in Africa are at risk of getting malaria?

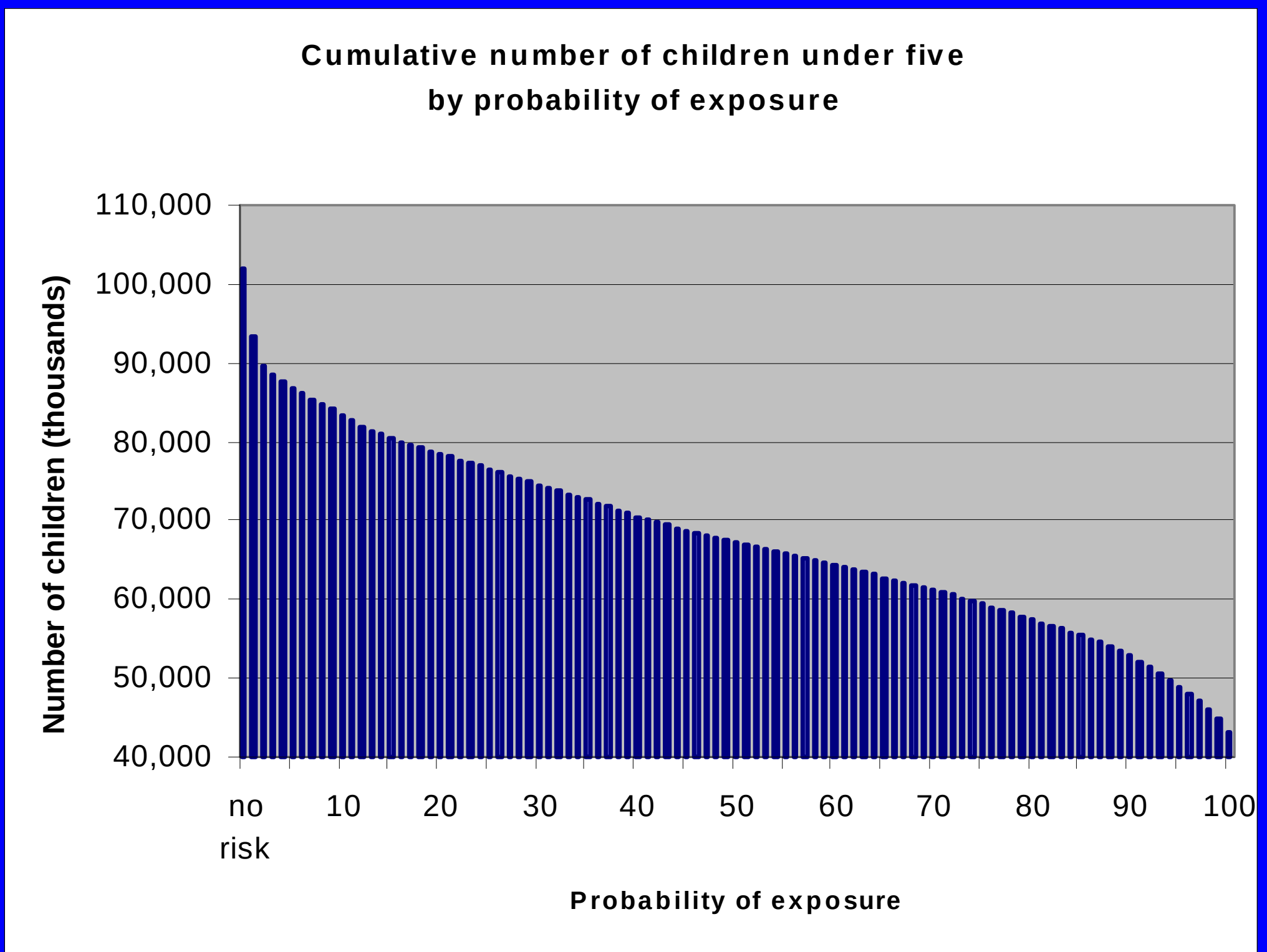
MARA/ARMA Study
Mapping Malaria in Africa
Medical Research Council
Durban, South Africa

Risk of exposure to malaria was estimated using information on climate and elevation, and known transmission rates in different climatic conditions.



