



New ideas on the old concepts:

**A proactive model for malaria
and dengue control with
Community Participation**

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Prevention and Control of Vector Borne Diseases

National strategies for Malaria:

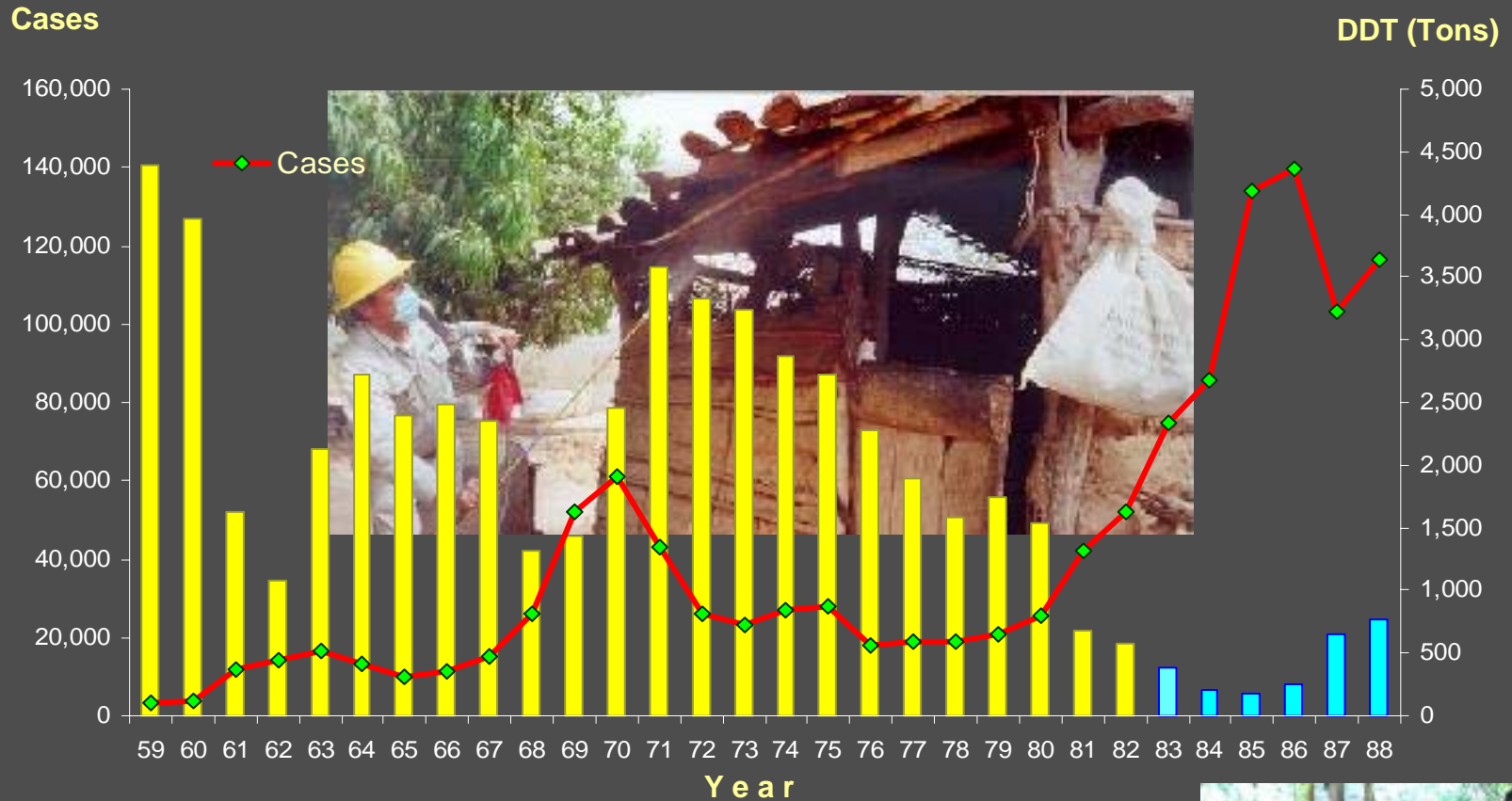
1. Eradication (1955-1989)

2. Intensive and Simultaneous
Actions (1990 – 1998)

3. Focalized
treatment (1999 –

1. Eradication

Malaria and DDT spraying in Mexico, 1959 - 1988



METHODOLOGY:

▮▮▮▮➔ **ERADICATION**

▮▮▮▮➔ **CONTROL**

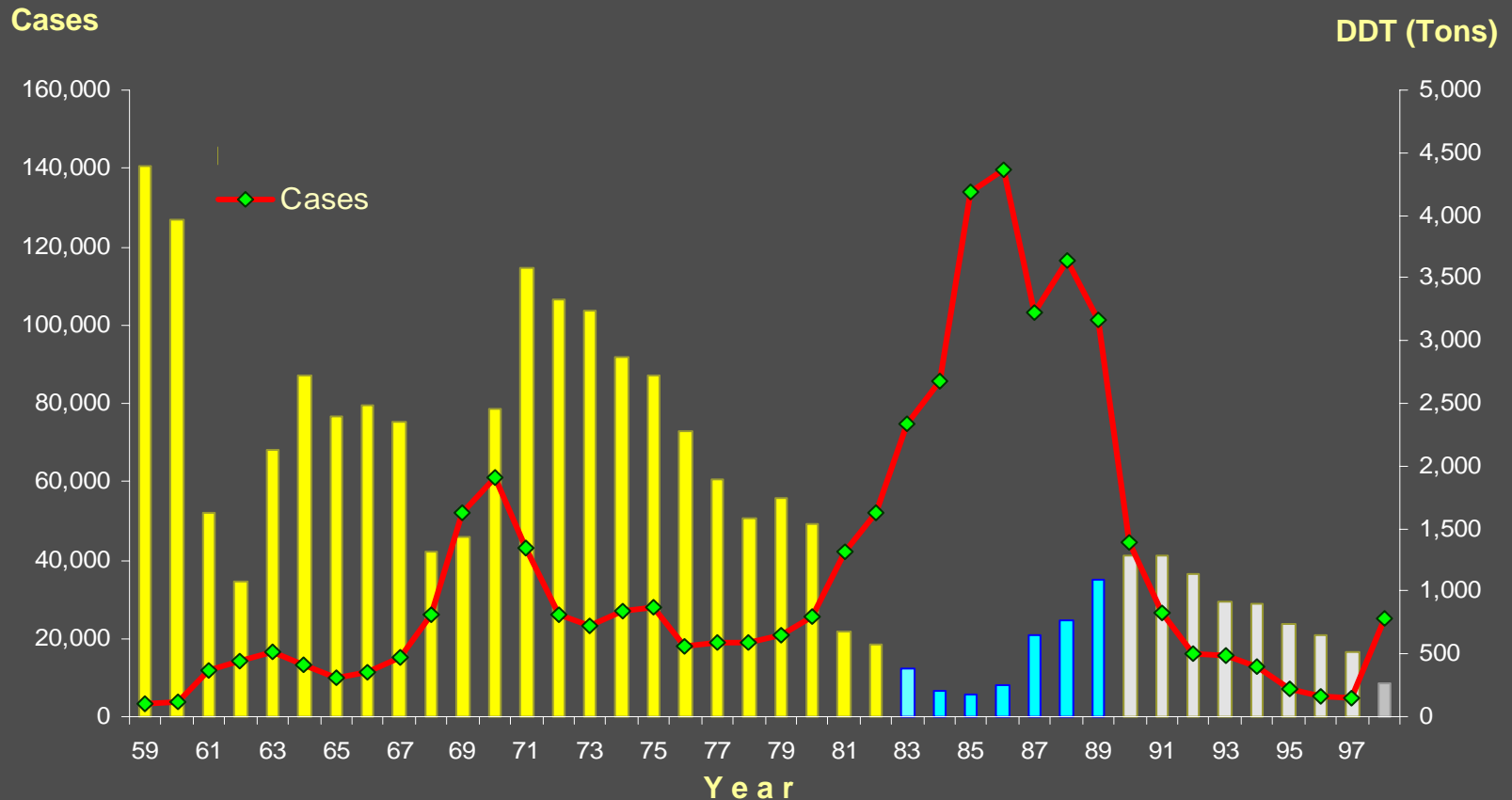


DIFFICULTIES.

