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**AN EXAMPLE OF THE ESTIMATION OF DISASTER LOSSES
IN THE HEALTH SECTOR**

Exercise prepared by International Consultant J.Roberto Jovel, for use in training workshops on damage and loss assessment after disasters.

DESCRIPTION OF CASE STUDY

In order to acquaint Damage and Loss Assessment Workshop participants on the manner in which losses in the health sector are estimated following disasters, an example is described below. Real-life data for the health sector of the State of Gujarat (India) is used to show loss estimation procedures (see figure below for the location of Gujarat). The baseline data to be used refers to the period prior and after the Gujarat earthquake that occurred in early 2001.



The earthquake caused extensive damage and destruction in urban areas and only minor effects on rural areas in the State of Gujarat. Damage and destruction of medical facilities, equipment and supplies were widespread. The value of damage to health sector assets in the State was estimated at Rs. 220 Crore, or US\$ 47 million.¹ No comprehensive estimation of losses for the sector was ever made, however.

¹ World Bank and Asian Development Bank, *Gujarat Earthquake Recovery Program: Assessment Report, March 2001*, pages 25 to 31.



The following health and medical facilities were destroyed by the earthquake (See photos above), as provided by the Gujarat State Department of Health and Family Welfare:

Description	Number of destroyed units
Health Centers	22
Sub-Centers	105
Dispensaries	15
Anganwadis	192
Total	334

The example to be used for the estimation of losses in the health sector is that of losses (increased government expenditures to treat malaria victims and to control the vector that spreads the disease) arising due to the increased incidence of malaria in the Kachchh District after the 2001 earthquake.

A detailed study made by the Gujarat State Health and Family Welfare Department revealed that significant increases in malaria incidence occurred in the Kachchh District after the earthquake².

The above was due to several reasons, some of which arose directly from the earthquake:

- Increase in vector breeding
- Higher than normal requirements of water storage due to irregular water supply
- Abandoned partially-filled water storage tanks in the affected area
- Increased human-vector contacts
- The occurrence of normal rainfall season after the disaster
- Population displacement and migration after earthquake, and
- Labor migration from malaria-endemic areas.



BASELINE DATA FOR ANALYSIS

A) Number of Cases

Epidemiological data available at the Gujarat State Department of Health and Family Welfare provides information on the annual number of malaria cases that occurred in the Kachchh District from 1975 to 2001, with a distinction between cases caused by *Plasmodium Vivax* and *Plasmodium Falciparum* (See Table 1).

In addition, monthly data on malaria incidence in the same District is available from the same source for the period January 2001 to June 2002, as indicated in Table 2, which can be used for the estimation of post-disaster losses. The time variation of malaria incidence for this period can be observed in Figure 1, that clearly shows the increased incidence of the disease after laborers from other malaria endemic regions moved into Kachchh to participate in the reconstruction program.

The year 1985 may be considered a typical year of malaria incidence in Kachchh District. The number of cases for each type of malaria may be seen in Table 3. From such data, the monthly variation of malaria for a non-disaster year may be derived.

² See power point presentation entitled *Malaria in Kachchh, A Case Study*, prepared by the Department of Health and Family Welfare, Gandhinagar, 2003.

Table 1
Number of Reported Cases of Malaria in Kachchh District, Gujarat
1975 to 2001

	Number of Malaria Cases		
	Plasmodium Vivax	Plasmodium Falciparum	Total
1975	33,780	4,877	38,657
1976	55,879	8,160	64,039
1977	34,169	3,198	37,367
1978	13,798	885	14,683
1979	12,115	688	12,803
1980	15,565	1,962	17,527
1981	13,798	1,695	15,493
1982	13,763	996	14,759
1983	8,512	665	9,177
1984	4,082	337	4,419
1985	2,329	367	2,696
1986	1,644	369	2,013
1987	1,115	189	1,304
1988	5,323	2,214	7,537
1989	26,972	14,403	41,375
1990	21,089	4,832	25,921
1991	7,398	994	8,392
1992	5,913	4,841	10,754
1993	5,061	2,282	7,343
1994	7,876	6,393	14,269
1995	7,018	2,638	9,656
1996	3,939	632	4,571
1997	9,657	2,407	12,064
1998	8,756	1,249	10,005
1999	5,044	791	5,835
2000	2,371	209	2,580
2001	10,886	4,175	15,061

