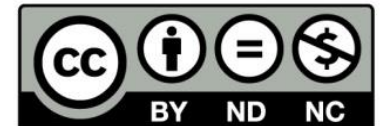




Towards understanding the determinants of Urban Malaria in three cities of the Colombian Pacific.

Alberto Tobón-Castaño
Gabriel Jaime Vélez-Tobón
MALARIA GROUP, University of Antioquia, Medellín, Colombia

Carolina Garcés-Murillo
ILEX-Acción Jurídica, Colombia



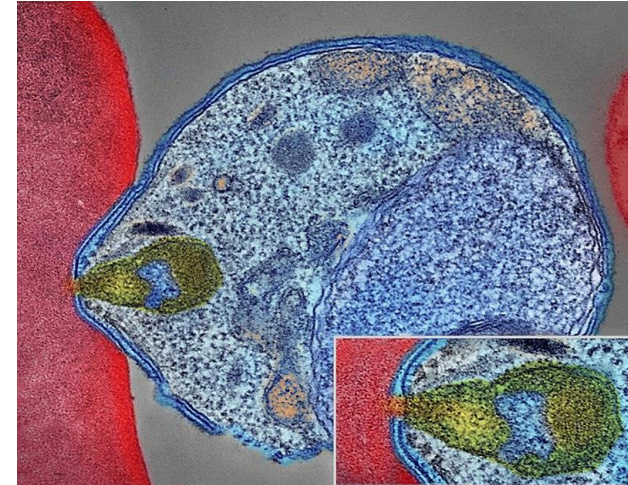
Malaria -Paludism

Vector Bord Disease:

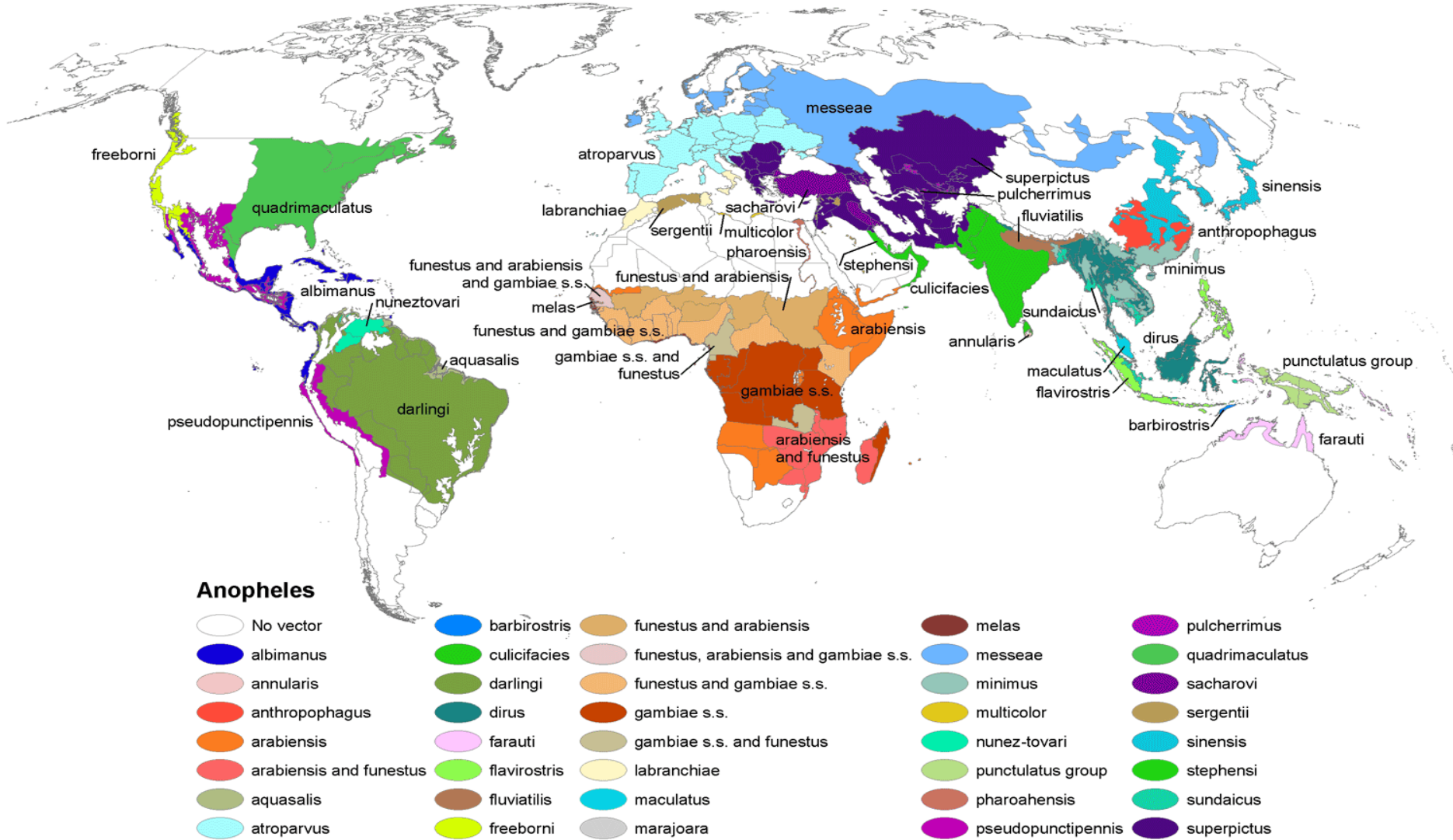
Agent: parasites of the genus Plasmodium.

- 175 species of Plasmodium that infect different vertebrates
- Historically 4 species infect humans naturally

Vector: female mosquitoes of the genus Anopheles. More than 537 species

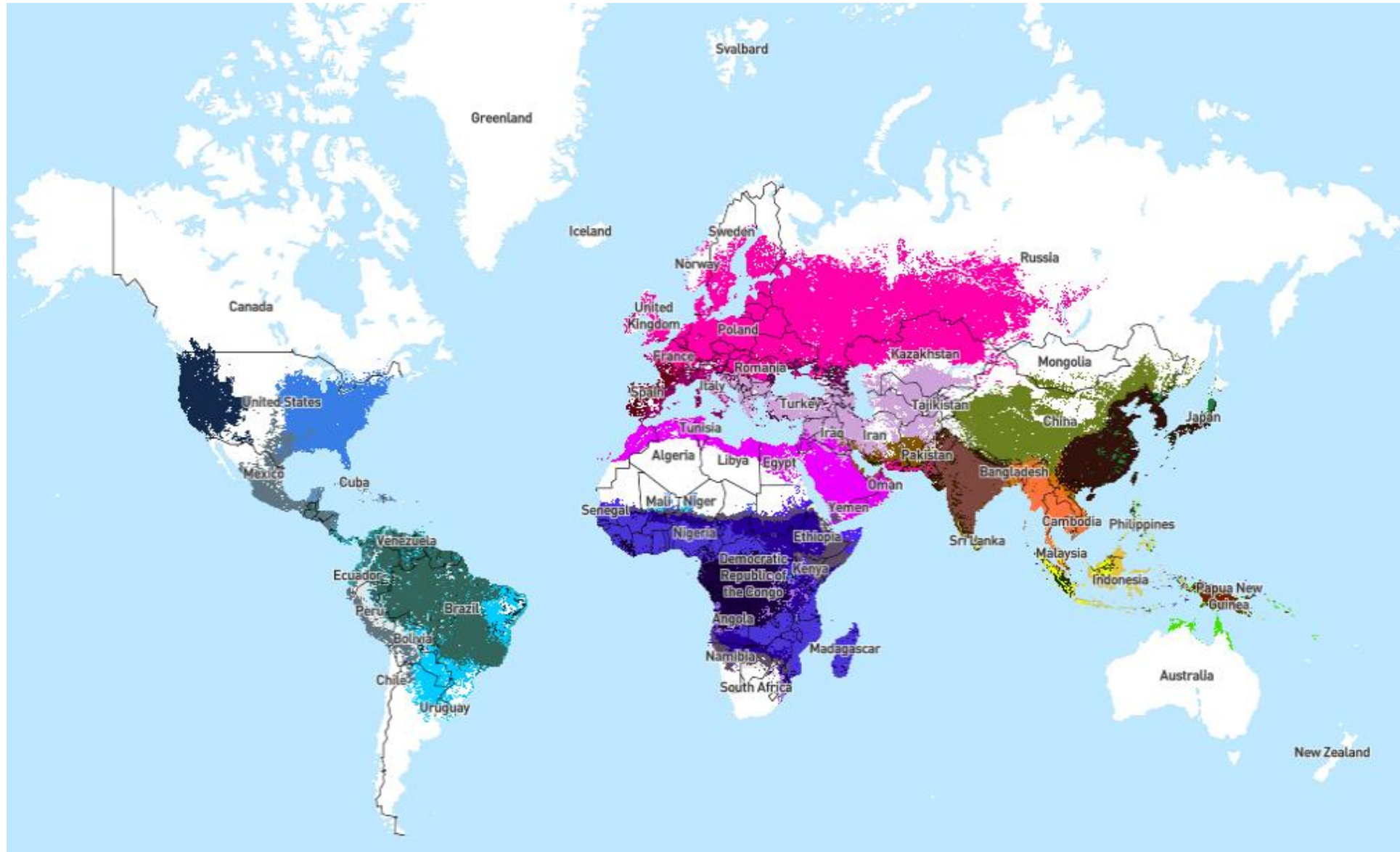


Global distribution of *Anopheles*



This image is a work of the [Centers for Disease Control and Prevention](#), part of the [United States Department of Health and Human Services](#). As a work of the [U.S. federal government](#), the image is in the [public domain](#). MARZO 2008