- Investment Reduction = increment of incidence.
- Inappropriate timely = increment of incidence.
- Strikes and less working days = increment of incidence.
- Decentralization caused a administrative confusion (1984)

2. Intensive and Simultaneous Actions

Malaria and DDT spraying in Mexico, 1959 - 1998



METHODOLOGY:

ERADICATION

CONTROL

INTENSIVE AND SIMULTANEOUS CONTROL ACTIVITIES



DIFFICULTIES.

🏠 High cost.

🏠 When the funds decrease = incidence increases.

- Inappropriate resources = incidence increases.

- Strikes = incidence increases

WHAT CHANGES MALARIA NEEDS ?

1999 - 2002.

In 1998 in Oaxaca State there were financial problems and consecutive developed an outbreak.

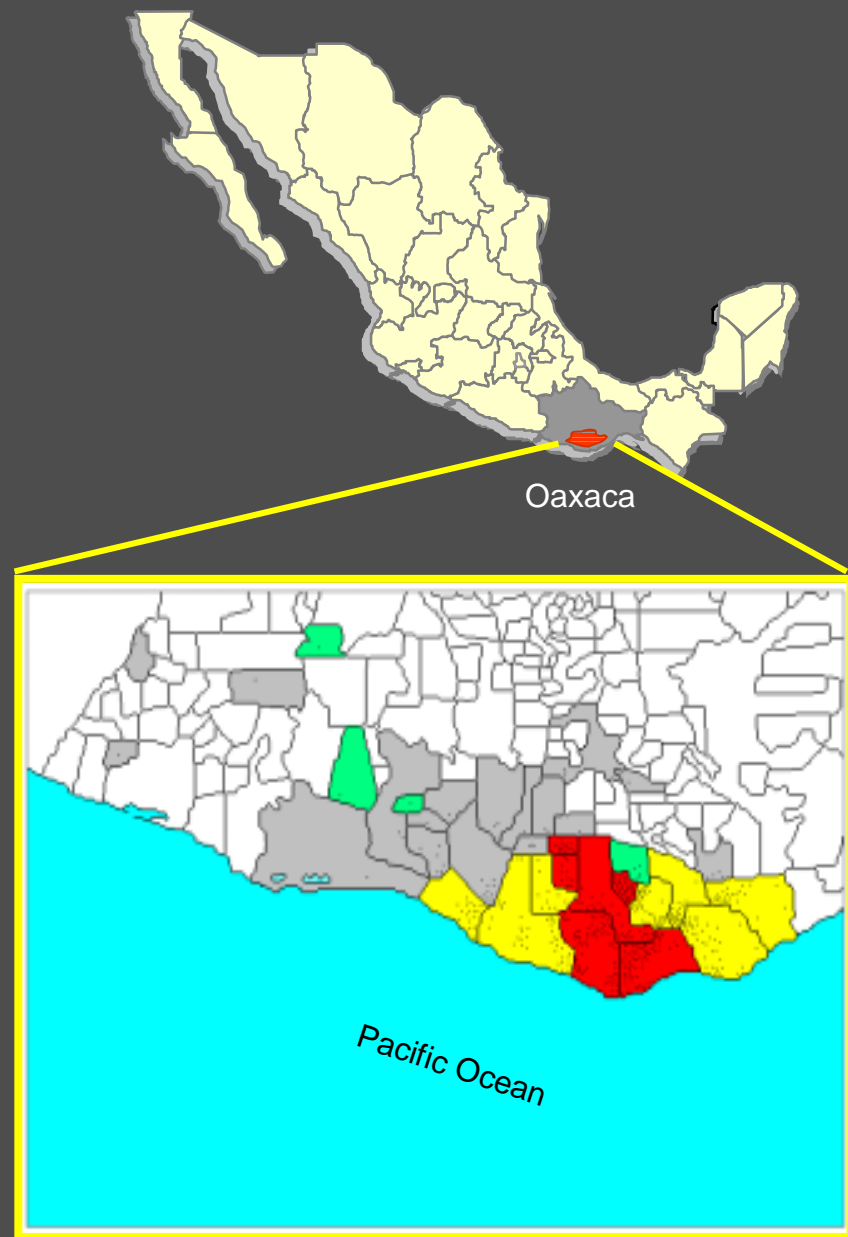
“However, malaria intensive affected communities differs at least in more than just number of cases and positive localities”
(Hackett 1941)

Outbreak in Oaxaca State, 1998:

/// One of the most important malaria areas in Mexico.

/// *Vivax* malaria and *An. pseudopunctipennis* as main vector.

/// In 1998, the outbreak represented 80% of total cases of the country.



General assumptions:

- There are different malarias: 4 parasites and many vectors.
- Geography features influence malaria patterns.
- The *vivax* malaria produces relapses with difficulties for a radical cure, therefore, there are persons and houses with frequent malaria attacks and asymptomatic cases. Natural infections can persist for almost three years.
- The habitats of anopheline mosquitoes are specific and different among the species, therefore the impact of control activities differ in each case.

Epidemic pattern assumptions in Oaxaca:

- The disease is not homogeneous within and between villages and households.
- *Vivax* malaria parasites, reservoirs and mosquitoes have some specific and constant interaction.
- Transmission's pattern is influenced by the raining season.
- Repeated cases (re-infections and relapses) occur on raining season. The new period of transmission in the next dry season is provided by these carriers.
- In the first weeks of the year most of the new cases occur and the repeated cases are in rain season.

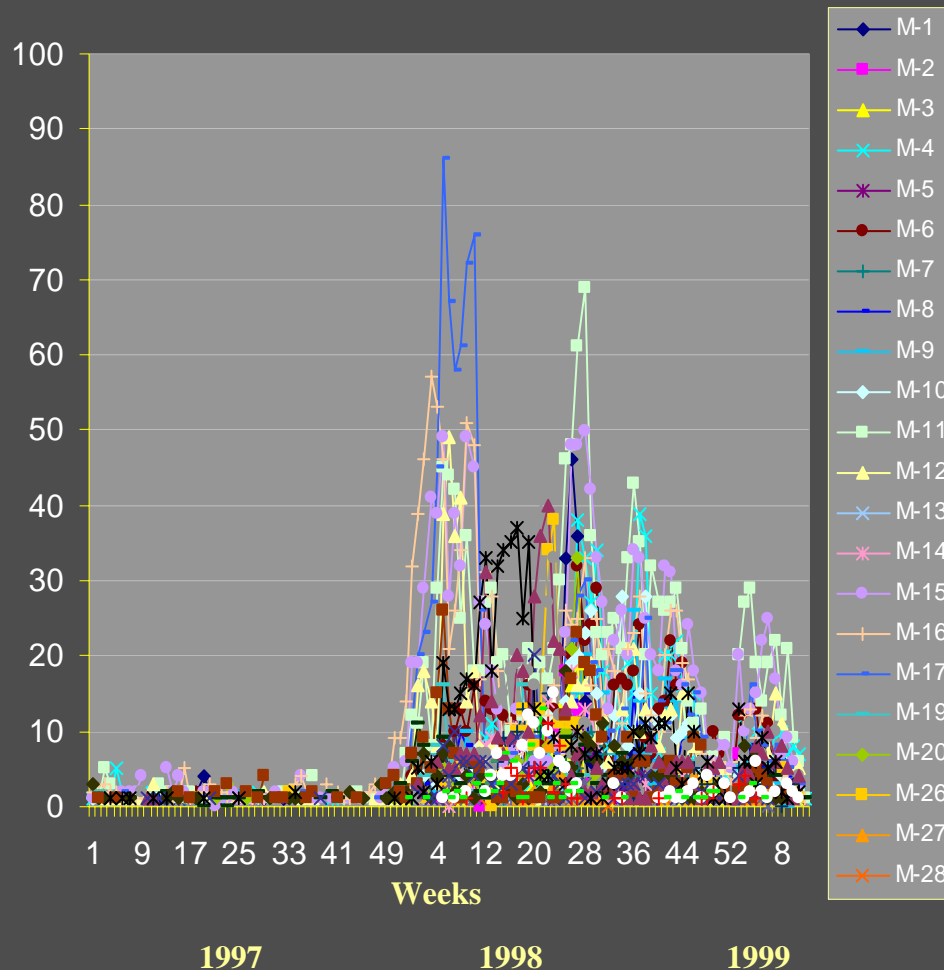
Cases and villages with malaria, Oaxaca. 1992 – 2001