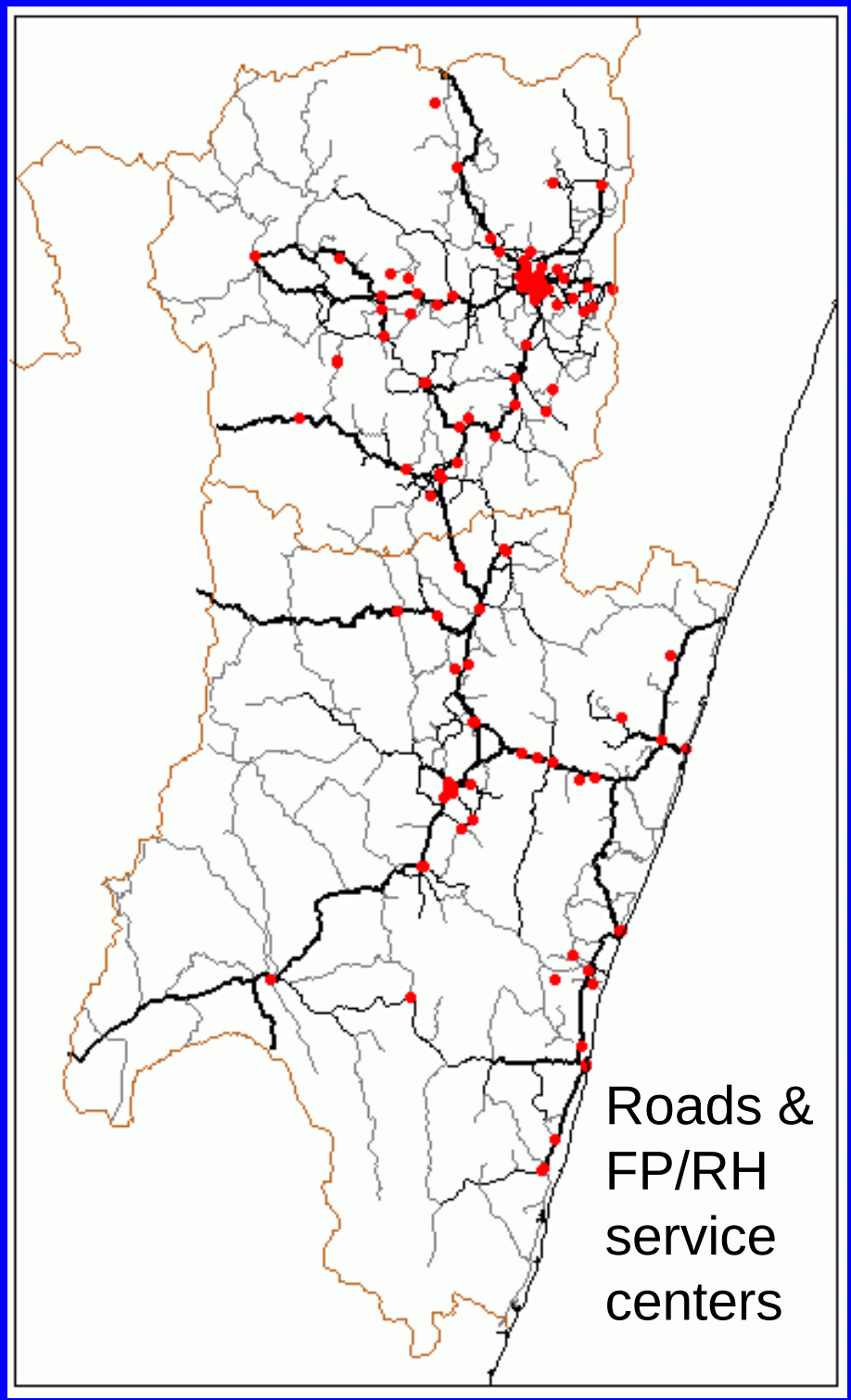
Malaria risk information can be combined with information on the distribution of population in different age groups to find out how many people are affected