Global distribution of potential vectors of *Plasmodium*



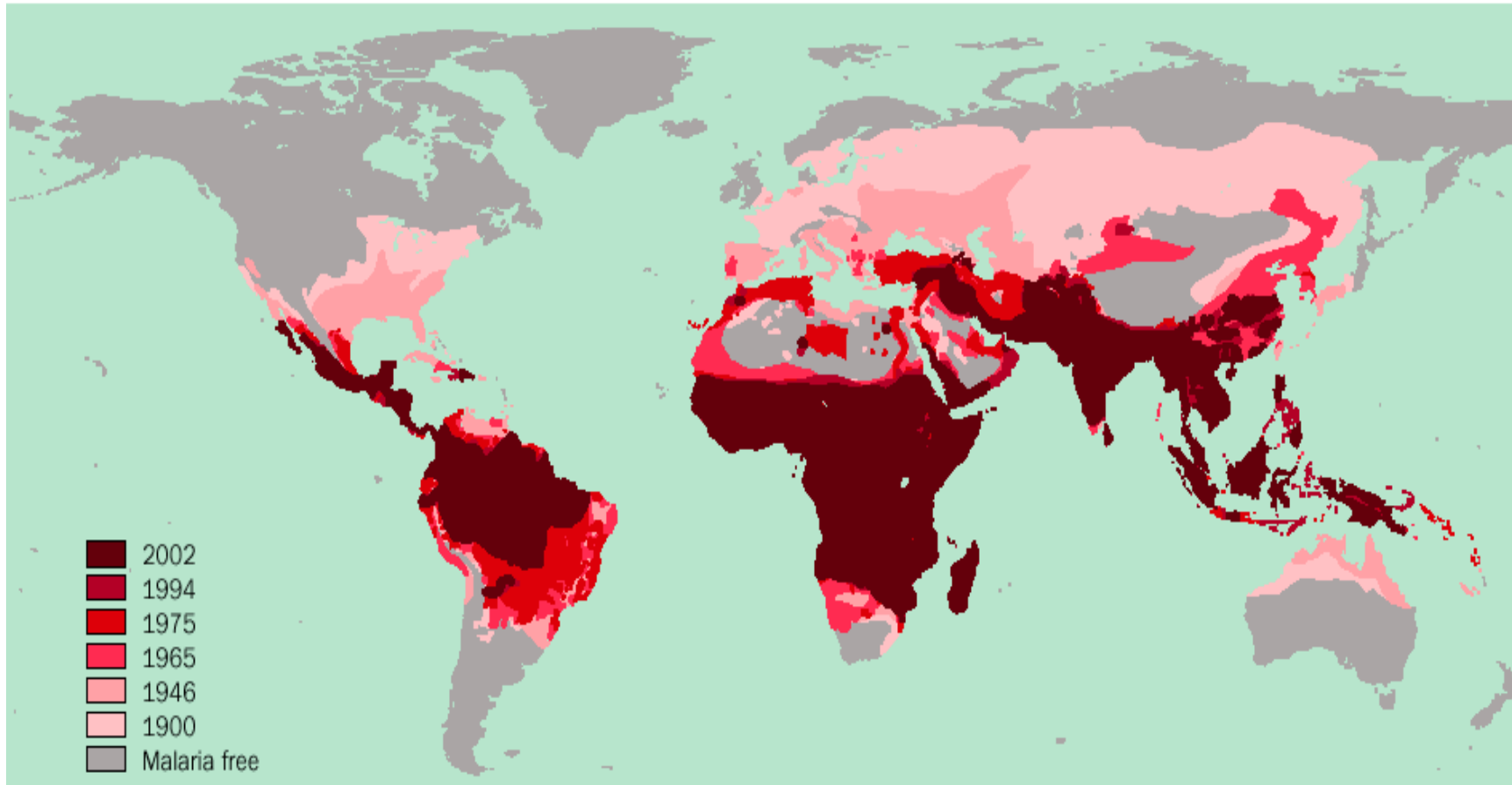
<https://malariaatlas.org/about-map/> 2023

Parasites causing malaria

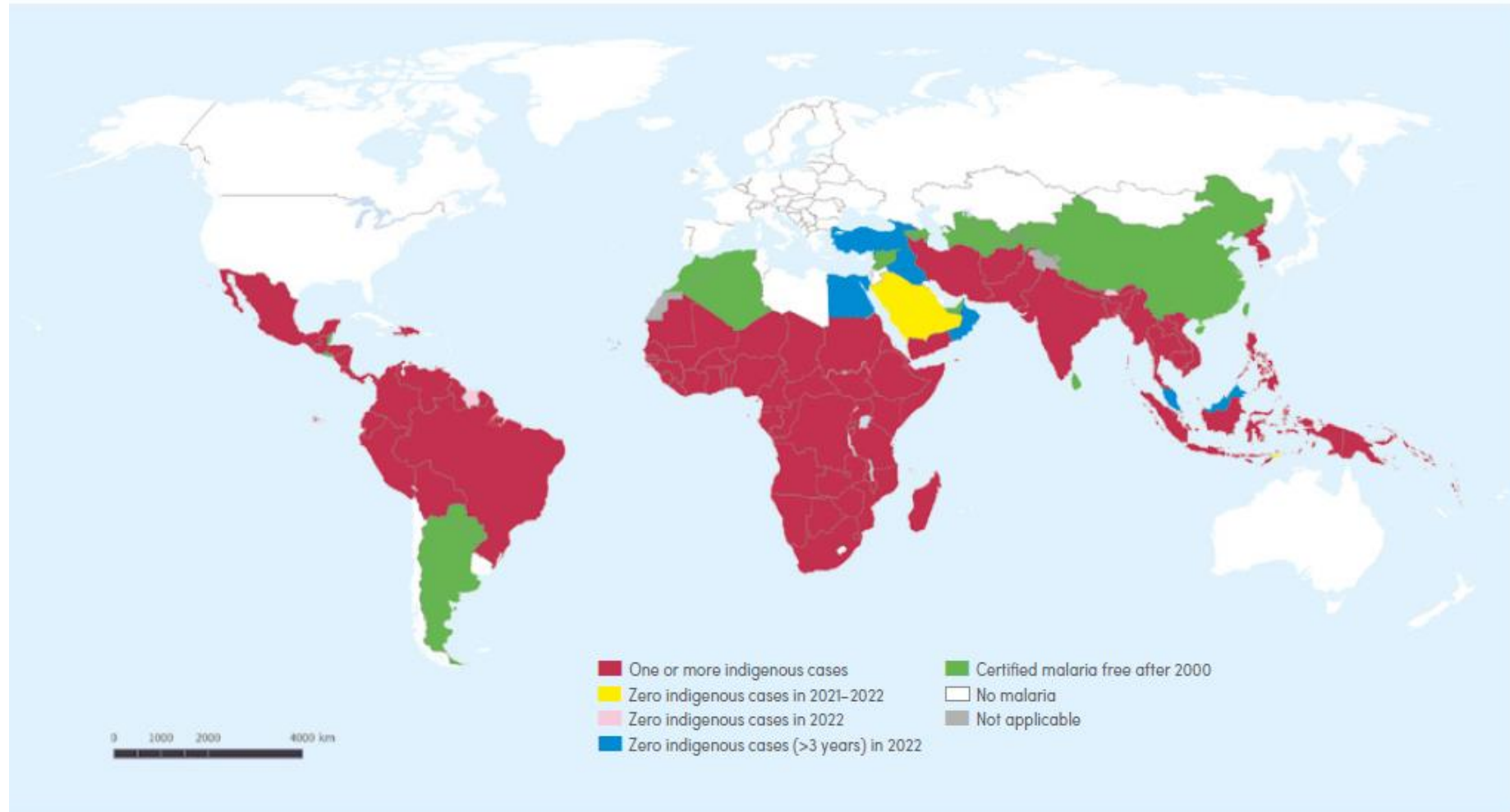
- *P. falciparum*
- *P. vivax*
- *P. malariae*
- *P. ovale*
- *P. knowlesi*
- *P. cynomolgi*
- *P. brasilianum*
- *P. simium*

Acute febril syndrom:

- Inespecífic
- Not distinguishable from other infectious entities
- Asymptomactics



Global situation of Malaria



Countries with indigenous cases in 2000 and their status by 2022^{a,b} Source: WHO database.

WHO: World Health Organization.

Malaysia has a significant number of indigenous malaria cases caused by *Plasmodium knowlesi* infection.

Countries with zero indigenous cases for at least 3 consecutive years are considered to have eliminated malaria. In 2022, Malaysia reported zero indigenous cases caused by human *Plasmodium* species^a or the fifth consecutive year and Cabo Verde reported zero indigenous cases for the fourth year. Belize was certified malaria free in 2023, following 4 years of zero malaria cases.

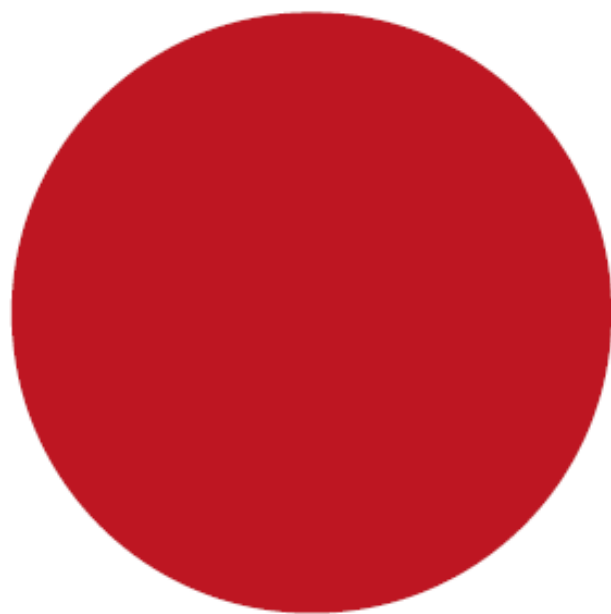
GLOBAL BURDEN OF MALARIA 2023: Cases - Deaths