Years w/ Persistent Transmission	Cases	%	Villages	%	ACV
1 – 2	1,094	4.01	320	43.66	3.42
3 – 4	1,683	6.17	120	16.37	14.03
5 – 6	3,679	13.49	104	14.19	35.38
7 – 8	7,344	26.93	106	14.46	69.28
9 – 10	13,467	49.40	83	11.32	162.25
TOTAL	27,267	100.00	733	100.00	37.20

ACV: Average of cases by village

Epidemiological stratification of malaria, based on altitud and communication vias, Weekly incidence patterns in the different 48 Micro - regions Coast of Oaxaca. 1997-1999

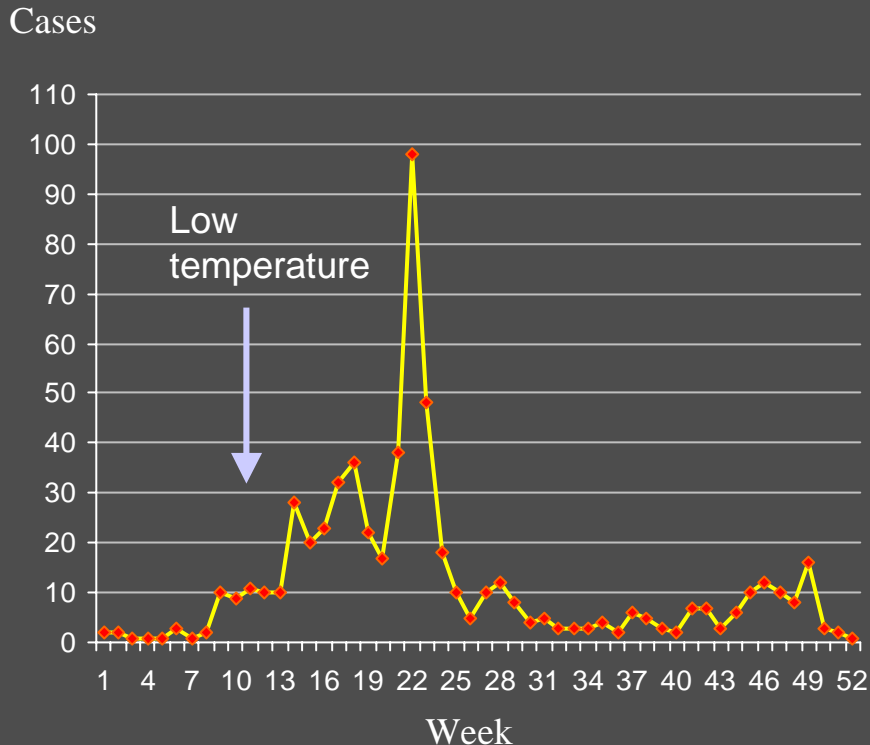
Cases



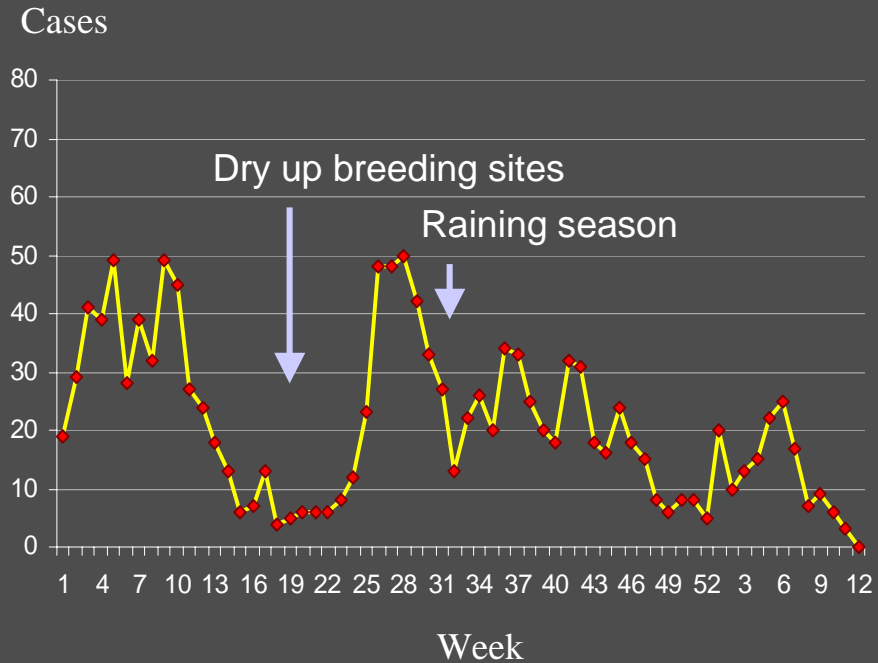
Candelaria Loxicha has an altitud of 200-400 meters above sea level.

Two picks were characteristic, regulated for the presence of water in breeding sites due to the dry up for seasonality changes.

Malaria in San Miguel del Puerto. 1998



Malaria in Candelaria Loxicha. 1998-1999



San Miguel del Puerto has an altitud of 700-900 meters from the sea level.

The epidemiological pattern was regulated by temperature at the beginning of the year, and after, by abundance of mosquito breeding sites and the raining season in the mountains.