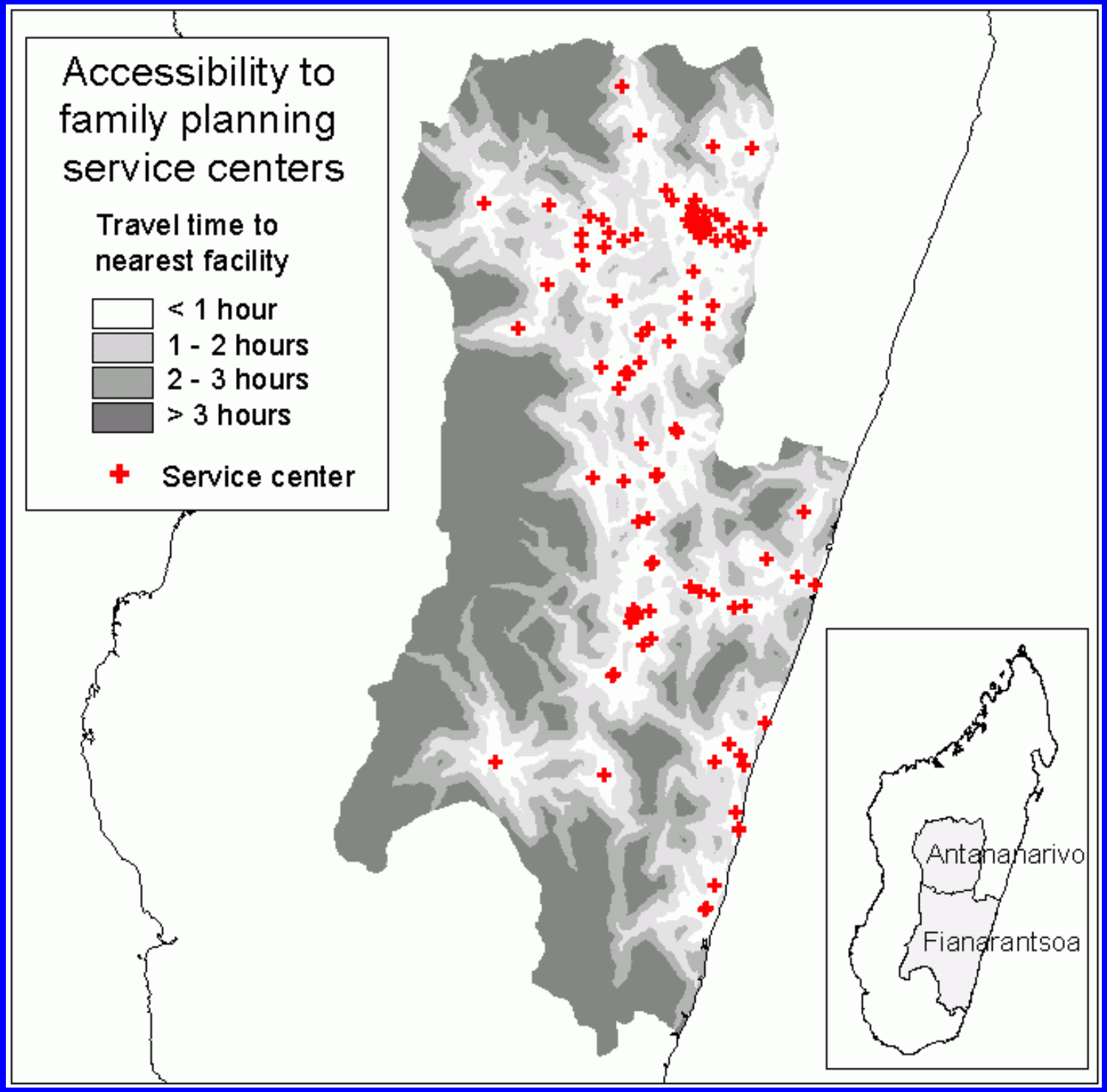

Cumulative number of children under five
by probability of exposure
Number of children (thousands)
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
no risk
10
20
30
40
50
60
70
80
90
100
Probability of exposure

Is accessibility to reproductive health services adequate?