Global estimated malaria cases and deaths, 2000–2022* Source: WHO estimates.							
Year	Number of cases (000)				Number of deaths		
	Point	Lower bound	Upper bound	% <i>P. vivax</i>	Point	Lower bound	Upper bound
2000	243 000	227 000	263 000	8.3%	864 000	835 000	905 000
2001	248 000	230 000	271 000	8.3%	873 000	841 000	918 000
2002	245 000	227 000	267 000	7.7%	841 000	811 000	885 000
2003	249 000	232 000	271 000	8.0%	813 000	783 000	856 000
2004	250 000	232 000	277 000	7.9%	808 000	774 000	866 000
2005	249 000	232 000	273 000	8.0%	770 000	738 000	819 000
2006	244 000	226 000	268 000	6.9%	776 000	745 000	826 000
2007	240 000	223 000	262 000	6.6%	754 000	723 000	796 000
2008	239 000	223 000	259 000	6.4%	716 000	686 000	757 000
2009	245 000	227 000	267 000	6.4%	726 000	692 000	775 000
2010	247 000	229 000	272 000	6.6%	703 000	668 000	755 000
2011	241 000	225 000	263 000	7.0%	665 000	633 000	707 000
2012	237 000	221 000	257 000	7.0%	619 000	590 000	660 000
2013	232 000	215 000	251 000	6.0%	591 000	560 000	633 000
2014	230 000	209 000	253 000	5.5%	588 000	551 000	643 000
2015	231 000	211 000	254 000	4.9%	586 000	548 000	645 000
2016	232 000	214 000	253 000	4.6%	582 000	546 000	645 000
2017	237 000	219 000	258 000	3.7%	580 000	545 000	644 000
2018	232 000	215 000	253 000	3.0%	581 000	545 000	656 000
2019	233 000	213 000	255 000	2.7%	576 000	537 000	660 000
2020	244 000	221 000	271 000	1.9%	631 000	587 000	747 000
2021	244 000	220 000	272 000	2.1%	610 000	568 000	726 000
2022	249 000	225 000	278 000	2.8%	608 000	566 000	738 000

P. vivax: *Plasmodium vivax*; WHO: World Health Organization.

* Estimated cases and deaths are shown with 95% upper and lower confidence intervals.

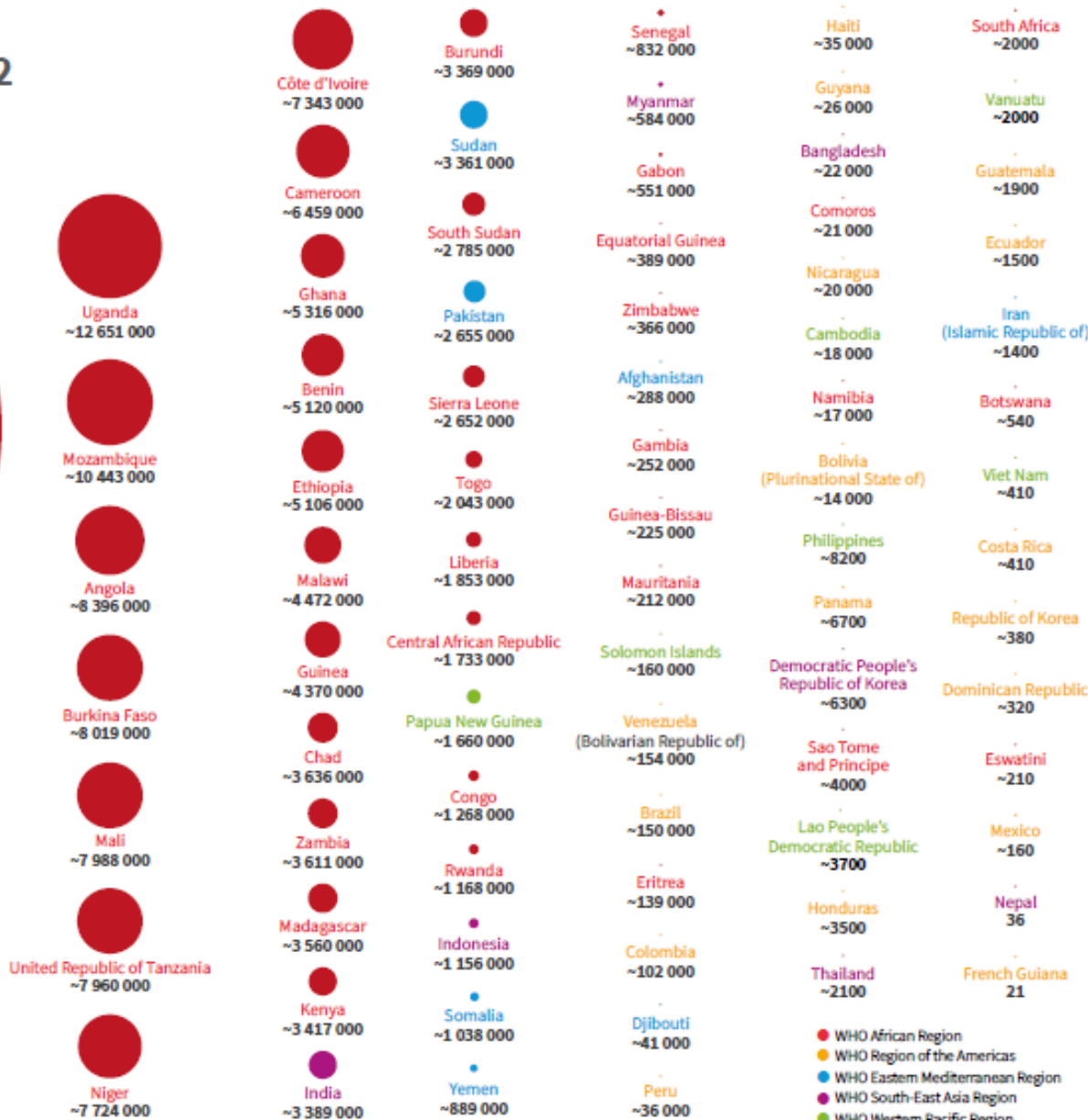
249 million malaria cases estimated globally in 2022