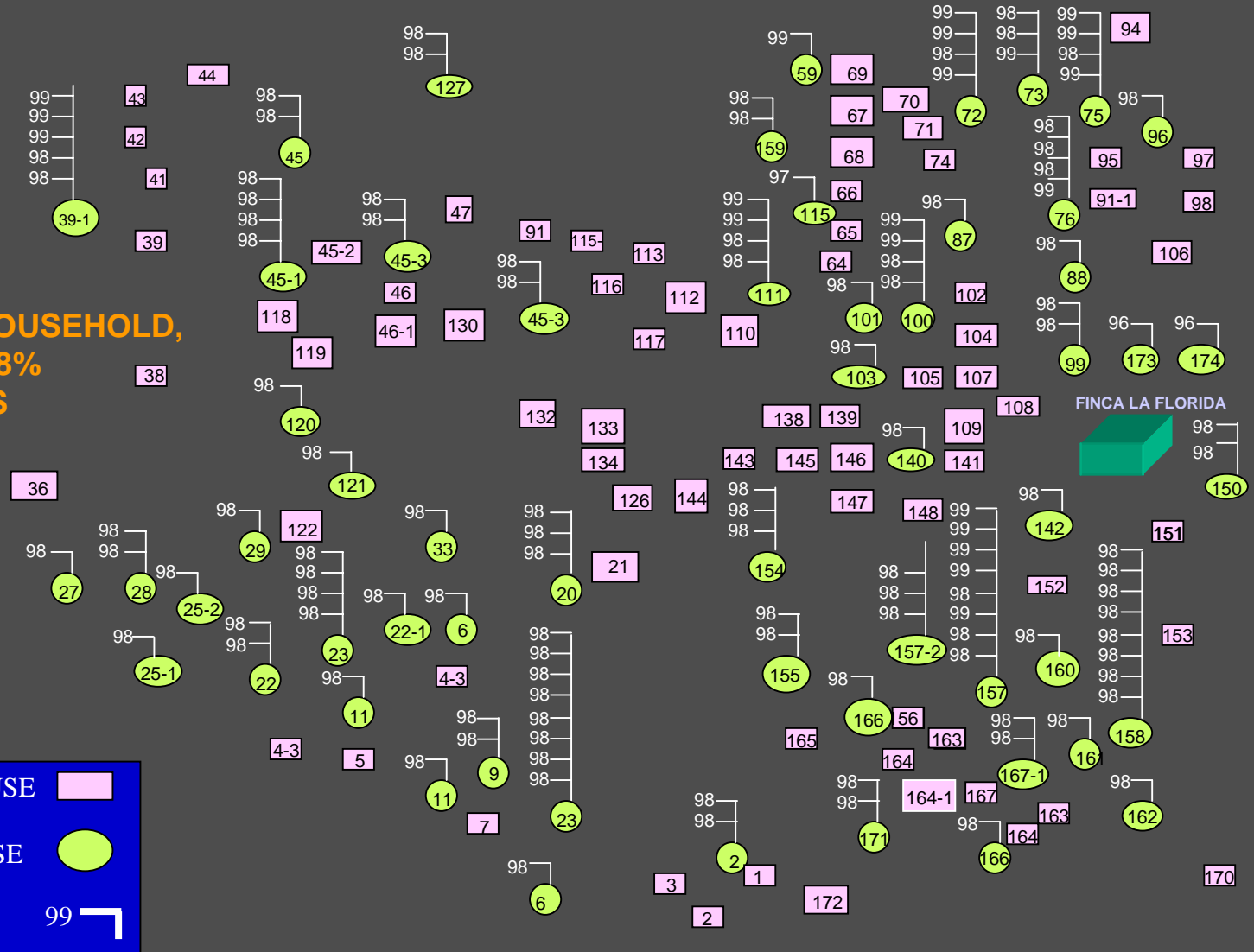
Epidemiological differences in three communities Oaxaca. January-April 1999.

Characteristic	Yerbasanta	Las Cuevas	Totolapa
Population	863	319	872
Household	256	199	234
Cases	169	133	166
*Houshold w/ malaria	30%	22%	37%
*Household > 1 case	52%	45%	39%
*Ill person > once	26%	34%	11%
*Relatives +	82%	72%	81%
Concentrate malaria in household	52% of household + had 90% of cases	64% of household + had 85% of cases	64% of household+ had 85% of cases

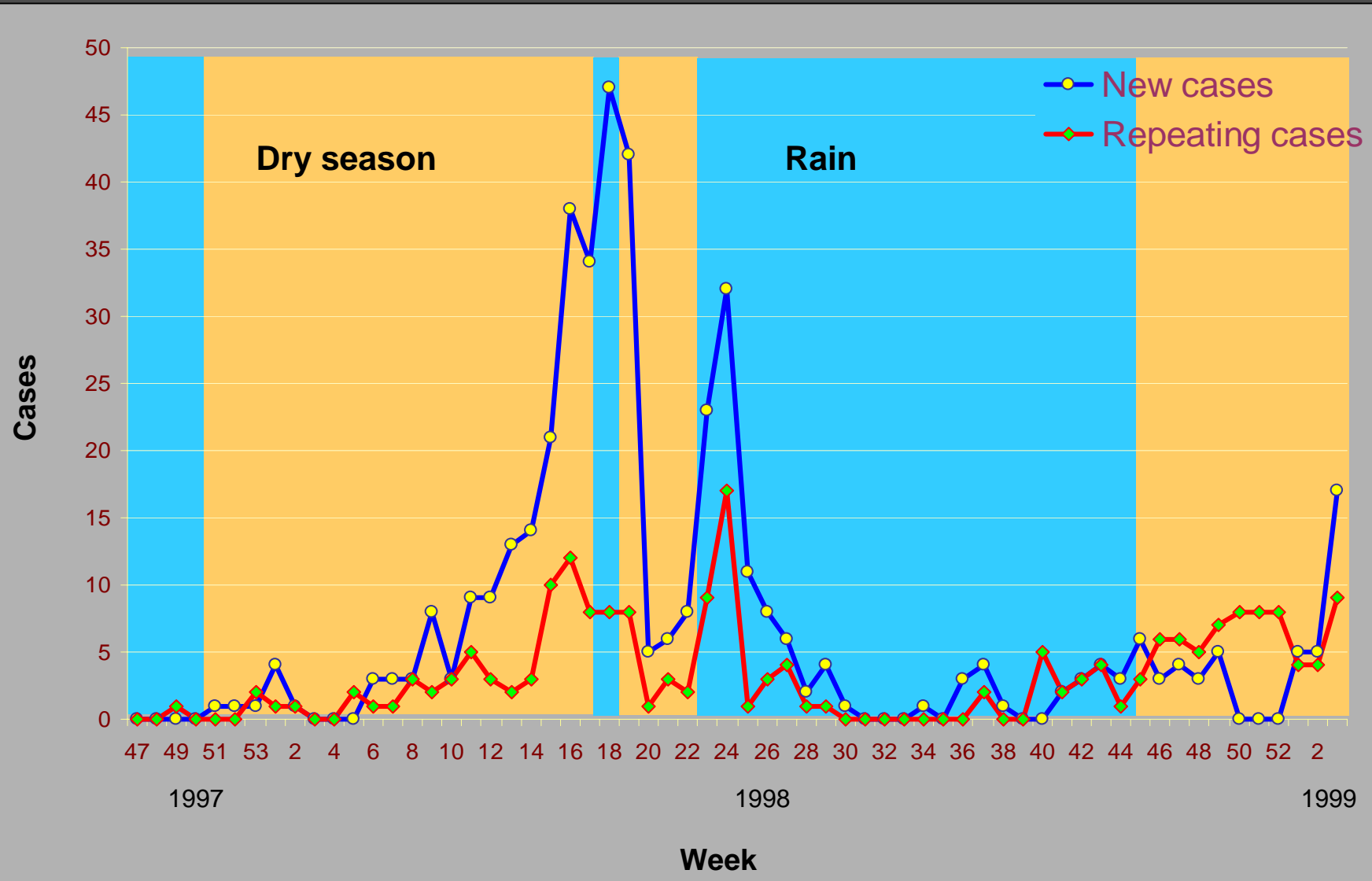
*Between 1997 to April of 1999

Scheme of household incidence of malaria. Some houses presented a nest malaria incidence.

