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Malaria in the Americas, 1996

In 1996 were reported 1,138,966 cases of malaria in the Region of the Americas (382.04 cases per 100,000) with 298 million people (37.9%) living in areas where ecological conditions were propitious for the transmission of malaria. Risk of exposure is the result of factors related to population movement, social stability, and adoption of individual and collective attitudes and behaviors which prevent malaria and protect against contact with vectors. These factors are further influenced by immediate access to appropriate diagnosis and treatment. Case detection rates for the population inhabiting areas ecologically propitious for transmission decreased from 523.2 to 382.04 per 100,000 in the same period (Table 1).

Of a total of 452 million people in the 21 countries with active malaria transmission, 218 million live in areas with risk of transmission. Of these, 130 million are exposed to low or very low risk of malaria transmission. Among this group, only 52,269 malaria cases were detected, resulting in a case detection rate of 40.2/100,000 or an API of 0.4 cases/1,000 exposed persons per year. The remaining 88 million people are living in areas exposed to moderate and high risk of transmission. The latter group is still suffering quite severe malaria morbidity, with APIs ranging from a low 0.96/1,000 in El Salvador to a very high 343/1,000 in Suriname. The overall API is 12.5 per 1,000 inhabitants in those areas.

The analysis by subregion indicates that Brazil reported the greatest absolute number of malaria with 426,510 cases (39.1%), together with all the Andean Subregion with 39.5%. However, the greatest risk of transmission was seen in the Central American countries (17% of the cases) and the others in the subregion which includes Guyana, French Guyana, and Suriname (API = 322/1,000), followed by parts of Brazil (API = 61.6/1,000), Peru (API = 43.5/1,000), and Belize (API = 42.1/1,000) (Table 2).

Since 1992 when the Global Strategy for Malaria Control (GSMC) was adopted in Amsterdam, the countries of the Americas have reoriented their malaria control programs according to four basic principles of the GSMC. These principles, that should be adapted to local epidemiological characteristics and patterns of transmission, are: 1) adequate case management and treatment (early diagnosis and treatment of each case); 2) implementation of preventive measures including vector control (promotion of individual and populational anti-vectorial preventive measures); 3) improvement local capabilities in the detection of malaria epidemics (increase epidemiological surveillance of risk factors of malaria epidemics in special the ones caused by Plasmodium falciparum) and 4) strengthening of local capabilities in epidemiological analysis (use of epidemiological stratification tools and results to determine interventions).

Of the 21 countries of the Region with active

IN THIS ISSUE...

TABLE 1
Malaria morbidity in the Americas, 1970-1996

	Population (in thousands)		Blood slides			Case detection (per 100,000 inhabitants)	
Year	Total Countries	Malarious Areas*	Examined	Positive	Slide Positivity Rate (SPR)	Total Americas	Malarious Areas
1970	505,819	181,257	9,925,162	344,170	3.47	68.04	189.88
1971	513,544	185,492	10,134,212	338,416	3.34	65.90	182.44
1972	524,774	190,448	9,695,953	284,813	2.94	54.27	149.55
1973	535,109	195,528	9,400,682	280,276	2.98	52.38	143.34
1974	544,865	200,755	8,997,318	269,003	2.99	49.37	134.00
1975	555,676	205,872	9,276,878	356,692	3.84	64.19	173.26
1976	565,249	211,086	9,352,775	379,364	4.06	67.11	179.72
1977	576,942	215,550	9,274,480	398,925	4.30	69.14	185.07
1978	587,704	220,153	9,493,751	468,923	4.94	79.79	213.00
1979	600,263	226,361	8,630,653	515,271	5.97	84.47	227.63
1980	610,021	231,366	8,943,369	602,836	6.74	98.82	260.56
1981	627,375	239,260	9,100,529	629,629	6.92	100.36	263.16
1982	635,954	245,307	8,826,418	715,177	8.10	112.46	291.54
1983	639,212	249,327	9,113,611	830,700	9.11	129.96	333.18
1984	659,535	257,276	9,422,827	931,356	9.88	141.21	362.01
1985	665,777	259,838	9,485,203	910,917	9.60	136.82	350.57
1986	662,983	263,371	10,070,388	950,570	9.44	143.38	360.92
1987	672,941	268,217	9,764,285	1,018,864	10.43	151.40	379.87
1988	703,370	280,758	10,092,472	1,120,040	11.10	159.24	398.93
1989	715,994	285,394	9,638,847	1,113,764	11.55	155.55	390.25
1990	698,741	278,600	9,459,912	1,045,808	11.06	149.67	375.38
1991	721,256	281,124	9,732,930	1,230,671	12.64	170.63	437.77
1992	725,564	289,948	9,373,323	1,187,316	12.67	163.64	409.49
1993	739,561	289,584	9,633,125	983,536	10.21	132.99	339.64
1994	763,305	231,323	8,261,090	1,114,147	13.49	145.96	481.64
1995	774,712	248,978	9,022,226	1,302,791	14.44	168.16	523.26
1996	**786,055**	**298,128**	**8,601,279**	**1.138.966**	**13.24**	**144.90**	**382.04**

* Areas ecologically propitious for transmission in 21 countries with active transmission.
Information for some countries is incomplete.
Not including information for Haiti or Guyana.

transmission of malaria only Ecuador, Haiti, Mexico and Dominican Republic are implementing control programs that do not follow the basic principles of GSMC. All other countries have adapted their respectiv programs to the Global Strategy.

In recent years, the epidemiological stratification of malaria in the Americas has been accompanied by the integration of case finding, diagnosis, and immediate treatment within the local health services. The local health services had high diagnostic efficiency, confirming 16.4% of suspected cases, whereas active surveillance continues to show a low diagnostic efficiency and high operational cost, confirming only 2.1% of «recent fever» cases.

Table 3 displays the availability of treatment per diagnosed case, ranging from 0.5 to 321 first-line treatments per case reported. The improvements in the availability of second/third-line therapy in Bolivia, Colombia, Peru, and Venezuela compared with previous years may be the result of further implementation of the Global Malaria Control Strategy, which calls for an emphasis on optimal clinical management of the disease.