Nigeria
~66 722 000

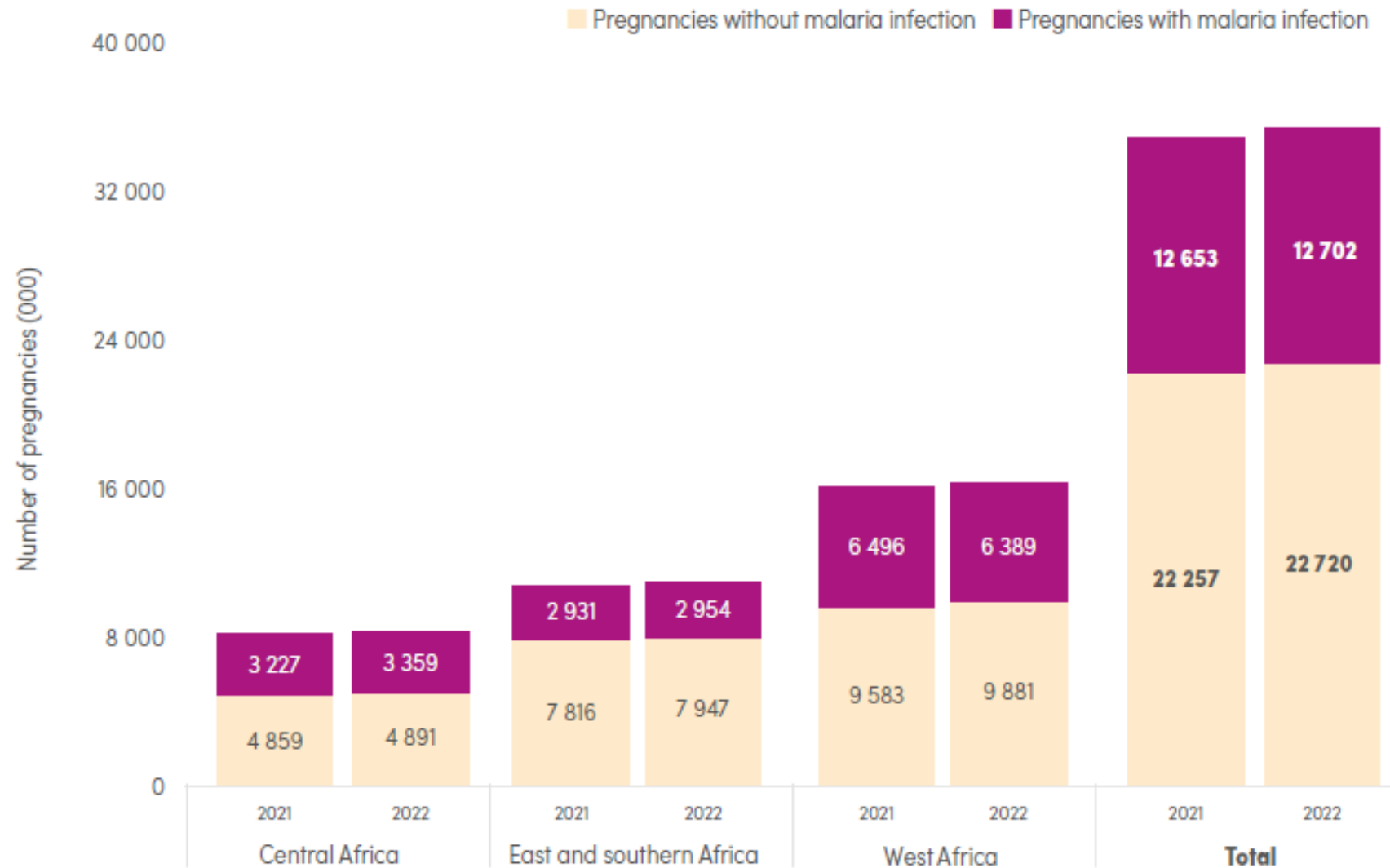


Democratic Republic of the Congo
~30 654 000

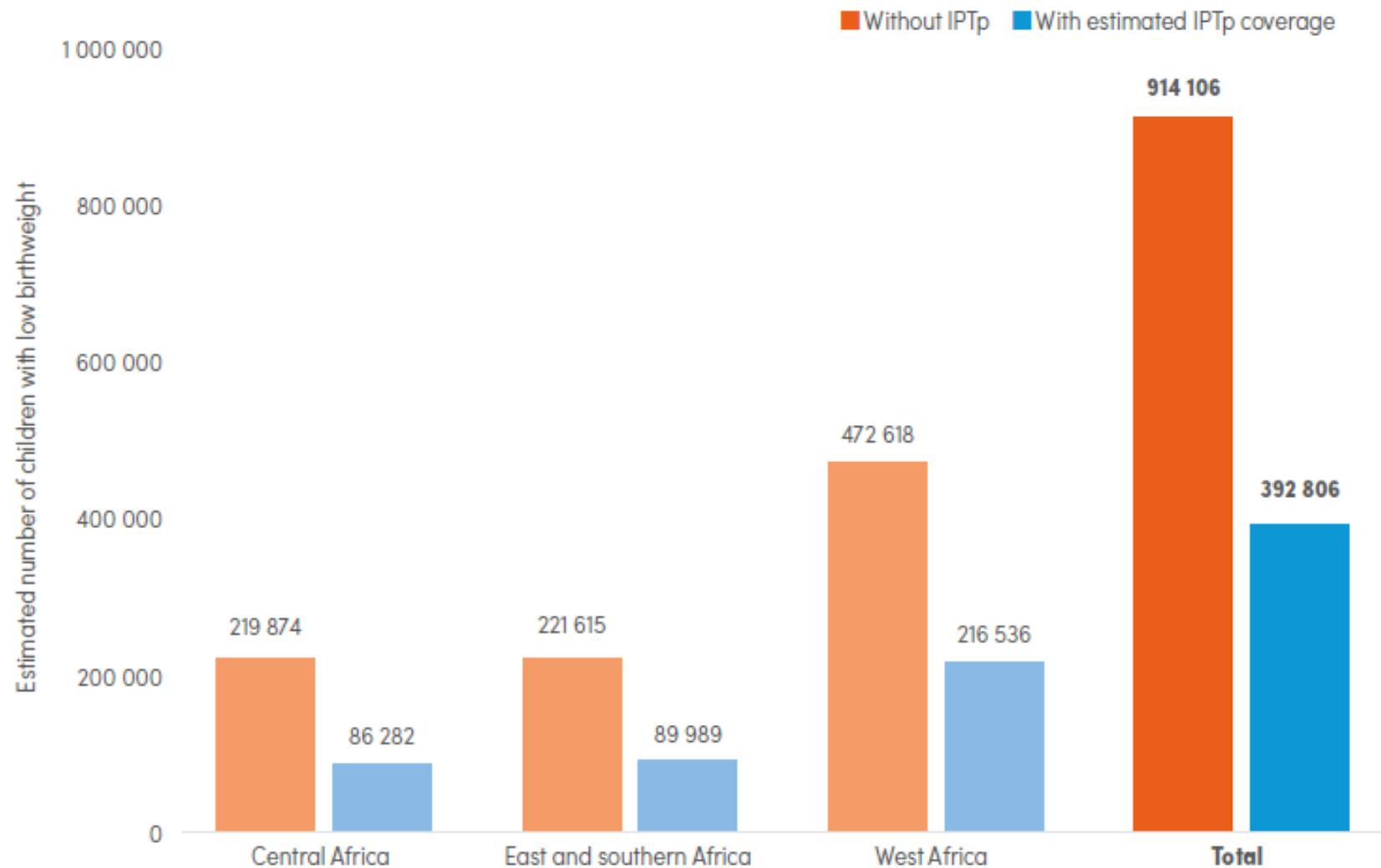


Estimated number of malaria cases per country and area in 2022 Source: WHO database.

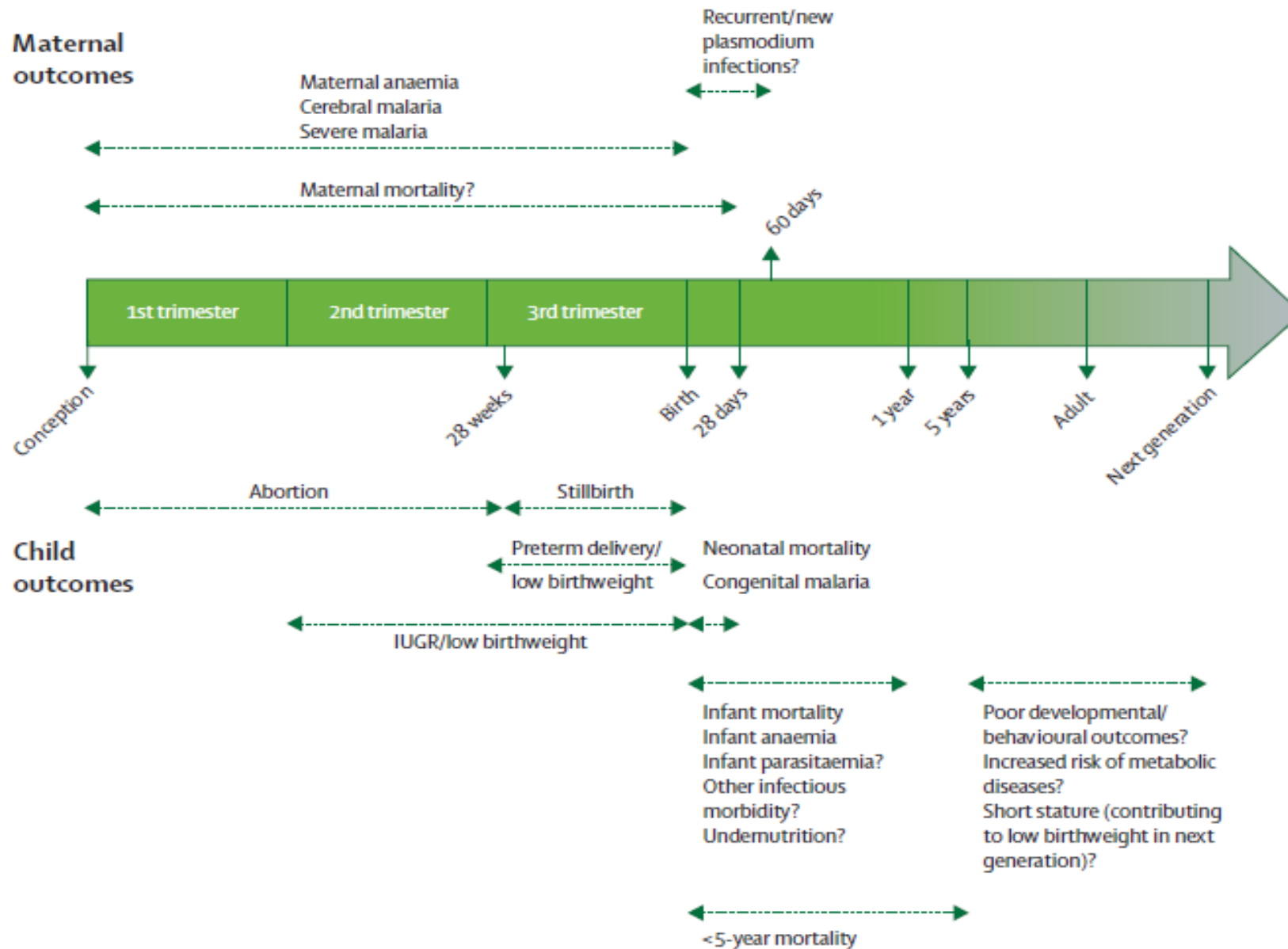
Estimated prevalence of exposure to malaria infection during pregnancy, overall and by subregion in 2022, in moderate to high transmission countries in the WHO African Region *Sources: Imperial College and WHO estimates.*



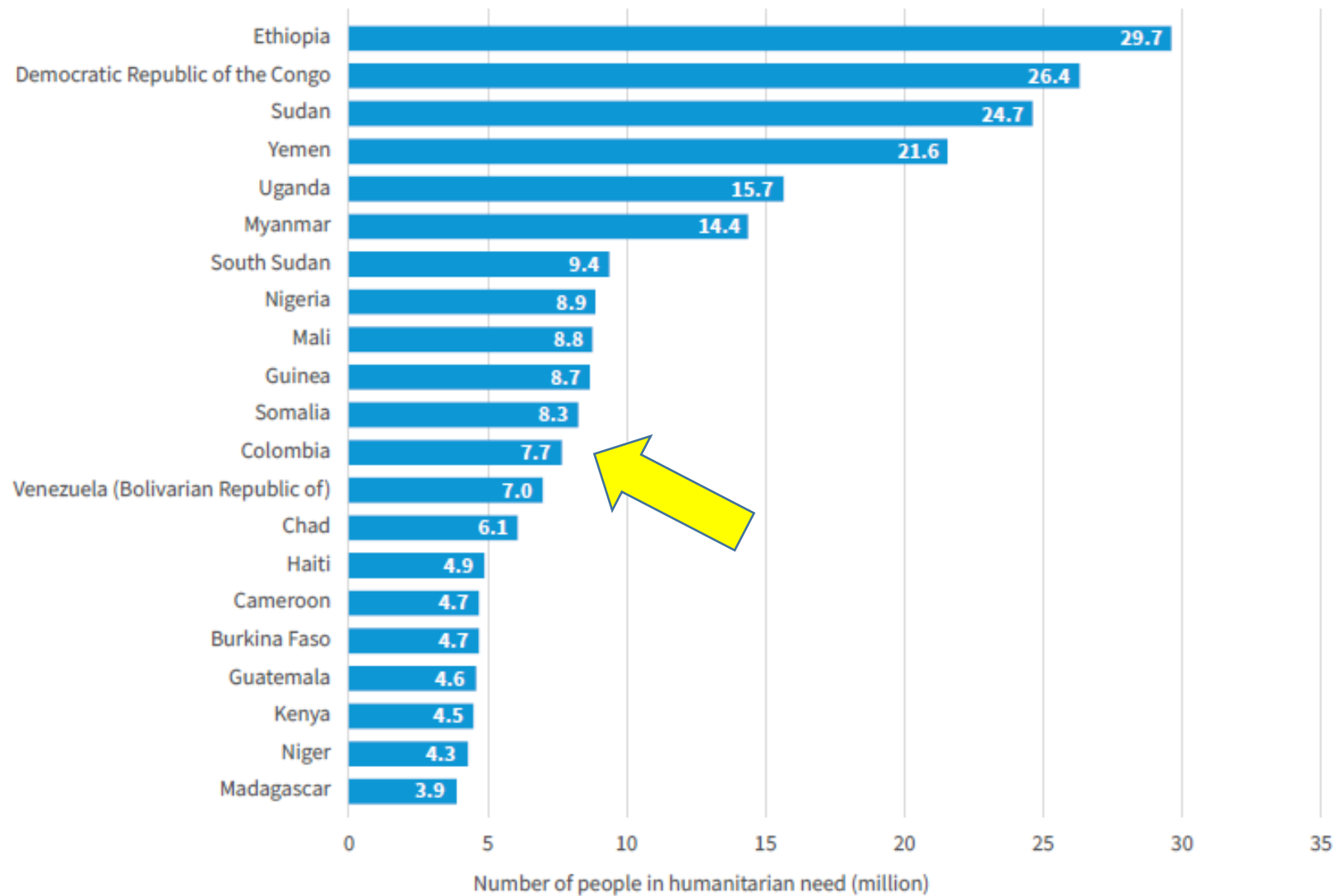
Estimated number of LBWs due to exposure to malaria infection during pregnancy (without IPTp versus at estimated levels of IPTp coverage), overall and by subregion in 2022, in moderate to high transmission countries in sub-Saharan Africa Sources: Imperial College and WHO estimates.