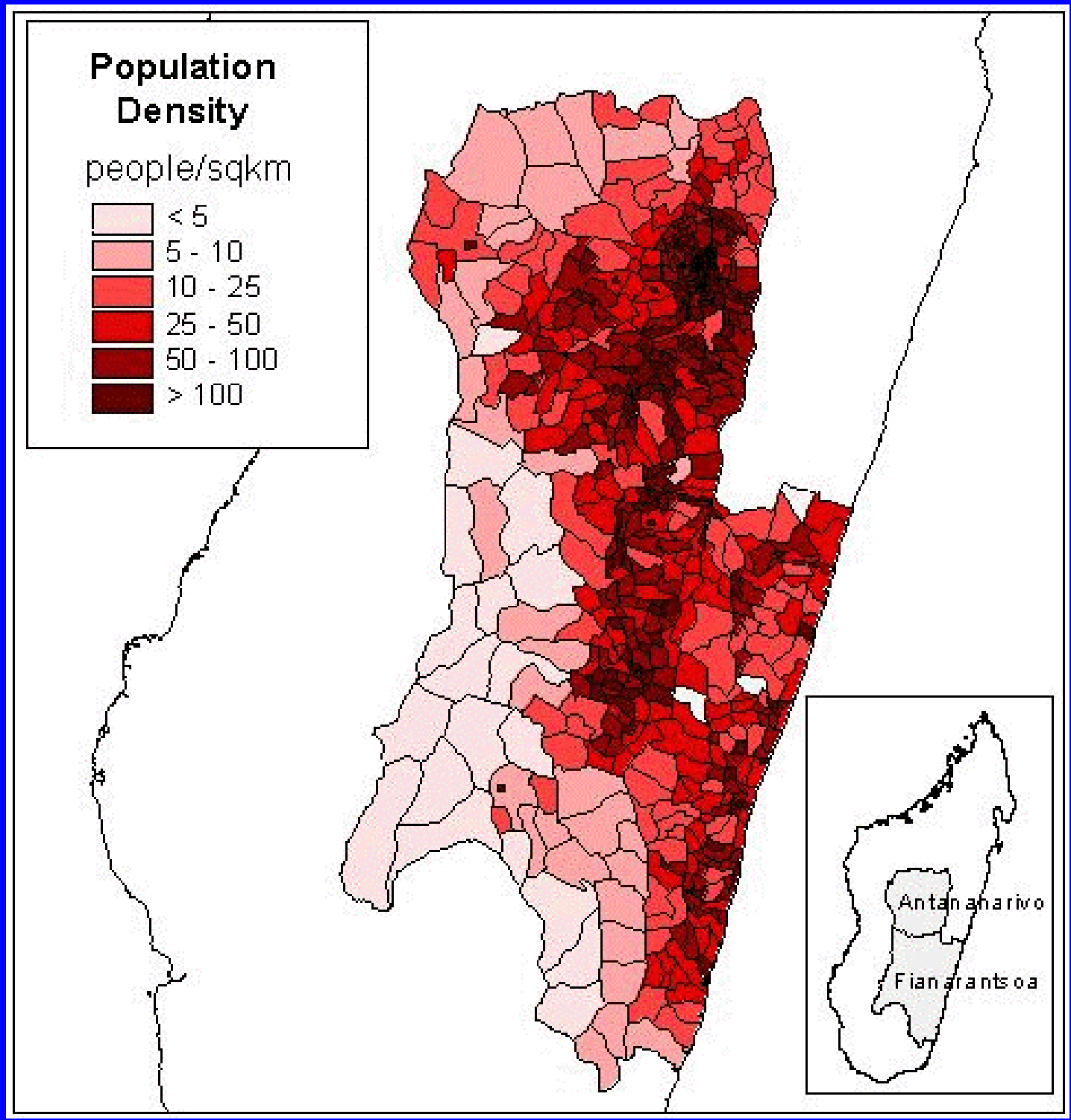
Example:
Two provinces in Madagascar

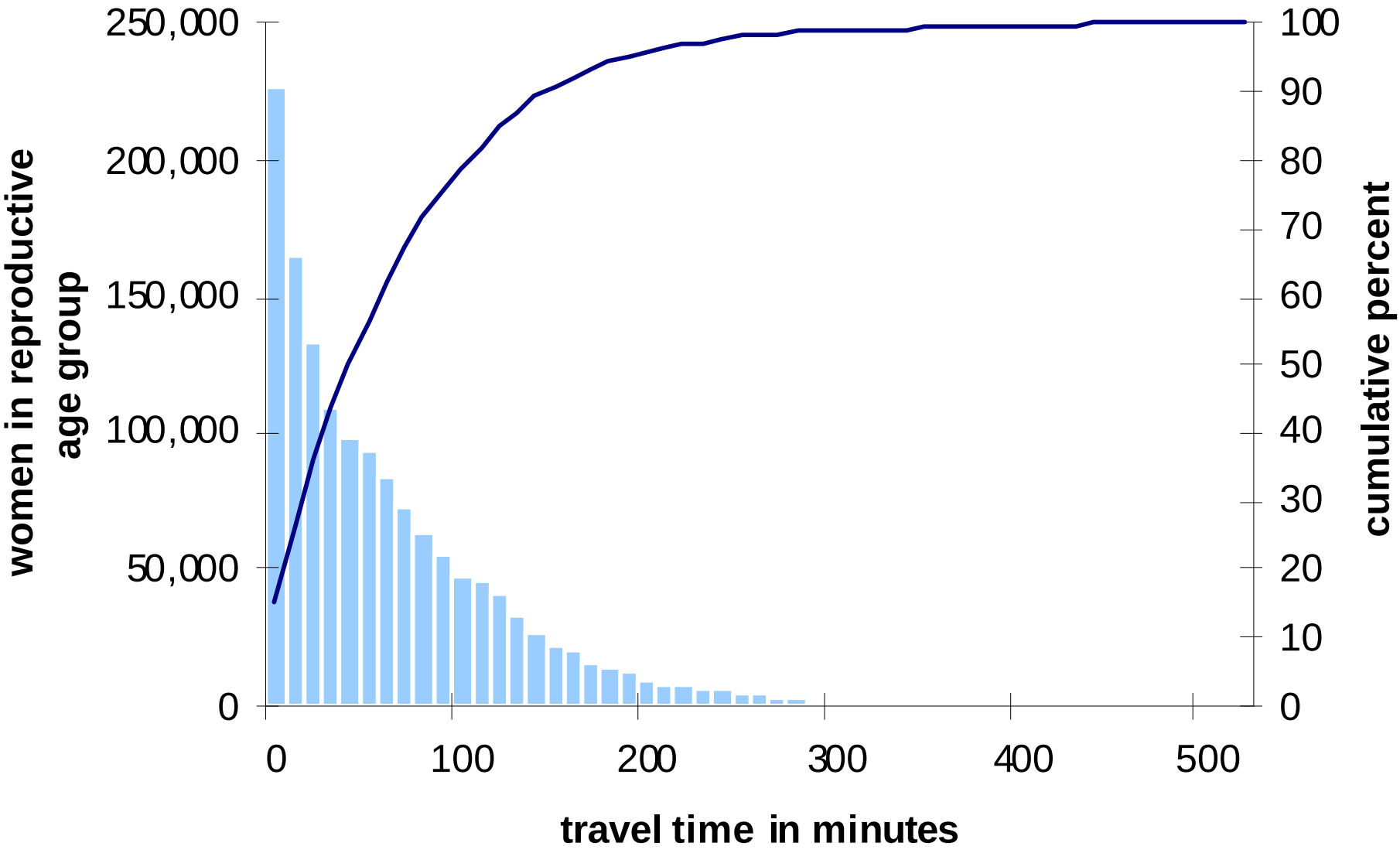


Using network functions in the GIS, we can compute the travel time from every location in the study area to the nearest service center



In combination with census data for small areas, we can compute how many people in the region do not have adequate access to service centers