Source: Gujarat State Department of Health and Family Welfare

Table 2
Number of Reported Monthly Cases of Malaria in Kachchh District, Gujarat
January 2001 to June 2002

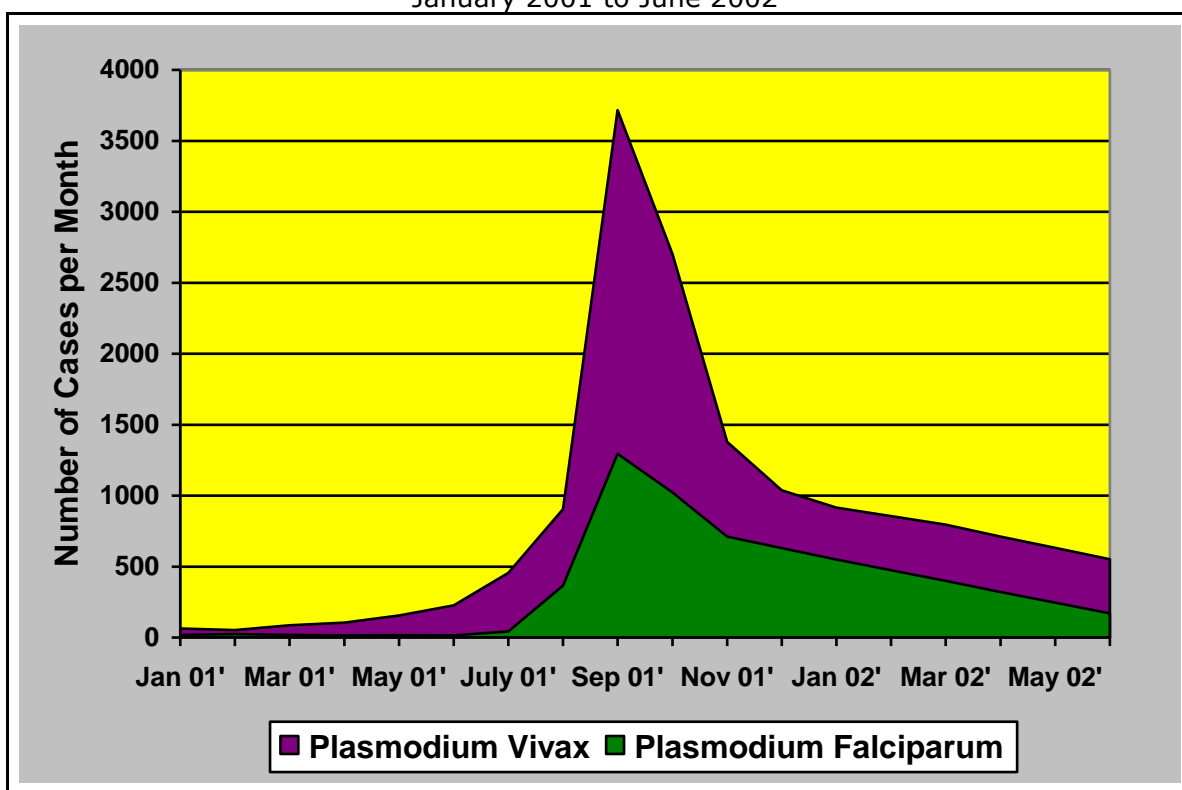
		Number of Cases		
		Plasmodium Vivax	Plasmodium Falciparum	Total
2001	January	64	19	83
	February	53	24	77
	March	86	19	105
	April	106	15	121
	May	156	16	172
	June	227	15	242
	July	455	43	498
	August	905	366	1,271
	September	3,716	1,295	5,011
	October	2,702	1,022	3,724
	November	1,379	711	2,090
	December	1,037	630	1,667
2002	January	915	550	1,465
	February	855	475	1,330
	March	795	400	1,195
	April	711	320	1,031
	May	632	245	877
	June	552	170	722