IPTp: intermittent preventive treatment of malaria in pregnancy; LBW: low birthweight; WHO: World Health Organization.



Malaria endemic countries that account for 89% of people in humanitarian aid in 2022 *Source: Global humanitarian overview 2022 (13).*



MALARIA IN COLOMBIA



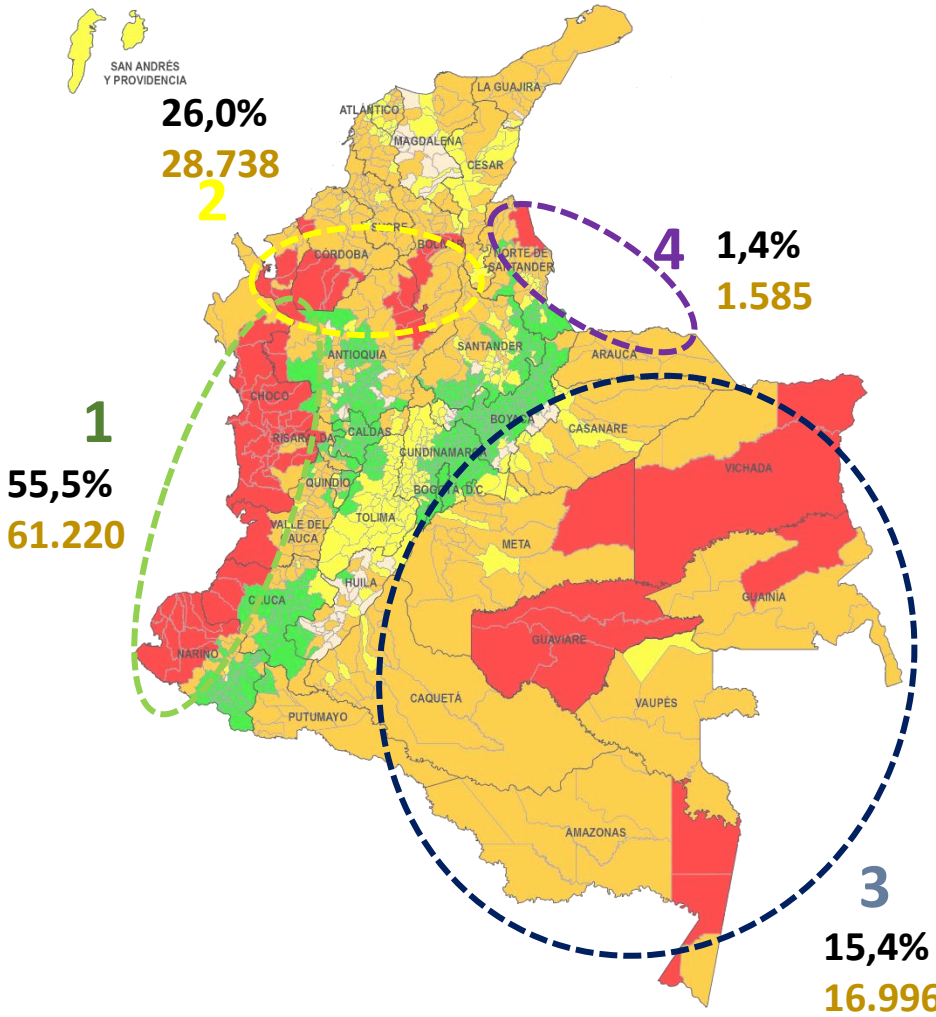
Malaria Risk stratification in Colombia

1 F. Costa Pacífica

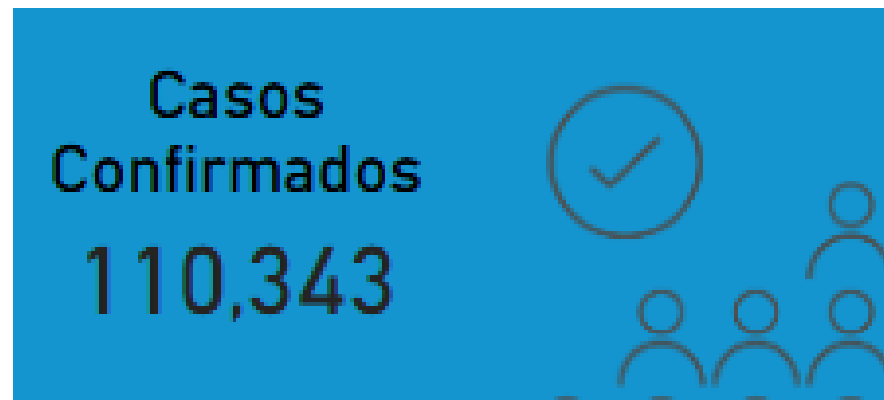
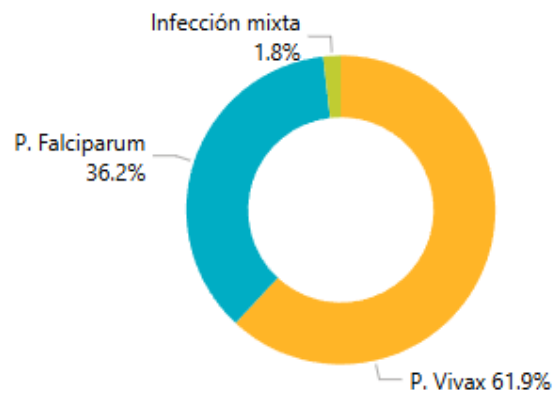
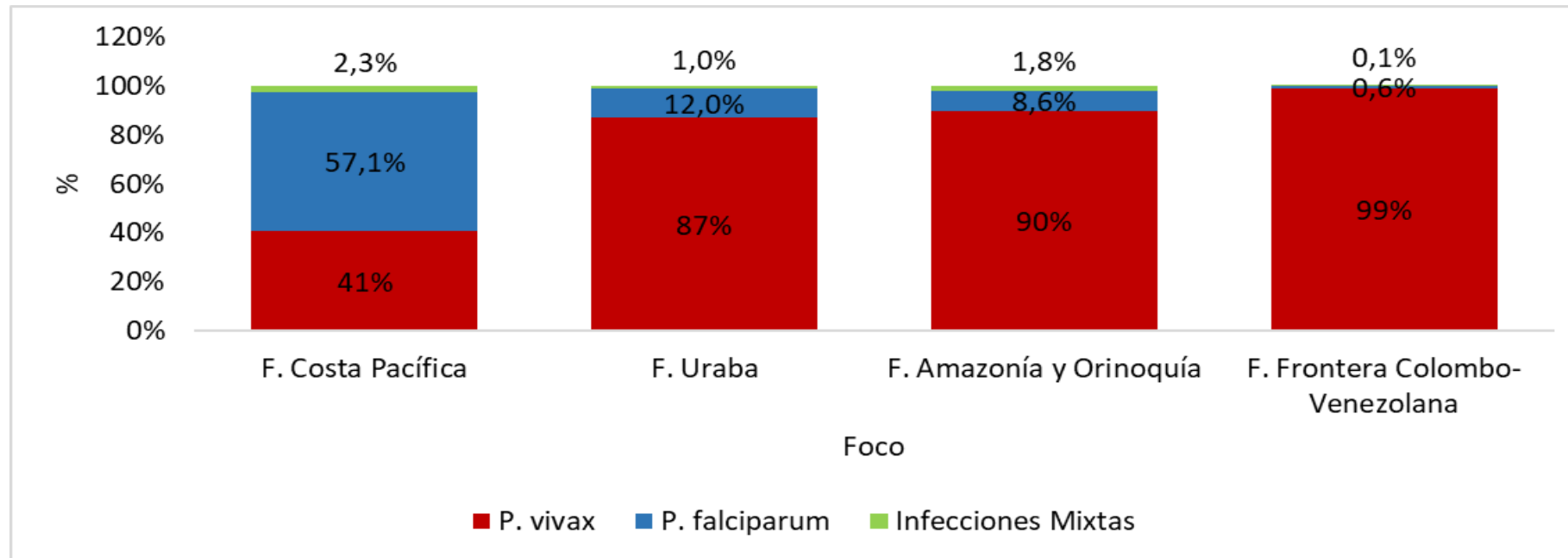
2 F. Uraba