TABLE 2

Epidemiological status of 21 countries with active Malaria Programs, 1996

Countries by Geographic Subregion	Population Malarious Areas*	Blood slides			Parasite species				
		Examine	Positive	API	*P.falciparum* & mixed	AFI	*P.vivax*	AVI	*P.malariae*
Mexico	34,599	1,731,396	6,189	0.18	85	0.00	6,104	0.18	0
Belize	150	32,285	6,324	42.16	424	2.83	5,900	39.33	0
Costa Rica	805	143,359	5,112	6.35	59	0.07	5,305	6.59	0
El Salvador	5,746	133,288	5,529	0.96	0	0.00	5,524	0.96	0
Guatemala	7,302	96,253	20,217	2.77	111	0.02	20,106	2.75	0
Honduras	3,960	232,436	73,020	18.44	870	0.22	72,150	18.22	0
Nicaragua	4,115	407,519	72,081	17.52	2,647	0.64	69,434	16.87	0
Panama	211	154,169	409	1.94	23	0.11	386	1.83	0
Haiti	7,329	69,853	18,877	2.58	18,887	2.58	0	0.00	0
Dominican Rep.	20	113,154	825	41.25	825	41.25	0	0.00	0
French Guiana	14	34,007	4,334	309.57	3,694	263.86	585	41.79	55
Guyana**	...	...	...	...	...	...	...	...	...
Suriname	55	68,674	18,880	343.27	13,604	247.35	5,262	95.67	14
Brazil	6,988	1,706,214	426,510	61.03	127,539	18.25	297,372	42.55	1,599
Bolivia	3,326	158,320	63,093	18.97	4,252	1.28	58,841	17.69	0
Colombia	5,464	405,662	134,561	24.63	36,558	6.69	97,968	17.93	35
Ecuador	1,460	46,175	7,176	4.92	1,062	0.73	6,114	4.19	0
Peru	4,798	1,121,424	208,543	43.46	49,962	10.41	158,458	33.03	123
Venezuela	687	198,801	17,505	25.48	3,343	4.87	14,116	20.55	46
Argentina	262	7,707	1,533	5.85	0	0.00	1,533	5.85	0
Paraguay	-	-	-	-	-	-			
TOTAL	**87,291**	**6,860,696**	**1,090,718**	**12.50**	**263,945**	**3.02**	**825,158**	**9.45**	**1,872**

... No information available
- No applicable
* Population by thousands (Moderate and High Risk areas only)
** No 1996 data available
Haiti entire population recorded as malarious areas

On the other hand, Guyana, Suriname, and Brazil are still reporting less than one treatment for each diagnosed case of *P. falciparum*.

Vector control activities continue to be applied by the countries as a means to prevent transmission. A clear shift away from the use of organochlorine and organophosphorus products towards the synthetic pyrethroids continues to be observed. However, between 1993 and 1996 the funds budgeted by the control programs have stabilized over the last five years, around US$ 0.70 per person in the malarious areas of the 14 countries that reported (Table 4).

Table 5 presents the geopolitical location and demographics of high risk areas, the causes of exposure, and the control measures implemented. From the characterization of the factors that lead to persistence of transmission, potential control measures can be identified. There is still a need for intersectoral coordination in order to ensure the sustainability of these measures.

Source: Division of Disease Prevention and Control, Communicable Diseases Program, HCP/HCT, PAHO.

TABLE 3

Antimalarial treatment completed in 1996

Countries by Geographic Subregion	Number P. falciparum treatments complete	Treatments complete @ 1,500 mg. of 4-Amino quinolines	Number of reported cases	Number of first-line treatments available per case reported
Mexico	4	738,425	6,293	117.34
Belize	...	20,650	6,605	3.13
Costa Rica	...	85,424	5,480	15.59
El Salvador	...	124,134	5,888	21.08
Guatemala	...	35,867	20,268	...
Honduras	...	200,856	74,487	2.70
Nicaragua	...	2,188,692	75,606	28.95
Panama	...	2,110	476	4.43
Haiti	...	93,743	18,877	4.97
Dominican Rep.	...	454,258	1,414	321.26
French Guyana	...	...	46,780	...
Guyana**	46,604	32,558	59,311	0.55
Suriname	5,559	5,779	16,649	0.35
Brazil	81,005	1,054,916	455,194	2.32
Bolivia	44,357	195,000	64,012	3.05
Colombia	101,695	124,730	135,923	0.92
Ecuador	-	112,000	11,882	9.43
Peru	91,985	636,059	213,132	2.98
Venezuela	11,751	183,610	18,858	9.74
Argentina	...	1,959	2,048	0.96
Paraguay	...	21,268	637	33.39

... No information available
** 1995 data used

TABLE 4

National Budget and Non-Budgetary Contribution to Malaria Control Programs in the Americas, 1993-1996

(In US$)