Source: Gujarat State Department of Health and Family Welfare

Table 3
Number of Malaria Cases in 1985 in Kachchh

Month	Number of Malaria Cases		
	P. Vivax	P. Falciparum	Total
January	216	57	273
February	227	49	276
March	121	4	125
April	120	5	125
May	118	2	120
June	114	3	117
July	49	0	49
August	152	2	154
September	306	6	311
October	374	31	405
November	370	56	426
December	162	64	226

Figure 1
Variation of Monthly Rates of Malaria Cases in Kachchh District
January 2001 to June 2002



B) Malaria Treatment Costs

In the absence of unit treatment costs, international values are to be used throughout the exercise, as described below.

An average of Rs. 45 (US\$ 1) per person per malaria treatment course is to be adopted for outpatients, following the experience in Africa³. Other international studies indicate that between 3 to 7 days of in-hospital care are required to deal successfully with severe types of malaria⁴. It is to be assumed that an average of 5 days of in-hospital care would be required in the case of the Kachchh District malaria patients. It is to be further assumed that the daily cost of malaria hospitalization treatment in the District was in the order of Rs. 1,900 per day, or a total of Rs. 9,000 per patient treated.

In order to arrive at the amount of money spent in the treatment of malaria cases due to the disaster, it is to be assumed that 50% of the *plasmodium falciparum* cases are to be treated in hospitals or other medical facilities, due to their complexity and severity. The balance is assumed to be treated as outpatients in both the urban and rural areas.

B) Vector Control Costs

For the estimation of the cost of controlling the mosquito vector in Kachchh it is to be assumed that a combination of indoor residual spraying with insecticides in the rural areas⁵, and spray fogging in urban areas would be adopted. Again in the absence of actual costs for the disaster area, the values obtained in similar countries for Africa are to be adopted: US\$ 3.50 and 2.15 (Rs 155 and 100) per person in urban and rural areas, respectively.⁶

Data on urban and rural population for the District is to be used for the estimation of these losses, as shown below:

Table 3
Urban and Rural Population in Kachchh District, 2001

	Number of Persons
Urban	474,892
Rural	1,108,333
Total	1,583,225

³ See *The Cost and Cost-Effectiveness of Antimalarial Drugs*, In *Saving Lives, Buying Time: Economics of Malaria Drugs in an Age of Resistance*, 2004.

⁴ Jovel, Roberto, *Actualización del impacto de El Niño 1997-1998 en la salud de la Costa Ecuatoriana*, PAHO/WHO Workshop on Socio-Economic Impact Assessment of Disasters on Health, Quito, Ecuador, July 2002.

⁵ See *Annual Report, 2002: National Anti-Malaria Programme*, Health Section, Health and Medical Services Commissionerate, Gandhinagar, Gujarat, 2003.

⁶ Conteh, L et al, *The Cost and Cost-effectiveness of Malaria Vector Control by residual Insecticide House-Spraying in Southern Mozambique: A Rural and Urban Analysis*, School of Hygiene and Tropical Medicine, London, January 2004.

SUGGESTED STEP-WISE PROCEDURE FOR ASSESSMENT OF LOSSES

The following steps are suggested for the estimation of losses in this exercise:

1. Define the baseline for the assessment
 - Long-term trends
 - Monthly variation of malaria incidence under "normal conditions"
2. Define the number of cases due to the disaster
 - Estimate period required to achieve recovery to pre-disaster conditions
 - Estimate the number of malaria cases due to disaster, for each type of disease
3. Estimate the cost of medical care
 - Use unit costs for each type of treatment
 - Combine with number of cases of malaria
4. Estimate costs of vector control
 - Determine unit costs for vector control in urban and rural areas
 - Combine with population data for District
5. Estimate total losses, through addition of
 - Medical care costs, plus
 - Vector control costs.

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