3 F. Amazonía y Orinoquía

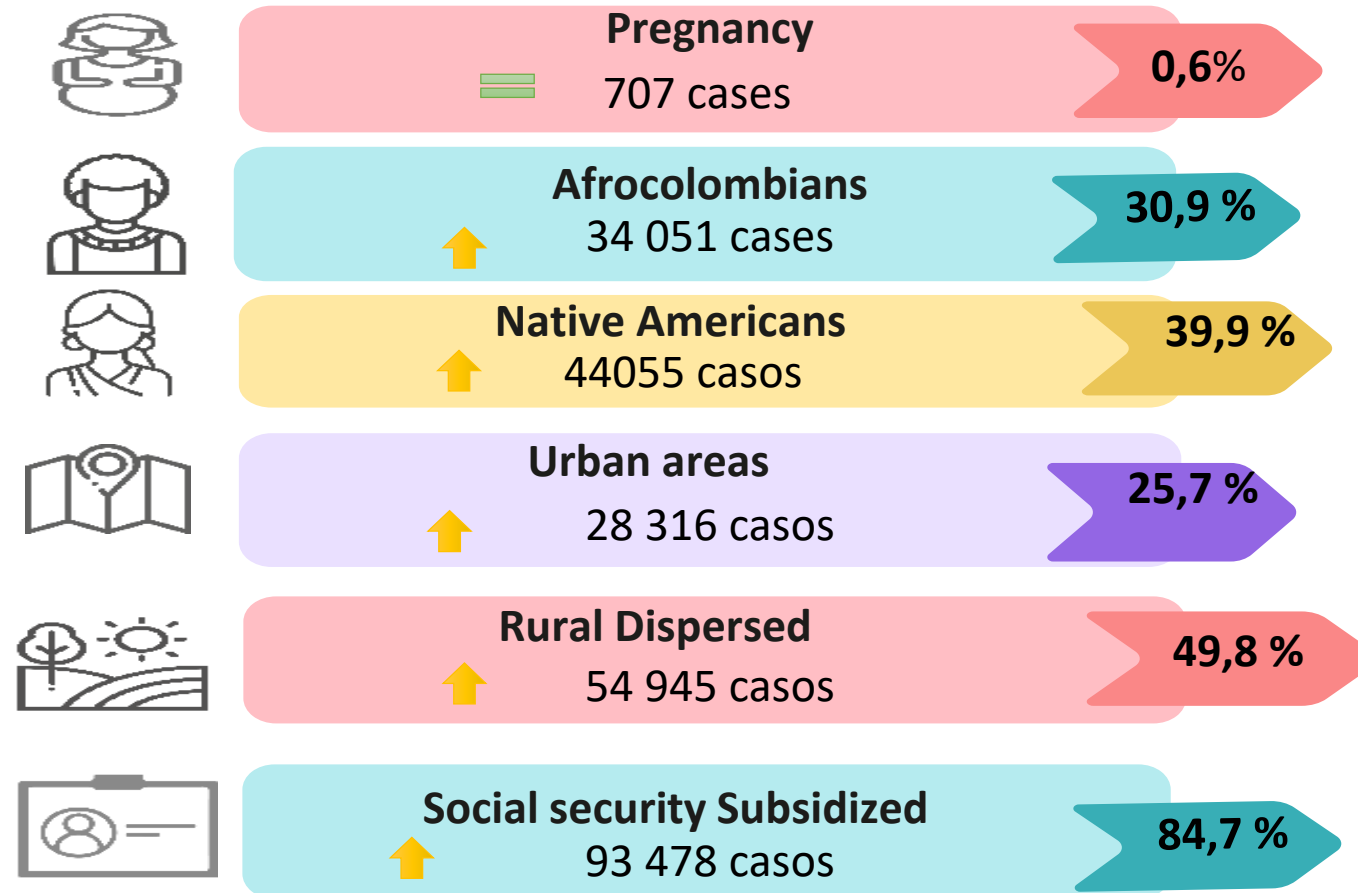
4 F. Frontera Col-Ven



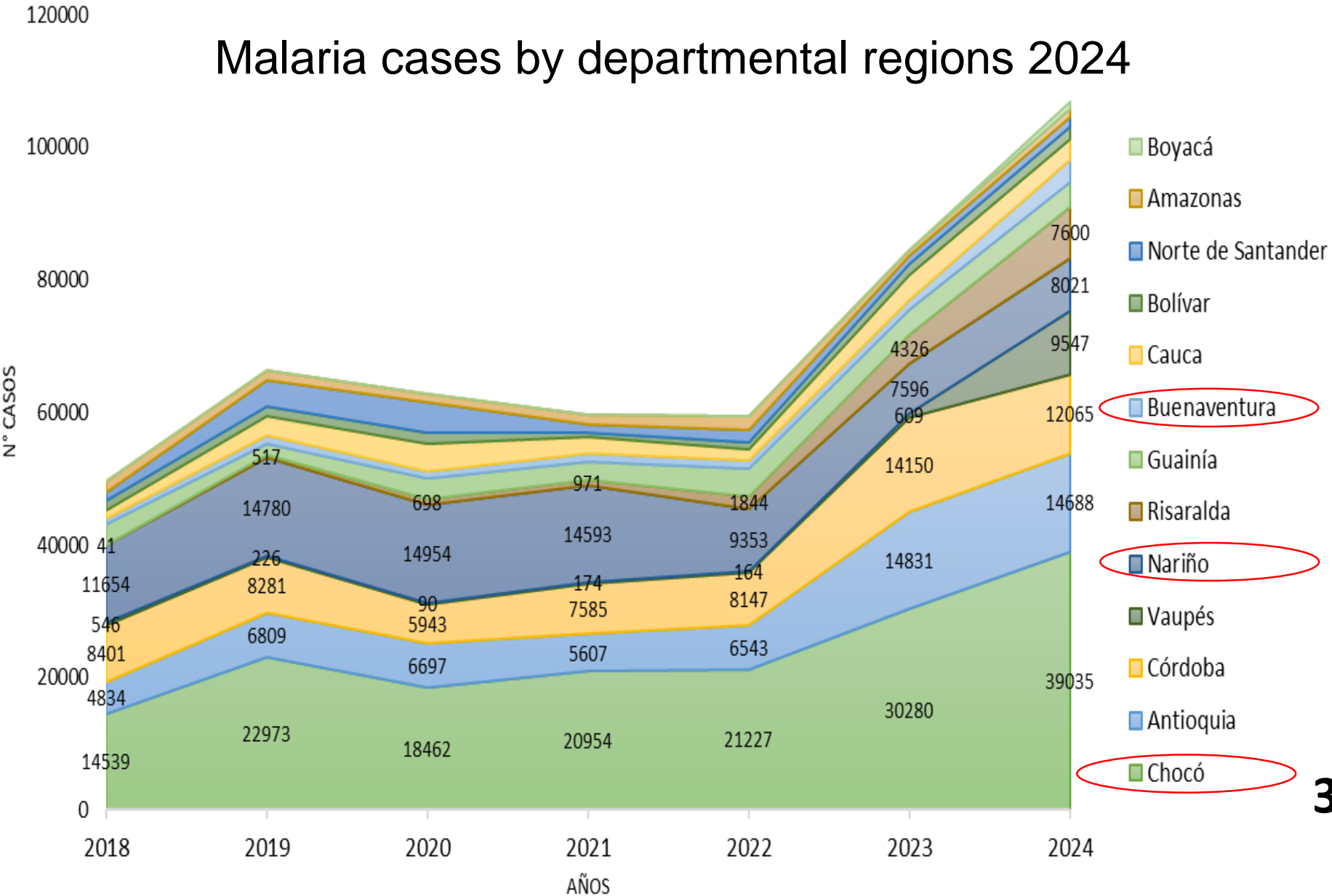
Malaria cases by Focus areas, Colombia 2024