Countries	National Malaria Budget 1993	Contributed Funds, Loans Other 1993	National Malaria Budget 1994	Contributed Funds, Loans Other 1994	National Malaria Budget 1995	Contributed Funds, Loans Other 1995	National Malaria Budget 1996	Contributed Funds, Loans Other 1996
Argentina	1,826,000	-	3,000,000	-	510,900	-	1,800,000	-
Bolivia	187,066	-	619,430	20,000	871,749	...	257,936	...
Brazil	97,124,000	5,500,000	12,117,647	24,400,000	35,294,157	35,633,326	28,488,629	-
Colombia	13,542,381	-	14,614,045	-	2,518,694	-	8,500,000	-
Costa Rica	1,714,017	344,310	138,000	393,308	1,527,035	1,065,088	1,012,859	409,090
Cuba	...	...	...	...	...	...	...	...
Dominican Rep.	599,334	517,815	667,171	...	758,525	113,717	719,784	117,651
Ecuador	4,963,244	-	5,253,888	-	6,057,590	-	...	-
El Salvador	1,220,930	1,023,255	1,314,286	682,571	1,321,838	402,299	4,597,701	-
Guatemala	2,434,719	166,985	...	288,703	...	41,000	372,795	-
Haiti	20,000	250,000	50,000	...	...	...	...	...
Honduras	2,016,013	283,072	1,611,927	576,382	956,146	40,000	1,295,788	-
Mexico	28,441,613	-	30,297,000	-	16,944,000	-	18,878,871	-
Nicaragua	...	301,647	...	386,004	...	250,000	...	-
Panama	3,719,976	71,000	3,633,545	124,224	3,742,203	145,683	3,686,553	749,730
Paraguay	6,405,522	-	1,030,831	-	1,362,444	-	6,949,609	-
Peru	...	-	3,062,696	-	2,865,431	-	...	-
Venezuela	6,976,914	4,600,000	24,233,445	25,319,792	...	...	...	...
SUB TOTAL	**171,191,729**	**13,058,084**	**101,643,911**	**52,190,984**	**74,730,712**	**37,691,113**	**76,560,525**	**1,276,471**
Guyana	538,535	-	295,483	-	...	...	...	...
Belize	477,919	100,000	617,462	79,407	-	760,819	331,513	760,819
Dominica	...	...	...	...	...	...	...	...
Franch Guiana	91,973	-	...	-	-	328,048	-	-
Grenada	...	...	...	...	...	...	...	...
Guadalupe	...	...	...	...	...	...	...	...
Jamaica	...	...	...	...	...	...	...	...
Panama	...	...	...	...	...	...	...	...
St. Lucia	...	...	...	...	...	...	...	...
Suriname	...	...	5,494	...	49,000	758,525	45,544	195
Trinidad & T.	...	...	...	...	...	...	...	...
SUB TOTAL	**1,108,427**	**100,000**	**918,439**	**1,847,392**	**49,000**	**1,847,392**	**377,057**	**761,014**
TOTAL	**172,300,156**	**13,158,084**	**102,562,350**	**54,038,376**	**74,779,712**	**39,538,505**	**76,937,582**	**8,819,129**
Gran Total		**185,458,240**		**156,600,726**		**114,318,217**		**85,756,711**
Funds/Person in Malarious Areas		**$0.64**		**$0.68**		**$0.80**		**$0.65**

Note: Funds/person only from reported data

TABLE 5

Malarious areas at high risk of transmission, and control priorities, 1996

Countries	Population	km2	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
Campeche	129,121	15,550	89			
MEXICO						
Campeche	129,121	15,550	89	House, larvacide and aerial	A. albimanus	Significant migration of agricultural
Chiapas	1,092,683	24,000	1,539	spraying; individual and mass	A. vestitipennis	workers from the south.
Guerrero	426,911	9,407	74	radical treatments; entomological	A. pseudopunct	Poor housing conditions.
Michoacan	558,801	8,596	341	studies; and promotion of		Vector resistance in small
Oaxaca	933,348	17,584	1,051	environmental management.		dispersed areas.
Quintana Roo	141,156	7,552	141			Population habits of outdoor
Sinaloa	482,643	11,618	1,516			activities in the evening hours.
Tabasco	259,546	4,932	199			
Sub-total	**4,024,209**	**99,239**	**4,950**	API = 1.23/1000		
BELIZE						
Corozal	30,809	1,390	345	Spraying and drug therapy.	A. albimanus	Limited residual spraying
Orange Walk	33,207	1,256	211	Case Treatment		No compliance to treatment
Belize	61,733	701	282			Unsupervised spraying
Cayo	40,800	3,585	2,246			
Stann Creek	19,575	1,289	1,495			
Toledo	18,877	2,190	2,006			
Sub-total	**205,001**	**10,411**	**6,585**	API = 32.12/1000		
COSTA RICA						
Canton Los Chile	21,293	1,358	567	Radical treatment, focal	A. albimanus	Border areas with heavy illegal migratory movements.
Canton Limon	78,032	1,766	1065	spraying and aerial		
Canton Talamanc	27,858	2,810	638	spraying.		Poorly timed control measures
Canton Matina	24,210	773	655	Social Education and Programs.		with little interagency coordination.
				Epidemiologic Stratification of areas		Poor community participation.
Sub-total	**151,393**	**6,707**	**2,925**	API = 19.32/1000		Environmental degradation.
EL SALVADOR				Spraying, drug therapy,		Poor housing conditions. Unhealthy
Costa Pacifico area hiperendem.	**5,428,293**	**4,754**	**5,121**	larvicides, structural works, mosquito bednets. API = 0.9/1000	A. albimanus	environment. Migratory movement. Lack of education. Poverty. Ideal vector habitat. Types of crops.
GUATEMALA					A. albimanus	Uncontrolled internal migration.
El Peten	35,854Non-coordinated house					Poor housing conditions.
Poptun	20,704	1,411		spraying; low		Difficult access to services.
Dolores	26,741	921		diagnositic and		Insecticide resistance.
San Benito	15,639	722		treatment coverage		
San Marcos	3,791					
Ocos	30,654	515				
Malacaton	39,960	457				
Tecún Unán	17,115	364				
Alta Verapaz	8,656					
Chisec	41,752	840				
Cobán	42,719	767				
Fray Bartolomé	35,814	649				
Sub-total	**271,098**	**48,301**	**6,646**	API = 24.51/1000		
HONDURAS				Integrated measures implemented;	A. albimanus	Presence of rice crops.
Health Region II	565,209	10,049	10,416	drug treatment: different		Increase in the at-risk population due
Health Region III	1,504,379	14,328	7,345	spraying methods for		to creation of industrial parks and
Health Region IV	...	...	17,215	physical and larval control;		rice farming. Migrant populations.
Health Region VI	604,354	15,512	16,178	and community participation.	A. darlingi	Lakes and large ponds used as
Health Region VI	356,810	23,821	13,169	watering holes for cattle.		
						Note: A.darlingi is present only
Sub-total	**3,030,752**	...	**64,323**	API = 21.22/1000		at Region VI

... No information available

TABLE 5 (cont.)