21% OF ALL HOUSEHOLD,
PRESENTED 78%
OF THE CASES



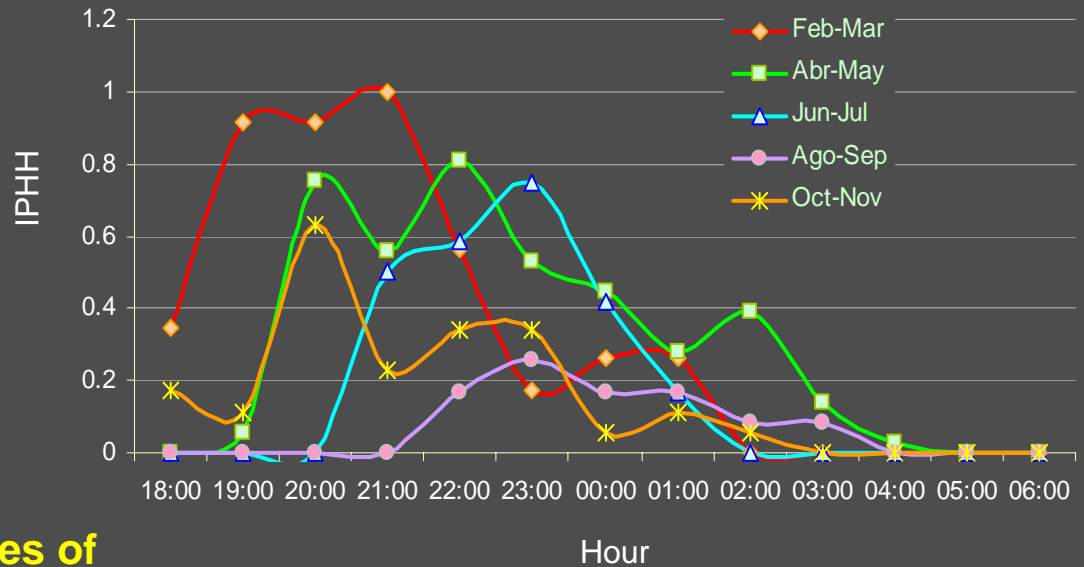
Incidence of malaria and repeating cases in Sirena Miramar, San A. Loxicha, Oaxaca. 1997-1999



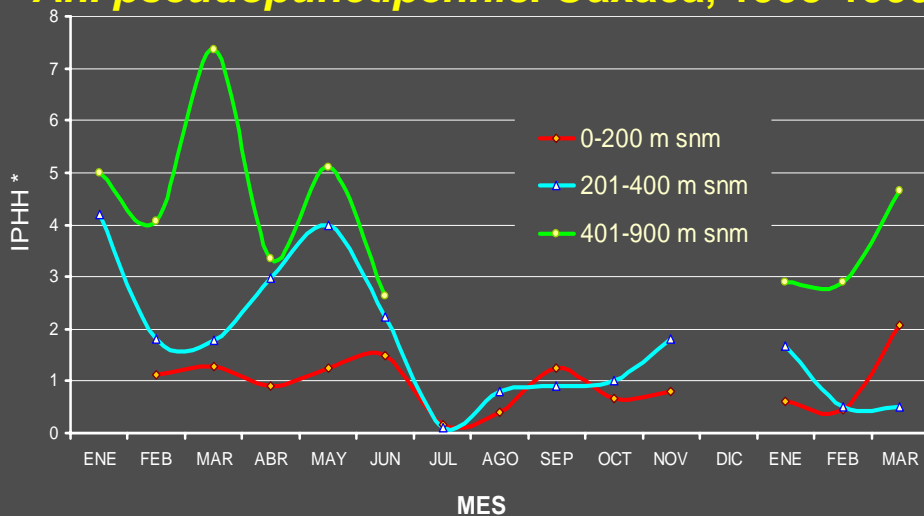
Patterns of *An. pseudopunctipennis* changed with altitud and with the season.

Probably these differences should influence the efficacy of impregnated bed net.

Hourly captures of *Anopheles pseudopunctipennis* in Rancho Corozal. Oaxaca, 1999.



Monthly variations of densities of *An. pseudopunctipennis*. Oaxaca, 1998-1999

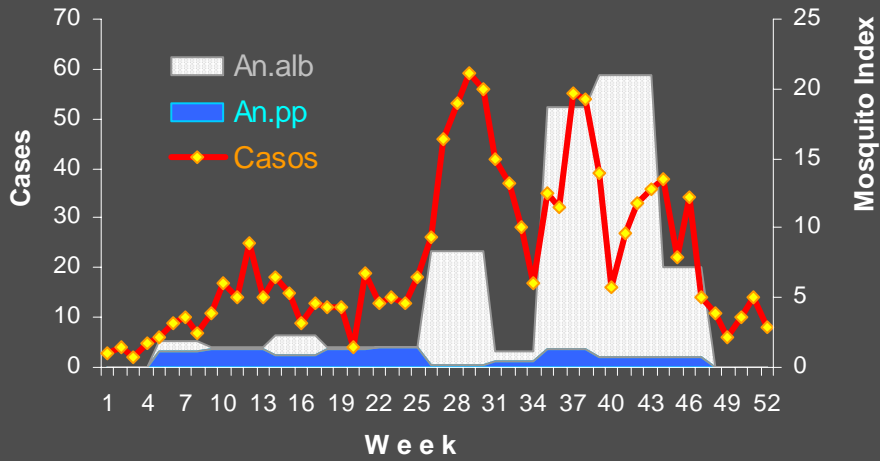


** IPHH: Human bait hourly index

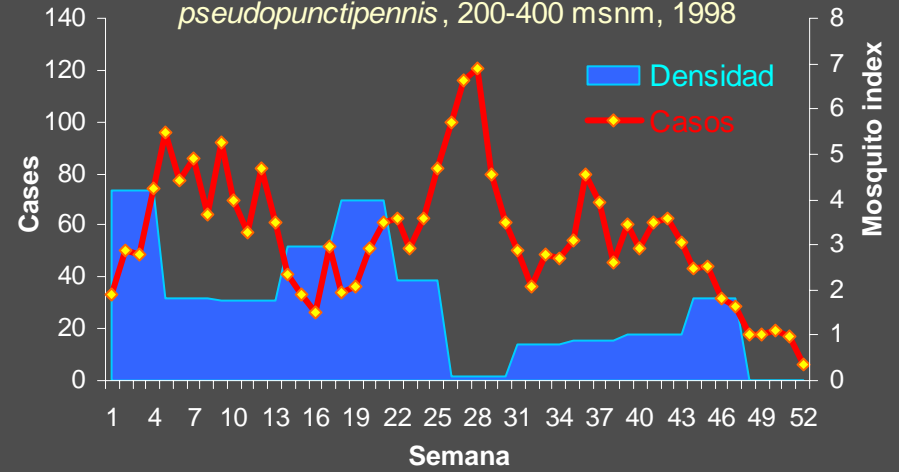
An. pseudopunctipennis are influenced by the raining season, due to the characteristic green algae in breeding sites that persiste in the dry season, however, the rain devastate this habitat and that is when larvae disappear.

The dry season in Oaxaca was starts in the first months of the year and raining in the second half.