Socio-demographic distribution, Malaria cases in Colombia, 2024



Malaria cases by departmental regions 2024

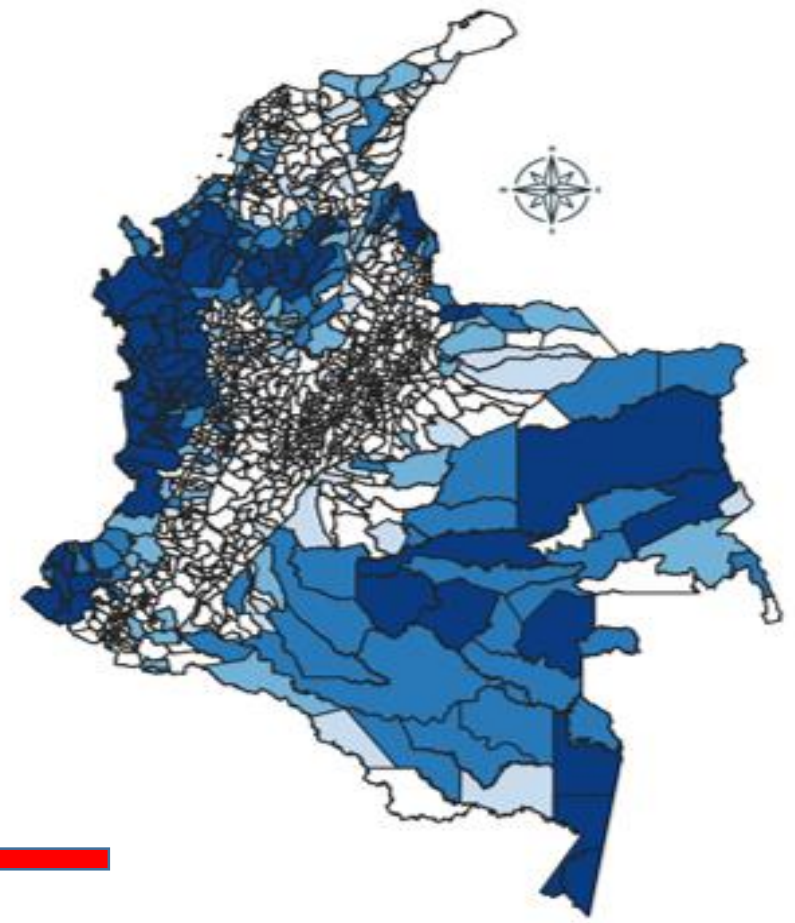
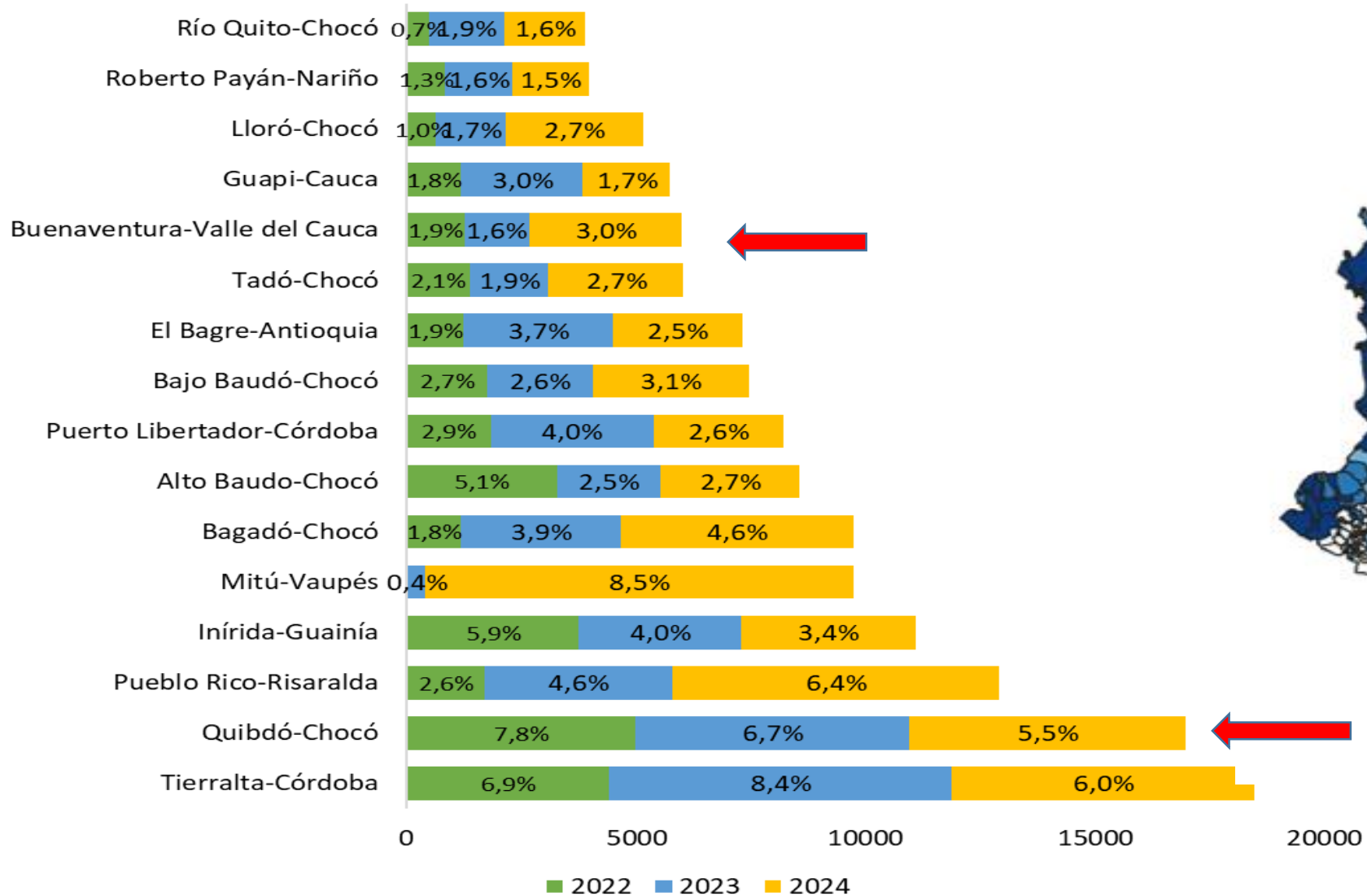


3,0%

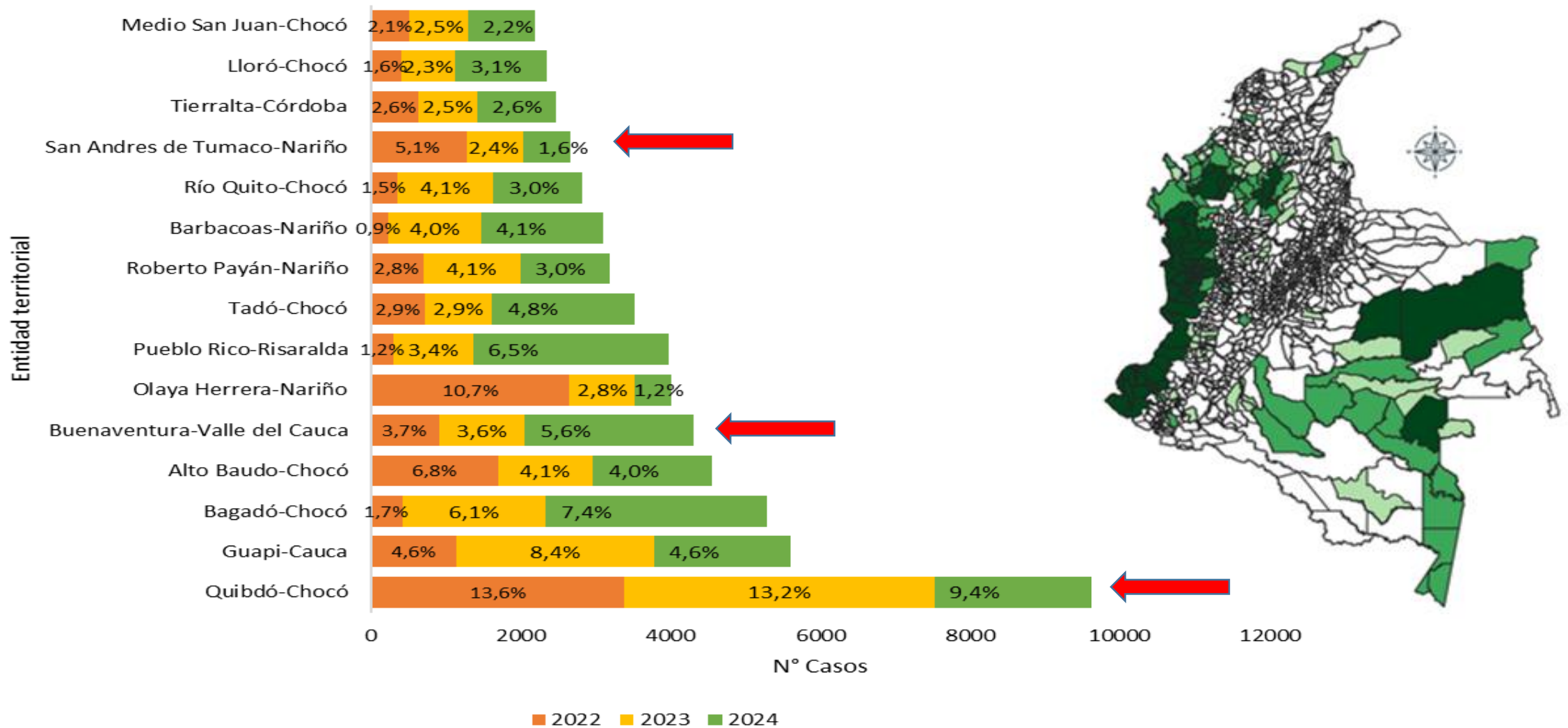
7,3%

35,4%

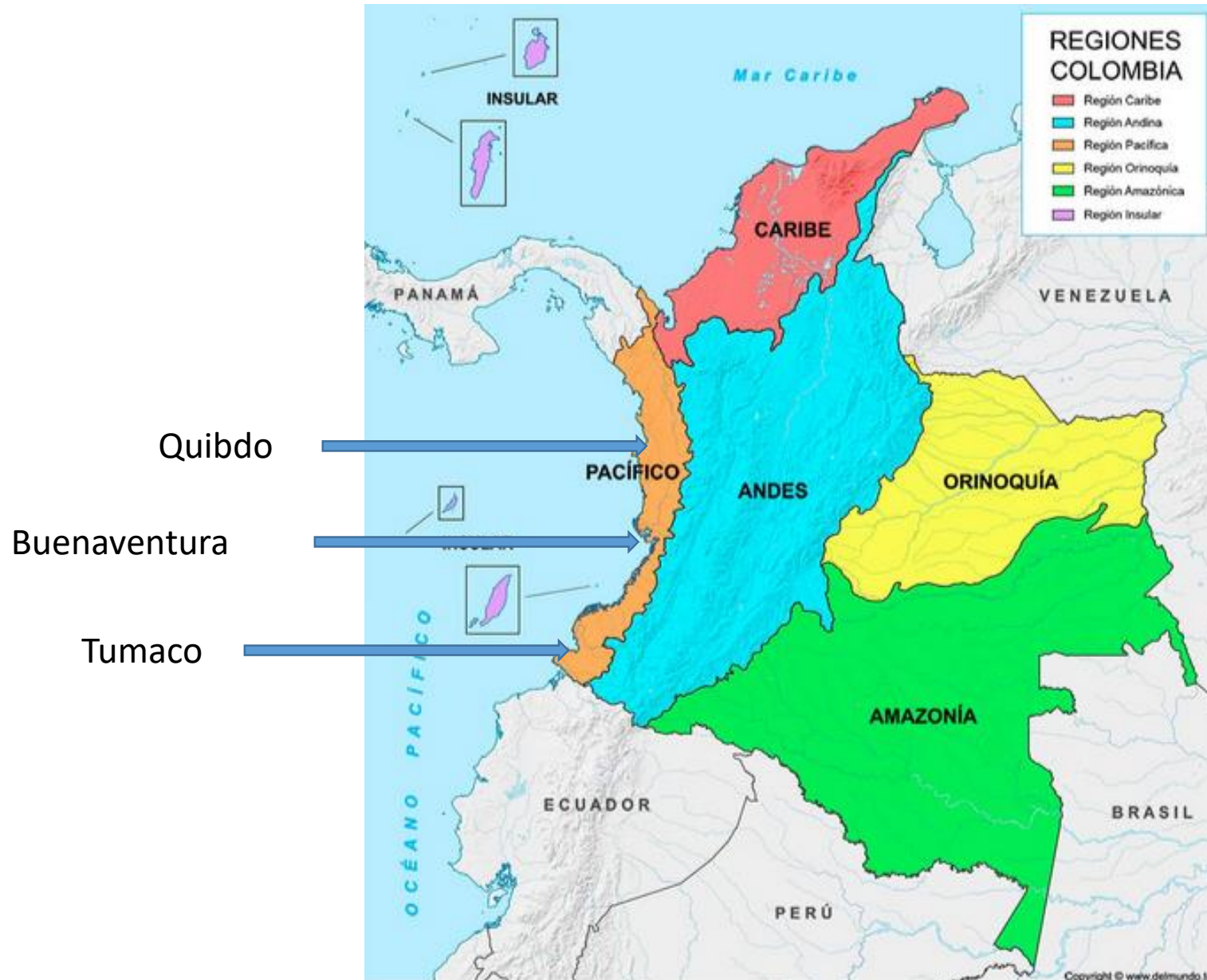
Contribution by municipality to national *P. vivax* malaria cases 2020-2024