Malarious areas at high risk of transmission, and control priorities, 1996

Countries	Population	km2	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
NICARAGUA					A. albimanus	Decentralization process under way.
Rio San Juan	70,875	7,473	1,978	...		
Chinandega	348,971	4,926	8,802	Low coverage of SILAIS.	A. pseudopunct.	High unemployment.
Leon	330,168	5,107	14,382			Highly mobile population.
Jinotega	214,070	9,755	6,462			Urban epidemic.
Matagalpa	364,790	8,523	7,027			Internal migration.
Nueva Segovia	151,324	3,123	4,420			Inaccessibility.
R.A.A.N.	175,405	32,159	2,578			
Managua	1,056,702	3,672	19,702			
Sub-total	**2,712,305**	**74,738**	**65,351**	API = 24.1/1000		
PANAMA						
Pinogama	15,838	4,790	36			
Las Palmas	23,552	2,560	55		A. albimanus	Nomadic migration of indigenous groups to the south.
Bocas del Toro	23,280	2,123	61	...		
Changuinola	70,110	2,281	68			
Chepigana	31,172	7,700	21			
San Blas	38,268	2,823	96			
Tole	30,552	3,203	70			
Sub-total	**232,772**	**25,480**	**407**	API = 1.75/1000		
HAITI	...	...	...	...	...	...
DOMINICAN REPUBLIC				Prophylactic treatment of immigrants, medicinal barriers, spraying in house and surrounding areas, cleanup of canals, fish farming, Bti treatment of breeding sites.	A. albimanus	Cross-border migration. Trade. Rice farming. Extensive use of immigrant labor in countryside and construction.
Pepillo Salcedo	8,735	16,295	103			
Castanuela	12,159	7,858	146			
Sub-total	**20,894**	**24,153**	**249**	API = 11.9/1000		
FRENCH GUIANA					A. darlingi	Precarius housing
Camopi/T-Sauts	746	1003	91			Border areas with intense migratory movement.
Bas Oyapock	1605	340	161	API = 464.6/1000		
Moroni	6,793	2,512	3,996	AFI = 452.1/1000		
Sub-total	9,144	3,855	4,248			
GUYANA	145 AFI = 224.6/1000	...	4,724	API = 449.3/1000	A. darlingi	Natural resources exploitation in the rain forest.
SURINAME				House spraying with pyrethroids. PHC treatment of clinical cases.	A. darlingi	Low coverage of PHC services. Gold mining exploitation. High circulation of people to/from coastal districts.
Districts:						
Para	6,250	1,150	1,342			
Brokopondo	4,176	3,000	2,463			
Sipaliwini	44,336	132,525	15,075	API = 344.8/1000		
Sub-total	**54,762**	**136,675**	**18,880**	AFI = 247.3/1000		
BRAZIL						
States (# municipalities at risk/total municipalities)						
AC (07/27)	59,768	...	7,383	Low coverage of integrated control due to difficult access and low stability in decentralization process. Lack of coordination between administrative and financial policies.	A. darlingi	All of the epidemiological risk factors that determine malaria transmission in ecological areas of rain forests with remote farms, mining areas and internal migration.
AM (02/62)	447,582	...	45,855			
AP (10/16)	127,951	...	13,418			
MA (02/136)	41,160	...	2,735			
MT (18/117)	358,314	...	34,017			
PA (37/128)	1,146,618	...	123,065			
RO (23/42)	640,365	...	93,302			
RR (07/08)	259,283	...	34,994	API = 82.68/1000		
Sub-total	**3,081,041**		**354,769**	AFI = 35.30/1000		

TABLE 5 (cont.)