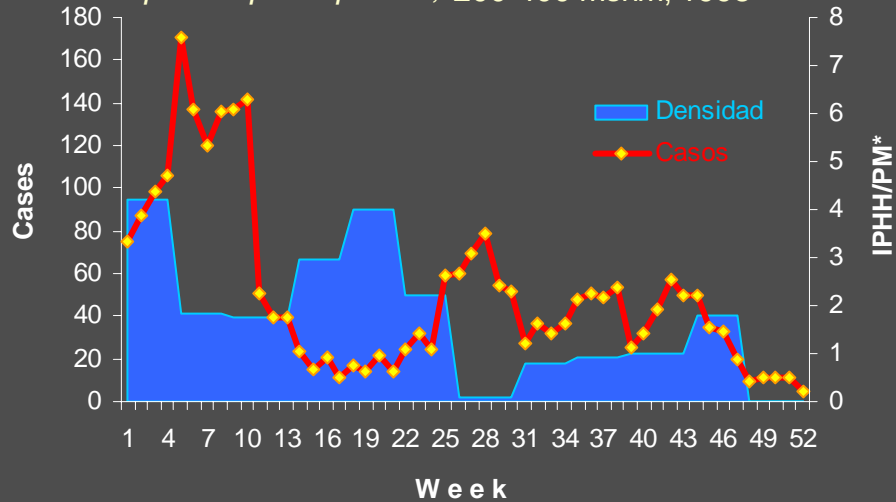
Casos de malaria y densidades de *Anopheles* spp. a <200 msnm, 1998



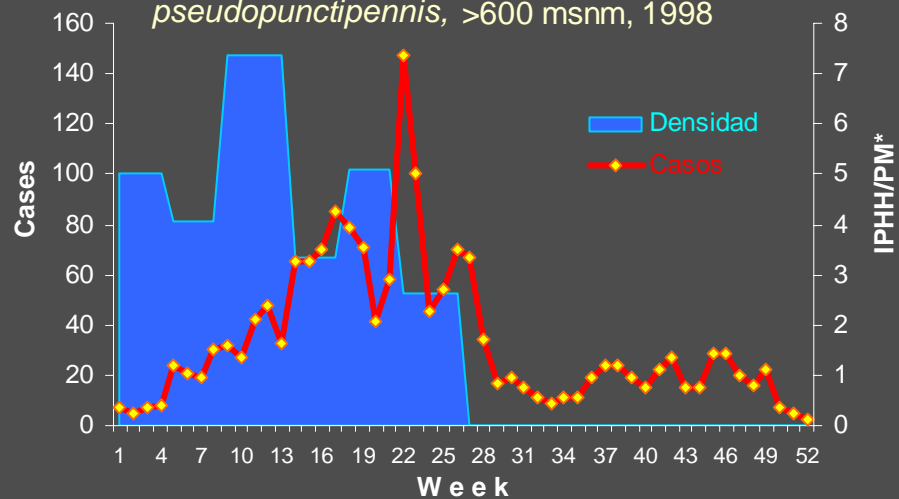
Casos de malaria y densidades de *Anopheles pseudopunctipennis*, 200-400 msnm, 1998



Casos de malaria y densidades de *Anopheles pseudopunctipennis*, 200-400 msnm, 1998



Casos de malaria y densidades de *Anopheles pseudopunctipennis*, >600 msnm, 1998



*Mosquito Index: Man/Hour/Mosquito Capture

The aquatic habitat of *Anopheles pseudopunctipennis*:

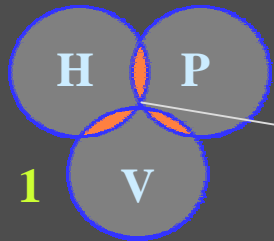


- The breeding sites of are influenced by presence of water in streams and rivers.
- The typical environment are in the mountains, between canyons.
- The breeding sites are characterized by the presence of low flow streams and green algae, that gives protection and food to larvae.



**WHAT SHOULD
BE A NEW
MODEL FOR
MALARIA
CONTROL?**

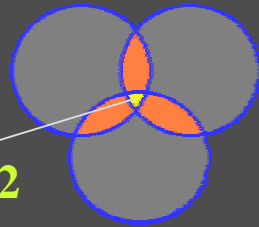
THE MODEL OF DISEASE: process of malaria is limited by the host, parasites, vectors and environment's own frontiers.



1

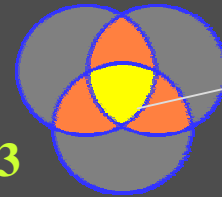
Disease transmission is absent or not frequent.

No Interaction:
Better well-being
Good hygiene
Sanitation



2

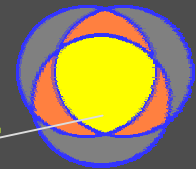
Scarce Interaction:
Oversight, but with regular hygiene and sanitation



3

Disease transmission is constant and for long time.

Frequent Interaction:
Unsuitable patterns for individual and family hygiene and sanitation



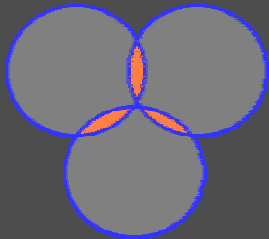
4

Disease transmission is Hard, permanent and intensive. Normally affects a complete family every year.

High Interaction:
It is related with poor hygiene and sanitation of households

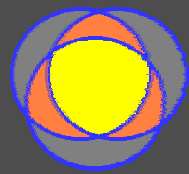
Malaria frontiers.

HOST SUBMODEL. In a case - control type study we found:



control

Daily bath, change of clothes, sweeping of the house and patios, cut the peridomestic vegetation, use of bednet, use a commercial insecticides, continuous walls, participation in breeding site elimination



case

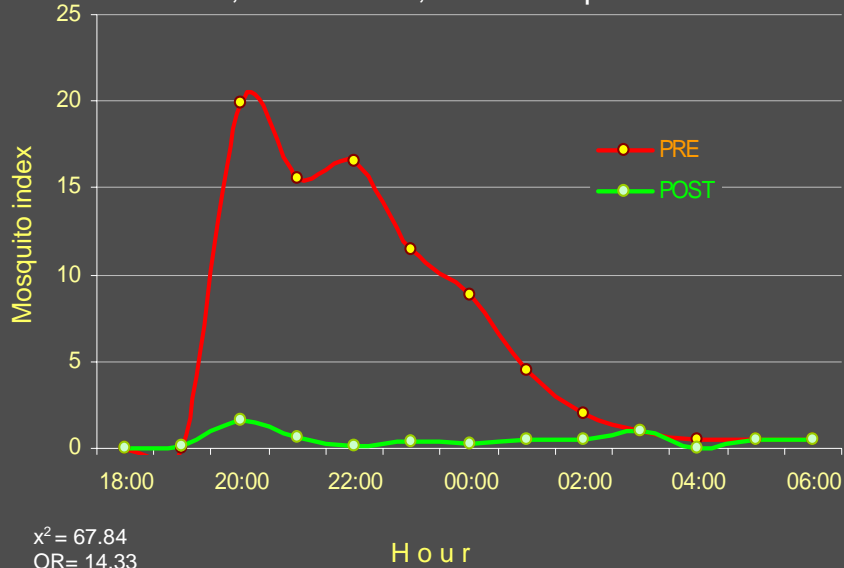
	OR	IC 95%	P
NO to take a daily bath	21.8	2.5-182.9	0.0001
NO to daily change of clothes	3.5	1.0-11.9	0.041
NO to sweeping the house and patios	7.4	1.4-39.2	0.007
NO cut the peridomestic vegetation	27.9	5.8-133.5	0.0000
NO to use of bednet	3.7	1.5-8.8	0.003
NO to use a commercial insecticides	7.6	1.0-60.9	0.027
Discontinious walls	5.6	2.1-14.5	0.0002

Agrees with solid knowledge of other international studies from Asia, Africa and America (1930-2000)

VECTOR CONTROL SUBMODEL:

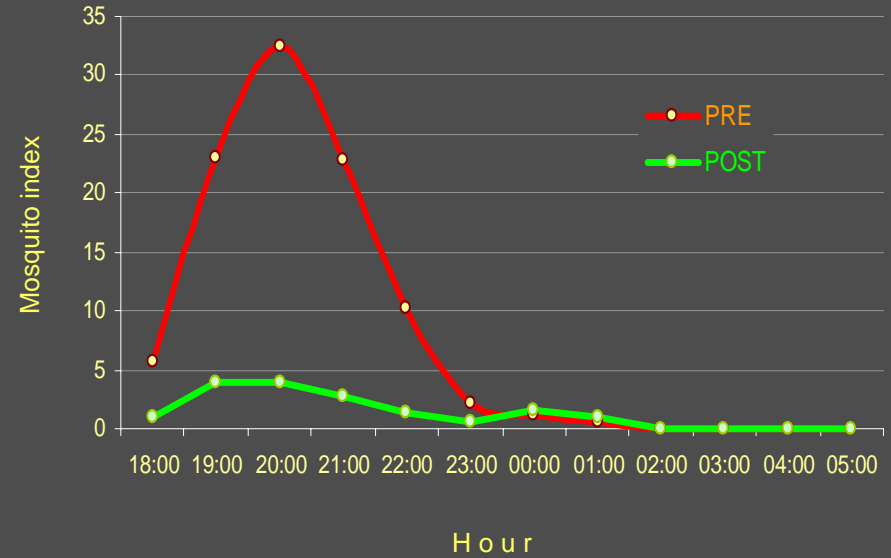
1. Mosquito densities are not constant and similar, a preventive insecticide spraying can be apply before the increments.
2. If malaria concentrates in a few households, insecticide can use only in these cases.
3. The breeding sites of *An. pseudopunctipennis* are susceptibles to seasonal strategy **WITH COMMUNITY PARTICIPATION**, and this way obtain an adult population control without insecticides.

Pre and post density patterns of *An. pseudopunctipennis*
 ABSE, Paso Limón, Oaxaca. April - 1999

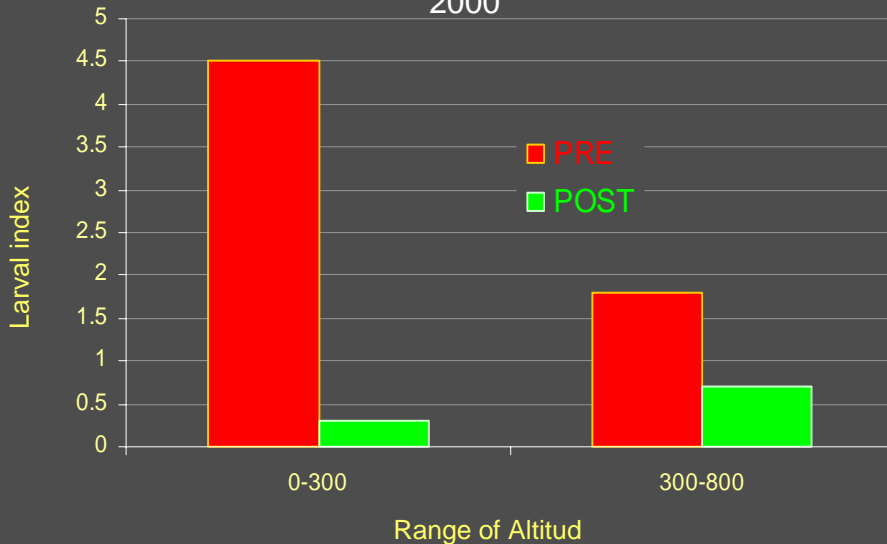


$\chi^2 = 67.84$
 OR= 14.33
 p= >0.0000
 CI 95%= 6.04-36.33

Pre and post density patterns of *An. pseudopunctipennis*
 ABSE, Corozal, Oaxaca. March - 1999



Pre and Post larval density index of *An. pseudopunctipennis*, in
 localities with different altitud, Oaxaca. November-December,
 2000





Examples of community participation cleaning streams for malaria mosquito larvae control.

The activity can be learned and evaluated by the community itself.



Our results in this sense showed, in over 600 villages worked monthly in Oaxaca and more than 1,500 in the country, that it can be sustainable and it is an effective community practice.

The cleaning of streams and rivers should be a good alternative for reduction of insecticides.



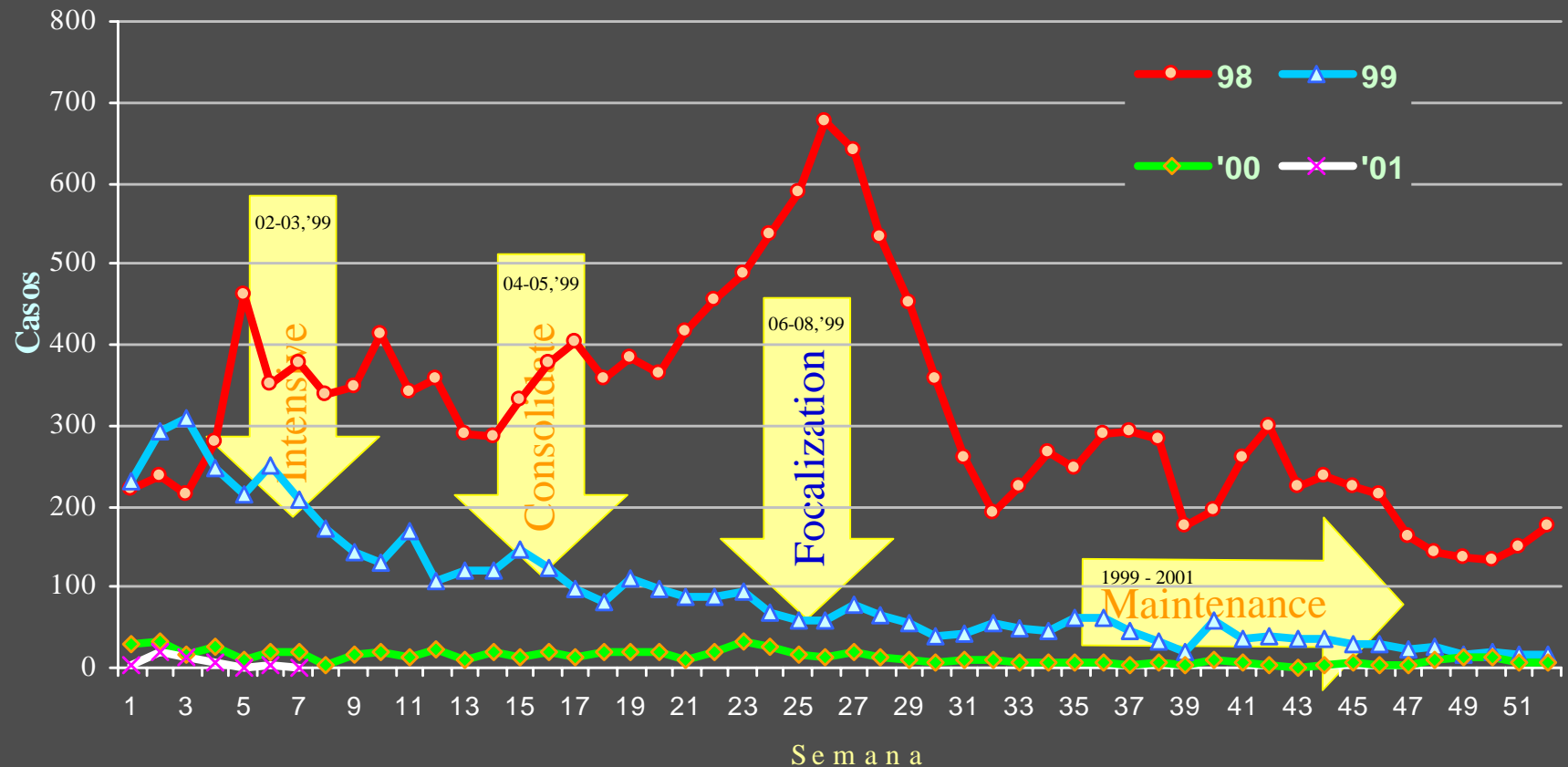
PARASITE-HOST SUBMODEL:

1. Not all the cases we can detect.
Asinthomatics, sub-clinics, repeters, relapses, nex cases.
2. Not all of Radical Cure Treatment are successful treatment. In Mexico about 80% of 5 days RCT are not successful.
3. We have evidences that relapses are associated with opportunity and dose of primaquine tratment.