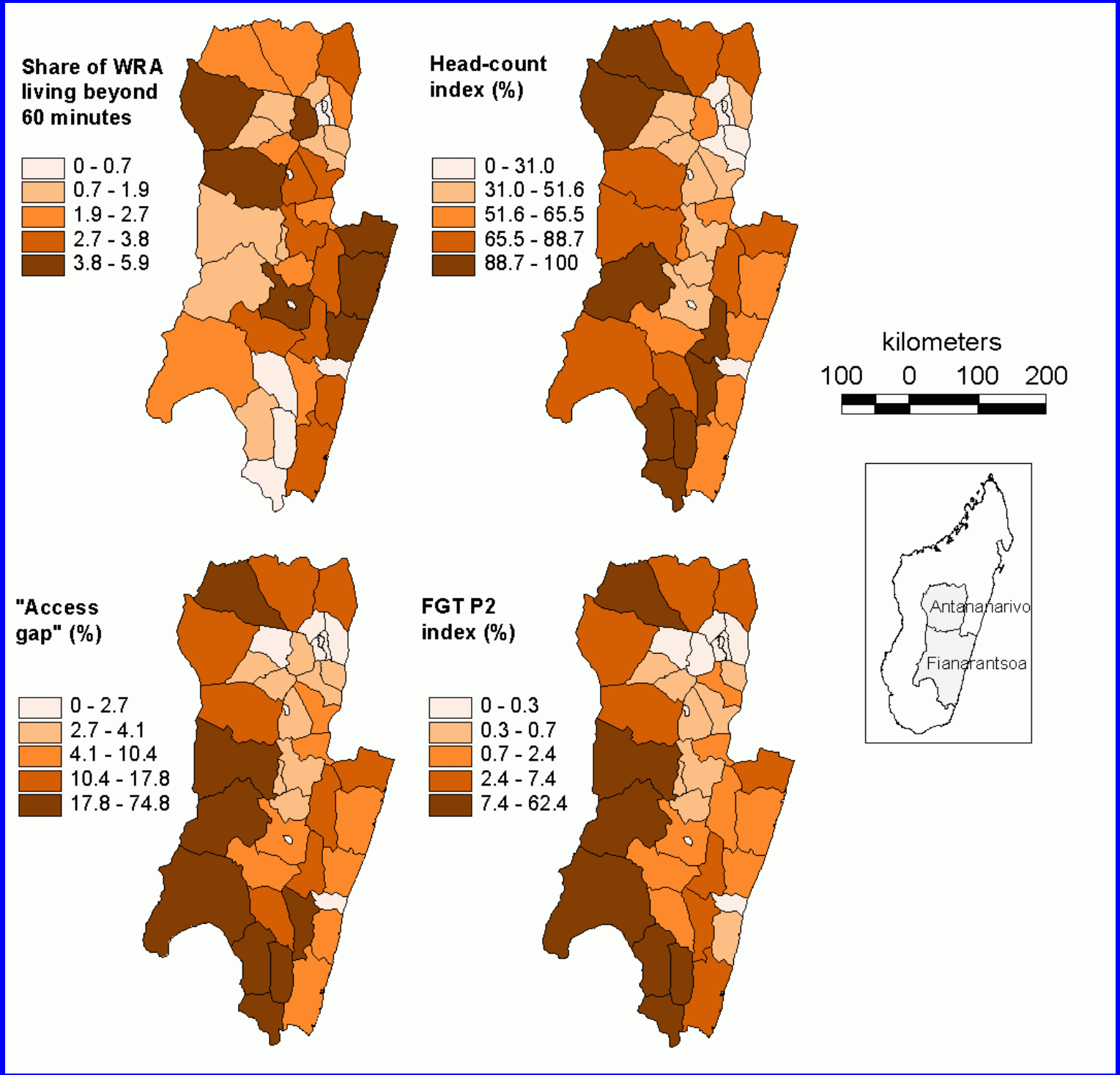



250,000
200,000
150,000
100,000
50,000
0
women in reproductive age group
100
90
80
70
60
50
40
30
20
10
0
cumulative percent
0
100
200
300
400
500
travel time in minutes

Accessibility indicators can be summarized by district

The dark colors indicate districts where accessibility is inadequate

Note: all figures refer to women in reproductive age (WRA)