Malarious areas at high risk of transmission, and control priorities, 1996

Countries	Population	km2	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
BOLIVIA						
BENI						
Rebiralta	53,700	34,000	10,767	Supervised case finding and	A. darlingi	Lack of clear and straightforward
Guayaraminin	34,500	22,434	10,007	treatment, chemical control,	A. pseudopunct.	policy decision.
TARIJA				physical control of breeding		Permanent migration to areas bordering
Yacuiba y Bermej	51,947	12,073	22,331	sites through petroleum applications.		Brazil and, in the south, Argentina.
STA. CRUZ				Health education on prevention		Internal resistance to change to the new
Plan 3000 y				and control.		strategies. Insufficient financial support.
Prov. Andres Iba	450,000	83,322	8,255			
				API = 87.03/1000		Note: Population at risk of P.falciparum
				AFI = 47.21/1000 only for the population of		88.20 only in Beni.
Sub-total	**590,147**	**151,829**	**51,360**	Riberalta, Guayaraminin		
COLOMBIA					A. albimanus	Sociopolitical factors. Mining.
1. Bajo Cauca-Ura	1,027,202	55,000	63,864	House spraying, physical control.	A.nuneztovari	Animalarial drugs and supplies. Migration
2. Orinoquia	605,818	90,063	47,076	Impregnated bednets, topical	A. darlingi	Settlement. Illegal crops.
3. Pacifico	1,114,582	80,000	6,881	repellents.	A. puntimacula	Vector behavior unknown
4. Amazonia	466,342	110,000	17,317	API = 42.05/1000		Drug Resistance
Sub-total	**3,213,944**	**335,063**	**135,138**	AFI = 14.69/1000		
ECUADOR						
Esmeralda	394,485	14,597	5,555	House spraying.	A. albimanus	Low operational coverage of national
El Oro	425,503	302	1,364			program. Lack of political commitment
Los Rios	564,372	1,992	1,748			to resolving labor problems in the
Manabi	1,093,830	4,015	3,534			old centralized structure.
Canar	37,047	349	...			
Cotopaxi	37,924	233	...			
Loja	195,281	610	...			
Sucumbios	81,275	2,049	1,579			
Pastaza	14,208	24,160	822	API = 3.2/1000		
Guayas	2,702,074	...	3,599	AFI = 0.3/1000		
Napo	112,860	542	...			
Sub-total	**5,658,859**	**48,849**	**18,201**			
PERU				Diagnosis and treatment	A. pseudopunct.	Delay in implementing the Global
Ayacucho	570,000	43,814	9,017	through general health	A.benarrochi	Malaria Control Strategy.
L. Castillo	642,817	15,238	9,034	services. Very limited residual	A.rangeli	Implementation began in 1994.
Loreto	796,694	368,851	94,856	spraying, aerial spraying,	A.darlingi	Lack of coverage of population
Jaen-Bagua	553,713	44,409	22,048	environmental sanitation.		at risk.
Junin	1,133,345	44,409	26,840			Migration.
San Martin	647,175	51,253	13,074			Rice cultivation.
Ucayali	366,877	102,410	5,885	API = 37.19/1000		
Madre de Dios	53,810	85,182	1,243	AFI = 18.42/1000 only for the population of		
Pasco	243,863	25,319	4,264	Piura, L. Castillo, Jaen, San Martin and Loreto		
Sub-total	**5,008,294**	**780,885**	**186,261**			
VENEZUELA						
Amazonas	55,717	179,441	1,365	Spraying and fogging,	A. darlingi	Uncontrolled mining areas in
Bolivar	900,310	238,000	2,977	use of larvicides.	A. aquasalis	the jungle. Border migration.
Sucre	679,595	11,800	3,797	API = 4.9/1000	A.nuneztovari	Transient Workers
Sub-total	**1,635,622**	**8,139**	AFI = 1.7/1000			
ARGENTINA						
Attack phase	24,741	11,275	1,550	Epidemiological surveillance and spraying.	A. pseudopunc.	Heavy internal and international migration. Limited access due to climatic factors. Economic and financial constraints on activities.
PARAGUAY						
Caaguazu	435,461	11,474	214	Case detection and treatment,	A. darlingi	Increase in the number of breeding
Alto Parana	562,216	14,895	263	house spraying.		sites. Migratory movements.
Aambay	...	...	...			Indigenous groups.
Canindeyu	128,935	14,667	119			Temporary workers.
Sub-total	**1,126,612**	**41,036**	**596**			

Eliminating Lead in Gasoline in Latin America and the Caribbean.

Report - 1996

It is well-known that airborne lead from gasoline additives is not the only source of lead pollution. However, leaded gasoline, especially in urban areas, is the most significant source of lead particles in the air, typically responsible for 90% of the lead in the atmosphere in most urban areas where leaded gasoline is still in use.

Apart from representing an immediate health risk through inhalation, lead from vehicle emissions accumulates in the soil, contaminates drinking water, and enters the food chain, thereby facilitating exposure through ingestion. The transition to unleaded gasoline is only one important step in the control of vehicle-related pollution. The elimination of leaded gasoline additives is therefore a necessary and vital step in combatting the adverse impact of lead on health, the environment, and the economy

The serious health effects of lead exposure are widely documented. Numerous studies demonstrate the negative correlation between blood lead levels and the intellectual development of children.

Lead is a chemical element, and as such does not decompose. Accordingly, it will continue to build up in greater concentrations in the environment as long as the use of leaded gasoline persists.

3. One of the most effective technologies for controlling vehicle emissions—catalytic converters—cannot be employed in the presence of lead additives, which permanently deactivate the precious metals used as catalysts. Continuing consumption of leaded gasoline eliminates the possibility of using this technology.

In December 1994, at the Summit of the Americas, 34 Heads of State and Government of the Americas signed a Plan of Action that included two environmental initiatives, the *Partnership for Pollution Prevention* and the *Partnership for Biodiversity*; and two initiatives related to energy: the *Partnership for Sustainable Energy Use* and *Energy Cooperation*. Within the framework of the *Partnership for Pollution Prevention,* the governments involved have made a commitment to developing and implementing national plans of action to eliminate the use of lead as a gasoline additive.

In order to respond to these concerns, a joint project was designed with the participation of the World Bank (IBRD), the Organization of American States (OAS), the Inter-American Development Bank (IDB), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), the U.S. Agency for International Development (USAID), nongovernmental organizations (NGOs), and the Pan American Health Organization (PAHO), with a view to:

- assisting the governments of the Americas in formulating and implementing national plans for the elimination of leaded gasoline.
- exchanging information and sharing experiences during the planning process.
- providing technical assistance.

As a preliminary activity it was decided that a diagnostic study would be conducted. A six-part questionnaire was sent to 40 Latin American and Caribbean countries. Responses were received from 29 countries, including all those with the highest levels of gasoline consumption, and from 21 of the 23 countries that have oil refineries. Of the countries that received the questionnaire, 6 of the 7 countries in Central America, 11 in South America, Mexico, and 11 of the 21 countries of the Caribbean responded. The 29 countries that responded account for over 98% of total regional gasoline consumption.

Progress to date in eliminating the use of leaded gasoline in the Region in question is very significant. However, a few countries have not yet set in motion any national plan to eliminate the use of leaded gasoline or have not advanced very far in this area.

In 1995, six countries attained 100% use of unleaded gasoline (Antigua, Bermuda, Bolivia, Brazil, Colombia, and Guatemala). Six more (Argentina, Belize, Costa Rica, El Salvador, Honduras, and Nicaragua) followed suit in 1996. Of the remaining eight countries, three intend achieve 100% use of unleaded gasoline before the year 2000 (Barbados, Ecuador, and Mexico). Jamaica and Saint Lucia intend to reach this target by 2001, Panama by 2002, Trinidad and Tobago by 2005, Venezuela by 2007, and Peru by 2009. The remaining countries either have not yet set a date (Anguilla, the Netherlands Antilles, the Dominican Republic, Saint Kitts and Nevis, Suriname, and Uruguay) or have not indicated whether they have set a date (Chile and Haiti).