New strategy for control for vivax malaria transmitted by *Anopheles pseudopunctipennis* in Oaxaca, 1999-2001:

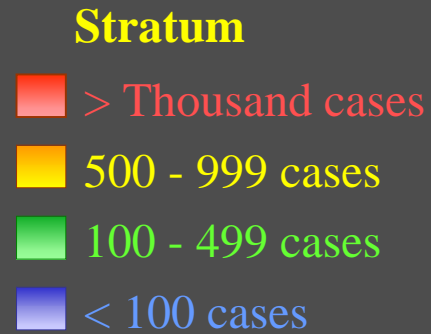
- To reduce the great parasite density in the community: Mass treatment with a single dose of Chloro-primaquine, plus nebulization for outbreak control.
- Permanent elimination of breeding sites based on green alga and trashes remove with community participation.
- 3 consecutive monthly treatment with single dose (chloro-primaquine) with 3 months without medication, to all malaria positive families from 1997 for 3 years.
- Discontinue the insecticides spraying.

WEEKLY MALARIA CASES, OAXACA, 1998 – 1999 - 2000

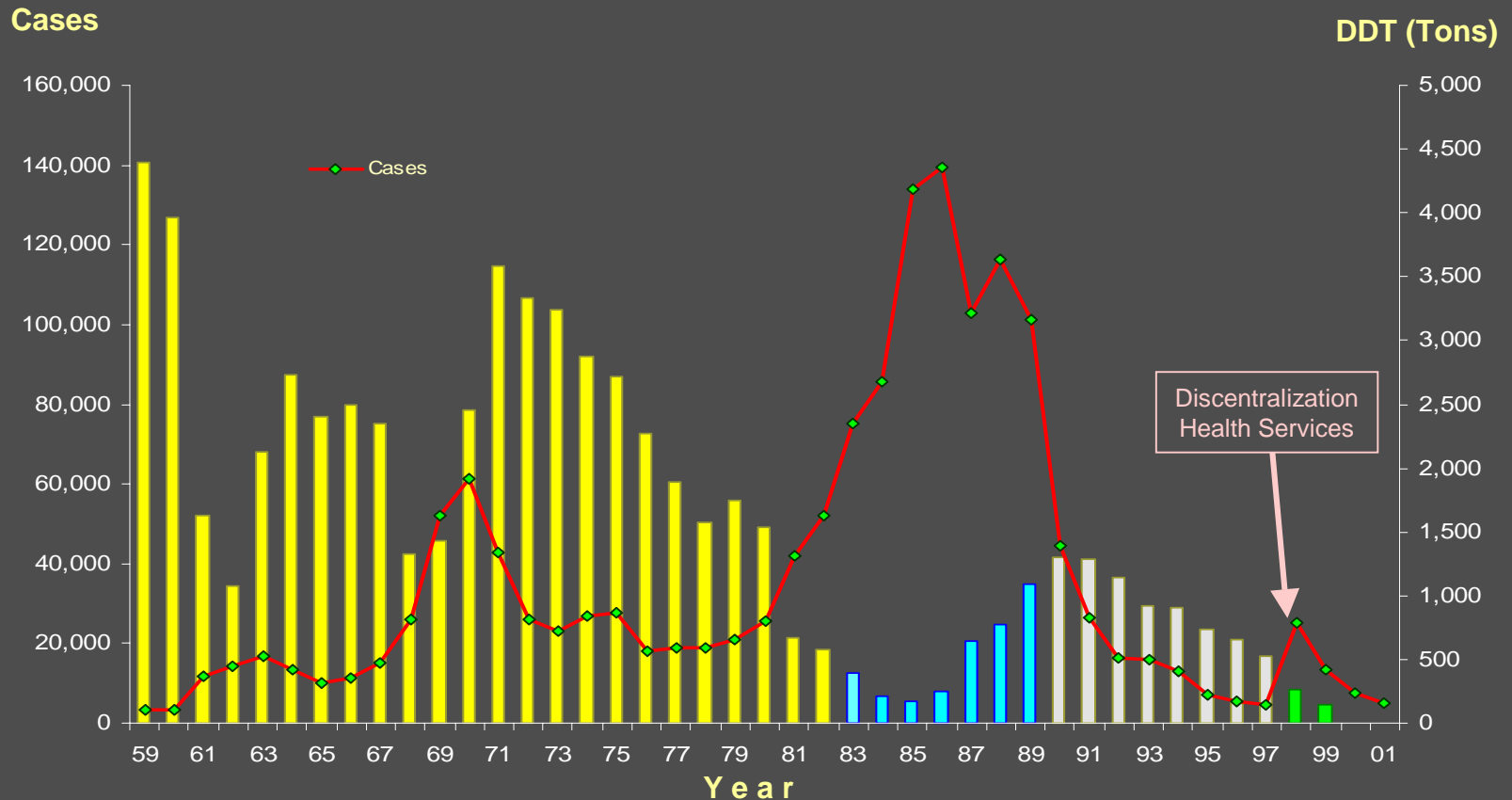


	98	99	00	01
Total cases	17,855	4,848	671	289
Average cases per week	320.7	93.2	12.9	5.5
Cases per locality	16.2	5.9	2.2	1.5
% of positive samples	7.0	2.1	0.3	0.001

Malaria in Mexico: Change of patterns of transmission. 1990-2001



Malaria and DDT spraying in Mexico, 1959 - 2001



ERADICATION

CONTROL

INTENSIVE AND SIMULTANEOUS CONTROL ACTIVITIES

FOCALIZED TREATMENT

What was new in community participation?

Establish a direct agreement with the local health committee.

Community learn directly from natural history of malaria in own environment (observation of breeding sites and larvae and from household characteristics of the families with malaria).

They get qualification and formal organization for breeding sites elimination.

Personnel of the Malaria Control Program advise and evaluated jointly with community the control activities.

Finally we learned that:

The people can be poor, but they can also be clean !!!!!

The people can be illiterate, but they can learn !!!!!

Official Programs had underestimated the power of the community, since they have remaining in different levels.

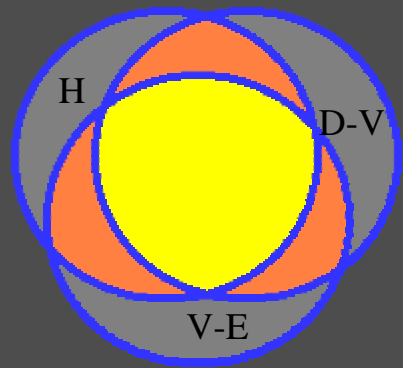
**WHAT IS
HAPPENED WITH
COMMUNITY
PARTICIPATION
IN DENGUE**

Designing a very simple model for community participation based in very simple assumptions:

- 1. Dengue is originated in household and recipients within the house.**
- 2. *Aedes aegyti* is the better pet of the families.**
- 3. We can organize a community from the vecinal organization and give the guidance for it.**

Dengue has a higher interrelation between the hosts, dengue viruses and the environment.

So, it needs to get a total households and the villages as universe to mosquito control.



The dengue model include a basic strategies:

- Clean patio, and
- Water protection



**CLEANING THE
PATIO:**

**A every day
exercise**