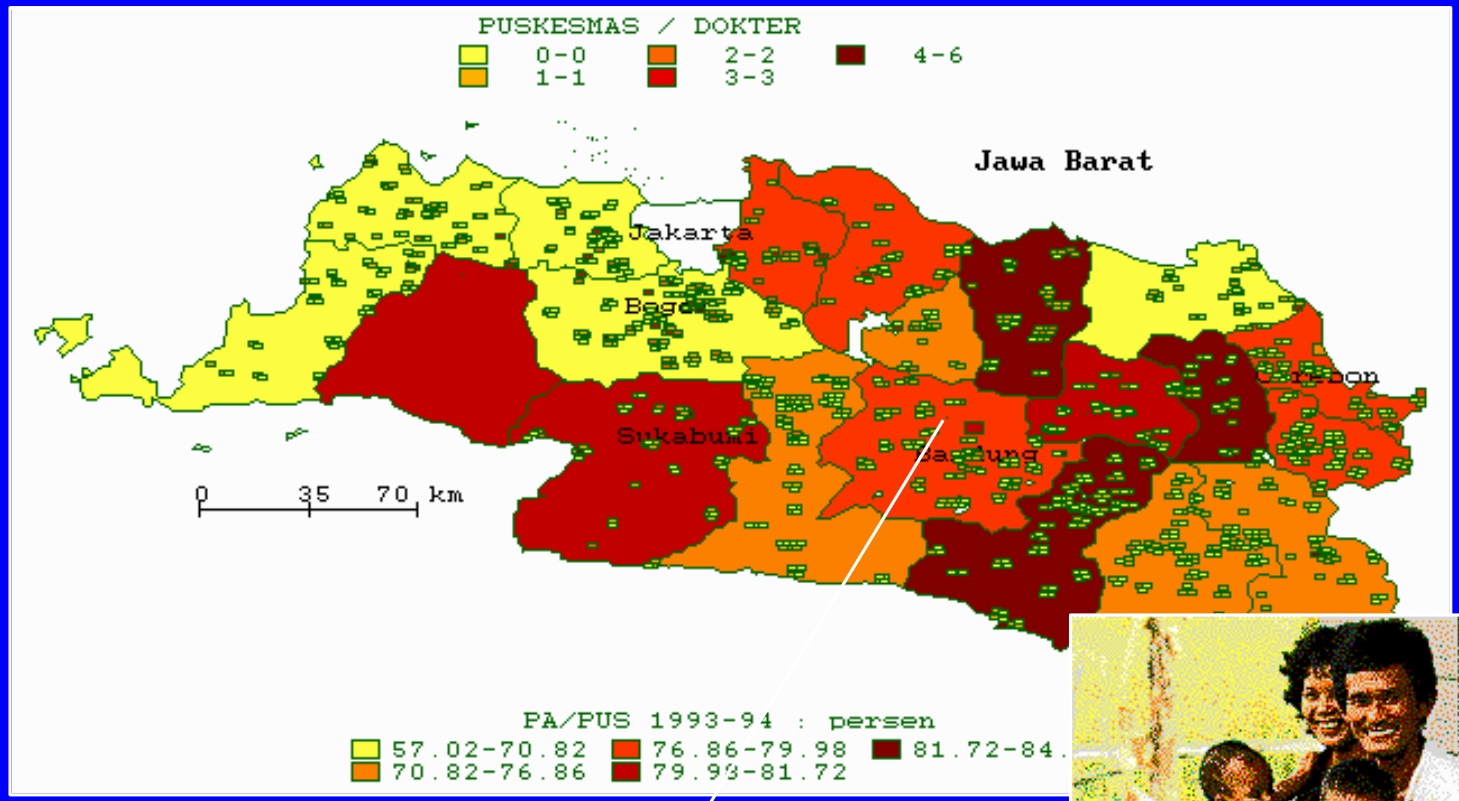


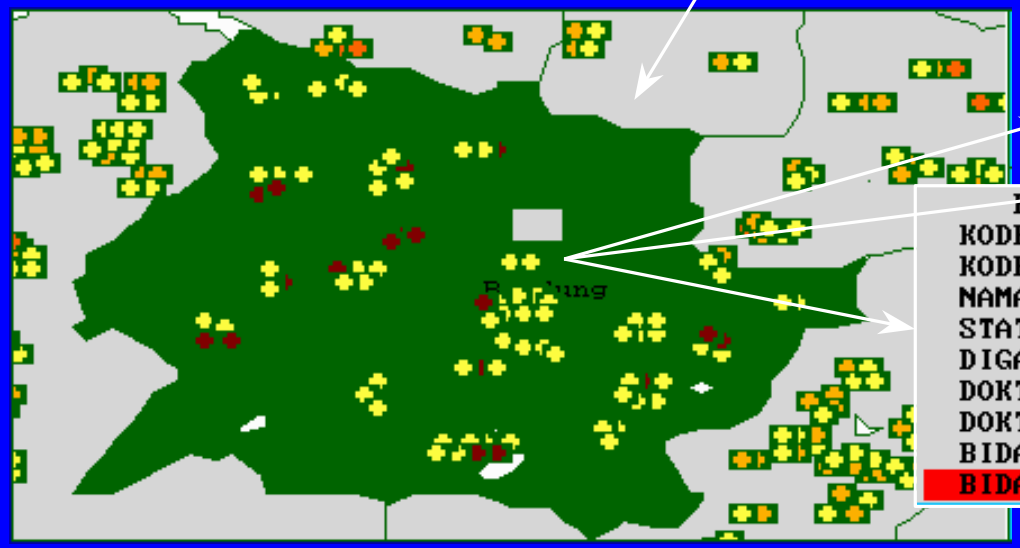
GIS helps maintain comprehensive databases

Case study:

Family planning in Indonesia

Family Planning Information System for Indonesia in POPMAP





PUSKESMAS: REGOL 2

KODE KLINIK	1021037	
KODE KECAMATAN	102113	
NAMA KLINIK	KKB PASUNDAN	
STATUS KLINIK	DEPKES	
DIGABUNG DANGAN	PKM	
DOKTER	6	ORANG
DOKTER LATI KB	1	ORANG
BIDAN	2	ORANG
BIDAN LATI KB	2	ORANG

Source: BKKBN, UNSD/Software Development Project