The percentage of unleaded gasoline in the Region is expected to increase from 68% in 1996 to 83% by the year 2000. This progress has resulted in a significant reduction in the lead added to gasoline in the Region: from 27,400 tons/year in 1990 (20 countries) to a projected 10,300 tons/year in 1996 (16 countries), or a 62% reduction.

In addition to the regional survey, a series of subprojects were identified that would furnish knowledge and information on current activities that could be used by the national focal points.

These subprojects are not confined to the technical aspects of eliminating lead additives from gasoline; they cover broader aspects than reducing pollution from mobile sources (for example, improvements and modernization of refineries).

Status of the Subprojects

The subprojects are in varying stages of execution. The first three have been completed, the fourth and the fifth are nearing completion, and the sixth will be incorporated into one or more case studies for the selected countries.

1. *Health considerations related to leaded and unleaded gasoline.* The objective is to document and analyze the adverse impact of both leaded and unleaded gasoline.
2. *Monitoring of the impact on health.* This study proposes a methodology for obtaining provisional information on the amount of lead in gasoline, in the atmosphere, and in the blood of highly exposed population groups.
3. *Motor vehicles.* This study deals, among other things, with the maintenance costs of engines designed to use leaded gasoline when they are used with unleaded gasoline.
4. *Alternative fuels.* The objective of this study is to review the state of the art of the technology and experiences in the use of fuels other than gasoline and diesel for motor vehicles.
5. *Workshop on air pollution from motor vehicles.* The objective is to intensify education on controlling motor vehicle pollution.
6. *Country case studies.* The following countries have been selected from the regional survey and ensuing discussions: the Dominican Republic, El Salvador, Jamaica, Panama, Paraguay, Peru, Trinidad and Tobago, and Uruguay.
7. *Refining.* The objective of this study is to review the additional costs that would be incurred from a comprehensive change to unleaded gasoline, taking into account the investments needed for modernizing and improving refineries to create new product specifications.

During and after the execution of the subprojects, dissemination activities such as meetings, workshops, and seminars will be conducted with the assistance of the PAHO/WHO Representatives to discuss the status and results of the subprojects. These activities will provide an opportunity to share experiences, facilitate cooperation, and determine the need for additional studies and technical assistance.

The documents may be obtained through the respective departments of the World Bank.

Source: Division of Health and Environment, Program on Environmental Quality, HEP/HEQ, PAHO/WHO.

Results of insecticide susceptibility tests carried out in four Central American Countries between 1994-1997

As long as the use of contact and residual insecticides continue to be the chief control method in most countries, one of the most important functions of a vector control program is insecticide susceptibility testing. Standardized tests have been developed by the World Health Organization to detect insecticide resistance (WHO, 1981). Diagnostic concentrations have been established and any significant survival with these concentrations is indicative of resistance. Upon detection of low to intermediate resistance levels, a decision must be made whether to continue the use of the insecticide until operational failure or change to an alternative insecticide or control method.

Adulticides available for use in vector control are grouped according to their chemical structure into 4 main categories: a) chlorinated hydrocarbons (CH) e.g. DDT, dieldrin and HCH; b) organophosphorus compounds (OP) e.g. malathion and fenitrothion which were the earliest alternate compounds to be used following vector resistance to DDT; c) carbamates (C) e.g. propoxur and bendiocarb which have also been widely used as an alternatives in areas of vector resistance; d) pyrethrins and synthetic pyrethroids (PY) e.g. permethrin and deltamethrin.

The following are results of the susceptibility levels of mosquitoes including malaria and dengue vectors to a wide range of insecticides as reported from four Central American countries. It should be noted that in some cases there were only 1-2 tests made in each locality. Follow-up tests will be needed in order to reconfirm results and monitor on-going changes in susceptibility levels.

Honduras: The most extensive testing was carried out in Honduras during 1995 in all of the 8 regions. Tests for 1996 were either not available or were not made. As is summarized in Table 1, testing was carried out against field collected *Anopheles albimanus* and *Aedes aegypti*.

An. albimanus:

Cyfluthrin - Of eleven tests carried out in a total of 10 localities, intermediate to high susceptibility was demonstrated having a range of 87-100%.

Deltamethrin - Similar results were also found with this pyrethroid (87-100%) in 9 of the 10 localities tested. Strong resistance (62%) was however found in Danli.

Fenitrothion - Intermediate to high susceptibility (90-100%) was determined in 9 of the 12 localities tested. Strongest resistance was found in Danli (47%) followed by Montecristo and Catacamas (80-84%).

Malathion - Strong to intermediate resistance (45-78%) was found in 4 of the 11 localities tested. Comparable susceptibility levels (88-100%) were observed in the remaining localities.

Propoxur - The vector demonstrated the highest range of susceptibility (89-100%) to this insecticide in the 9 localities tested.

Ae. aegypti:

Cyfluthrin - In the 3 localities tested, including 5 tests in Tegucigalpa, the vector showed strong susceptibility (96-100%).

Deltamethrin - Similarly, strong susceptibility (95-100%) was found with this insecticide in the 8 localities tested especially in Tegucigalpa.

Fenitrothion - As a result of 6 tests carried out, strong resistance (12-81%) was found in both Tegucigalpa and Choloma-Chamelecon.

Malathion - In comparison, generally high susceptibility (89-100%) was found in the 8 localities tested.

Propoxur - The vector was determined to be 100% susceptibility in La Ceiba and Tegucigalpa.

El Salvador: El Salvador carried out the fewest tests of the 4 reporting countries Table 2. Tests were made using field collected *An. albimanus*.

Propoxur - Results from 4 localities tested during late 1996, determined *An. albimanus* to be nearly 100% susceptibility.

Nicaragua: Results reported were carried out between 1996 and 1997 against *An. albimanus* in Managua and *An. pseudopunctipennis* in Leon Table 3. Since most tests were made in Managua, they represent the largest numbers of replicates carried out in a single area of the reporting countries.

TABLE 1.

Insecticide Susceptibility Test Results for Honduras

Test sp. *Anopheles albimanus*, 1995

Insecticide	Replicates	% mortality	No. of localities	Localities
Cyfluthrin	11	87-100	10	Danli, El Progreso, Catacamas, Montecristo, Amarillo de Rio, Flores, Copan de Florida, La Ceiba/Carril, Preita (Tocoa), Comayagua
Deltramethrin	12	62-100	10	Same localities
Fenitrothion	15	47-100	12	Danli, El Progreso, Catacamas, Montecristo, Amarillo de Rio, Flores, Copan de Florida, La Ceiba/Carril, Preita (Tocoa), Comayagua, Ojochal and Trujillo
Malathion	14	14	11	Same localities except Trujillo.
Propoxur	11	11	9	El Progreso, Catacamas, Montecristo, Amarillo de Rio, Flores, Copan de Florida, La Ceiba/Carril, Preita (Tocoa), Comayagua

Test sp. *Aedes aegypti*, 1995

Insecticide	Replicates	% mortality	No. of localities	Localities
Ciflutrina	7	96-100	3	Tegucigalpa, Choloma-Chamelecon, La Ceiba
Deltrametrina	9	95-100	6	Tegucigalpa, Danli, Juticalpa, Choluteca, Choloma-Camelecon, La Ceiba
Fenitrotión	1	12-81	2	Tegucigalpa, Choloma-Camelecon
Malatión	9	89-100	8	Tegucigalpa, Danlí, Juticalpa, Choluteca, Choloma-Camelecon, La Ceiba, Catacamas y Tocoa
Propoxur	2	100	2	Tegucigalpa y La Ceiba

An. albimanus - Managua:

Bendiocarb - As a result of 3 tests carried out over a period of 3 months, strong resistance (37%) was found in an area of malaria transmission.

Cyfluthrin - Following 6 replicates, a strong wider range of resistant was indicated (30-72%).

Deltamethrin - Following 9 replicates, strong to intermediate resistance was found (66-78%).

Etofenprox - Following 4 replicates to 3 concentrations, intermediate resistant was indicated (77-81%).

Fenitrothion - Since only 1 test was made, indicating strong resistant (55%), additional testing in needed to confirm results.

Lambda Cyhalothrin - Following 4 replicates, intermediate resistant was indicated (81%)

Malathion - As a result of 2 replicates, strong resistance was indicated (36%) over a 6 month period.

Propoxur - Similarly, following 4 replicates, strong resistant was indicated (50%) during the same period.

Pirimiphos Methyl - Following 5 replicates, near complete susceptibility (99%) was found.

An. pseudopunctipennis - Leon

Deltamethrin - As a result of 5 replicates, the vector was found to be completely (100%) susceptible.

Lambda Cyhalothrin - Following 2 replicates, Similarly high susceptibility (99%) was found.

TABLE 2.
Insecticide Susceptibility Test Results for El Salvador

Test sp. *Anopheles albimanus* - 1996

Insecticide	Replicates	% mortality	No. of localities	Localities
Propoxur	4	99-100	4	La Union, San Miguel, Usulutlan y La Paz

Guatemala: Testing was carried out in Guatemala by El Instituto De Investigaciones, Universidad Del Valle De Guatemala (Investigatora Principal, Licenciada Celia Cordon de Rosales) during 1994-1995 in most of the 8 regions. Again tests for 1996 were either not available or were not made. As is summarized in the Table 4, testing was carried out against field collected *An. albimanus*.

Deltamethrin - There was a wide range of susceptibility (7-98%) found in 5 of the 8 regions tested. Strongest resistance was observed in regions 3, 5 and 8 (7-66%) while highest susceptibility (95-98%) was found in regions 1, 2, 3 and 8. There was little difference in susceptibility between 1994 and 1995.

Fenitrothion - The vector was also found to be strongly resistant in most tests but susceptible (98-99%) in regions 1 and 2. Generally stronger resistance was observed in 1995 as compared to 1994.

Malathion - Although only 2 replicates made in 1994, 12

TABLE 3.
Insecticide Susceptibility Test Results for Managua, Nicaragua

Test sp. *Anopheles albimanus* -1995-1996

Year	Insecticide	Replicates	% mortality
1995	Bendiocarb	3	37
1996	Ciflutrina	3	30-72
1995	Deltrametrina	4	66-78
1996	Deltrametrina (0,025%)	5	74
1997	Etofenprox (0,1%)	2	77
1997	Etofenprox (0,25%)	1	79
1997	Etofenprox (0,5%)	1	81
1995	Fenitrotión	1	55
1995	Lambda-Cyhalothrin	4	81
1995	Malatión	2	36
1995	Primifós Metilo	5	99
1995	Propoxur	4	50

Test sp. *Anopheles pseudopunctipennis* - 1997

Insecticide	Replicates	% mortality	Localities
Deltametrina	5	100	Leon
Lambda-Cyhalotrin	2	99	Leon

were carried out in 1995 confirming a wide range of susceptibility (47-99%) found in all 4 regions tested.
DDT - A similar wide range of susceptibility (52-94%) was determined in the 3 regions tested in 1994 and 1995.

In general, these results demonstrate a wide range of resistance to most insecticides in the four reporting countries. In areas where intermediate to strong resistance was indicated it is clear that insecticide use had been over extended and its continued use will result in operational failure. This underscores the need for up-dated susceptibility testing so that alternative insecticides can be used or other control methods can be implemented.
Workers in the field have developed criteria as to what characterizes a good insecticide. These are: (1) high intrinsic biological toxicity against the vector, (2) high effective surface residual activity, (3) minimal acute or chronic toxicity to man, his domestic and wild animals, (4) low irritancy or repellent effect, (5) ease of formulation and application, stability when stored and transported, and good mixing qualities, (6) low cost.
Finally, in order to give a more comprehensive evaluation in the selection of insecticides and their use, an investigation of the baseline data is needed indicating when insecticides were first used including a complete history of insecticide use in the immediate agriculture areas. This will enable an integrated selection of alternative insecticides and allow their extended use as a result of better management.

Acknowledgment is given to the Ministries of Health, of the participating countries as well as to the Universidad del Valle (Lic. Celia Cordon de Rosales, Universidad Del Valle de Guatemala) who provided data. Information was also provided by the Communicable Disease Program, Division of Disease Prevention and Control, PAHO and the country office of PAHO/WHO in Nicaragua.

TABLE 4.
Insecticide Susceptibility Test Results for Guatemala

Test sp. *Anopheles albimanus* 1994-1995

Year	Insecticide	Replicates	% mortality	No. of Regions	Regions
1994	Deltametrina	13	66-98	5	1, 2, 3, 5 y 8
1995	Delrametrina	16	7-95	4	1, 3, 5, y 8
1994	Fenitrotion	17	27-99	5	1, 2, 3, 5 y 8
1995	Fenitrotion	15	38-51	3	1, 3 y 5
1994	Malation	2	99	1	2
1995	Malation	12	47-99	3	1, 3 y 5
1994	DDT	3	84	1	2
1995	DDT	15	52-94	3	1, 2 y 5

References

World Health Organization. (1981). Instructions for determining the susceptibility or resistance of mosquito larvae to insecticides. WHO/VBC/81.807, Geneva.

Source: Division of Disease Prevention and Control, Communicable Diseases Program, HCP/HCT, PAHO.

Exposure to Aromatic Hydrocarbons and their Potential Effects on Workers' Health, Colombia - 1996

In 1992, based on an agreement between the *Empresa Colombiana de Petróleos* (ECOPETROL), the Ministry of Health, the *Unión Sindical Obrera* (USO), and the Pan American Health Organization (PAHO/WHO), a preliminary agreement was drawn up with the object of characterizing the link between exposure conditions, exposure indicators, and the health impact of occupational exposure to benzene, toluene, and xylene among workers at the CIB/ECOPETROL aromatic chemical plant.

Of the three chemical substances, benzene has the greatest impact on workers' health, a fact known and well documented in the international literature. Damage to blood and neurological, psychological, dermatological, and renal damage are attributed to benzene. Chronic exposure to toluene impairs behavioral functions, as demonstrated by measurements of cognitive ability, visual acuity, neuromuscular function, and the discrimination of odors.

The project, which examines the potential impact of aromatic chemicals on the health of workers exposed to hydrocarbons such as benzene, toluene, and xylene, is the epidemiological application of retrospective morbidity and mortality studies, cross association studies, and prospective morbidity and mortality studies. A mixture of designs will be employed, beginning with a cross-sectional indicative study; measures to control exposure will be implemented; and a prospective follow-up study of the working population will be undertaken.

The project is in full gear with respect to the field study of the various areas mentioned. Project execution is the responsibility of PAHO/WHO. Acting as counterparts and facilitator are the Commission on Aromatics, an entity that includes equal representation by labor and management, representatives of the Ministry of Public Health, and a number of groups, such as the National Institute for Occupational Safety and Health (NIOSH); the Center for Worker Studies of the University of Carabobo, Venezuela; the Center for Neurosciences of Cuba; several laboratories in the United States and Colombia; and a Brazilian team of experts. To date, 72 international and 33 national consultants have participated in the project.

Once the respective databases are in place, work will begin on an integrating database and data processing. A sample of 730 workers is being used that includes 345 working in aromatics, 234 of the 1,800 working in maintenance, and 151 retirees.

It is anticipated that the project will recommend a plan of interventions aimed at eliminating and/or controlling the risk of injury and disease in the workplace, as well as promoting greater worker participation in the development of measures in prevention and self-care.

Source: Office of the Director of the SOIP Project and the Division of Health and Environment, HEP, PAHO/WHO.

PUBLICATION

Health and environment analysis and indicators for decision-making, *World Health Statistics Quarterly*, Vol. 48, No. 2, 1995

The Health and Environment Analysis for Decision-Making Project (HEADLAMP) aims to provide decision-makers, environmental health professionals and the community at large with valid and useful information on the impact that environmental hazards have on health, at the local and national levels. HEADLAMP combines methodologies in environmental epidemiology, human exposure assessment, and other fields related to health and environment, in order to produce information that could be easily understood and serve as a basis for action. The articles that describe the HEADLAMP project, its methods, the development and use of environmental health indicators, in the decision-making process, and the findings from field studies were presented in ***World Health Statistics Quarterly, Vol. 48, No. 2, 1995. World Health Organization, Geneva.***

International Conference on Emerging Infectious Diseases

Centers for Disease Control and Prevention (CDC) - Atlanta, Georgia, USA

March 8-11, 1998

The International Conference on Emerging Infectious Diseases will be convened to (1) encourage the exchange of scientific and public health information on global emerging infectious diseases issues, (2) highlight programs and activities that address emerging infectious disease threats, (3) identify program gaps, (4) increase emerging infectious disease awareness in the public health and scientific communities, and (5) enhance partnerships in addressing emerging infectious diseases.

The meeting will consist of plenary sessions and symposia with invited speakers as well as verbal and poster presentations based on the submission of an accepted abstract. Major topics will include current work on surveillance, epidemiology, research, communications and training, and prevention and control of emerging infectious diseases as well as topics related to emergency preparedness and response. Abstracts should address new, reemerging, or drug resistant infectious diseases that affect human health including foodborne diseases, tropical diseases, sexually transmitted diseases, infectious respiratory diseases, infectious diseases transmitted by animals and arthropods, infections acquired in health care settings, infectious diseases of infants and children, infectious diseases in immunodeficient persons, infectious diseases in minority and other at-risk populations, blood safety, and xenotransplantation.

Deadline for submission of abstracts is **October 31, 1997.**

Registration will be limited to 2,500 participants.

Additional information on abstract submission, registration, and exhibit opportunities can be obtained by sending an email message to meetinginfo@asmusa.org of by calling 202-942-9248. Proceedings of the conference will be published in the *Emerging Infectious Diseases* journal.

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