Contribution by municipality to national *P. falciparum* malaria cases 2020-2024



Towards understanding the determinants of Urban Malaria in three cities of the Colombian Pacific



Annual malaria cases in Colombia 2018-2022

Distribution by specie and contribution of Buenaventura, Tumaco y Quibdó.

		Falciparum	Vivax	Mixed	TOTAL	%
National Cases	2018	29.907	31.077	1.210	62.194	
	2019	71.729	38.392	837	110.958	
	2020	39.879	39.687	670	80.236	
	2021	36.169	35.992	657	72.818	
	2022	27.663	44.146	697	72.506	
	Total	205.347	189.294	4.071	398.712	
		Falciparum	Vivax	Mixta	TOTAL	%
Buenaventura, Tumaco y Quibdó	2018	5813	1760	229	7.802	14,3
	2019	14683	2305	97	17.085	31,3
	2020	7100	2049	131	9.280	17,0
	2021	8071	2502	116	10.689	19,6
	2022	6934	2669	124	9.727	17,8
	Total	42.601	11.285	697	54.583	13,7

Malaria in Buenaventura, Quibdó y Tumaco 2018-2022

- ❑ 54.583 cases of the cities
- ❑ 44,2% diagnosed in Women
- ❑ 27-59 diagnosed in men (37,5%)
- ❑ 27-59 years i women (38,9%).
- ❑ Niños 0-11years in Quibdó 22,6% (12,2% < 5 años)
- ❑ Niños 0-11 years in Tumaco 10,9%
- ❑ Niños 0-11 years in Buenaventura 14,1%

Malaria cases in Urban áreas in Colombia 2018-2022

		Area			Total
		Urban area	Rural populated center	Rural dispersed	
Buenaventura	Cases	1.090	1.225	4.870	7.185
	% municipality	15%	17%	68%	100%
Quibdo	Cases	14.737	19.483	2.519	36.739
	% municipality	40%	53%	7%	100%
Tumaco	Cases	3.726	1.402	5.531	10.659
	% municipality	35%	13%	52%	100%
Total	Cases	19.553	22.110	12.920	54.583
	%	36%	41%	24%	100%

Malaria cases by ethnic group in Colombia 2018-2022

		Cities/ Municipality			
		Buenaventura	Quibdo	Tumaco	Total
Indígena	Cases	306	7764	100	8170
	% Municipality	4%	21%	1%	15%
Afrocolombian	Cases	6042	27965	9120	43127
	% Municipality	84%	76%	86%	79%
Total Cases		7.185	36.739	10.659	54.583

Malaria cases by socio-economical stratum in Colombia 2018-2022

		Municipality			Total
		BUENAVENTURA	QUIBDO	TUMACO	
No data	Cases	532	1.138	531	2.201
	% Municipality	7,4%	3,1%	5,0%	4,0%
Low-low	Cases	6.064	34.922	8.319	49.305
	% Municipality	84%	95%	78%	90%
Low-low	Cases	541	599	1.703	2.843
	% Municipality	8%	2%	16%	5%
Middle-low	Cases	28	8	74	110
	% Municipality	0,4%	0,0%	0,7%	0,2%
Middle	Cases	2	1	5	8
	% Municipality	0,0%	0,0%	0,0%	0,0%
Middle-High	Cases	17	67	13	97
	% Municipality	0,2%	0,2%	0,1%	0,2%
High	Cases	1	4	14	19
	% Municipality	0,0%	0,0%	0,1%	0,0%
Total Cases		7.185,00	36.739,00	10.659,00	54.583,00

Malaria cases in Colombia 2018-2022 by access to social security groups

Acces to Health Security		BUENAVENTURA	QUIBDO	TUMACO	Total
Contributory	Cases	861	2357	1203	4421
	% Municipality	12,0%	6,4%	11,3%	8,1%
Special	Cases	5	92	121	218
	% Municipality	0,1%	0,3%	1,1%	0,4%
Undetermined	Cases	114	295	235	644
	% Municipality	1,6%	0,8%	2,2%	1,2%
Non insured	Cases	964	3207	1128	5299
	% Municipality	13,4%	8,7%	10,6%	9,7%
Exception	Cases	438	726	842	2006
	% Municipality	6,1%	2,0%	7,9%	3,7%
Subsidized	Recuento	4803	30062	7130	41995
	% Municipality	66,8%	81,8%	66,9%	76,9%
TOTAL	Cases	7185	36739	10659	54583

Urbanization in region

Since the end of the 20th century, population and urban growth have been closely linked

National average of urbanization in 2023 reaches of 82.3%.

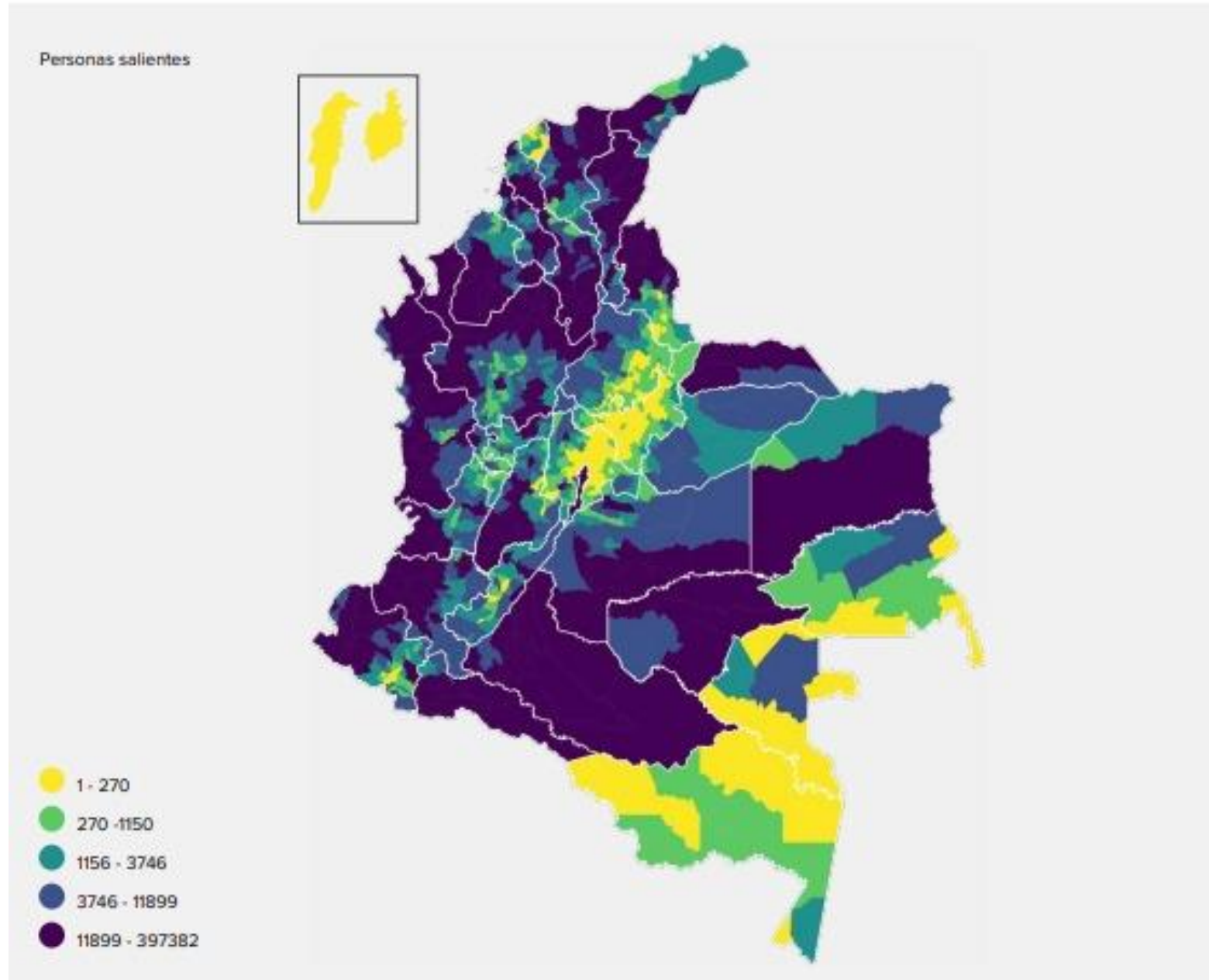
33.8% in Tumaco

77.2% in Buenaventura

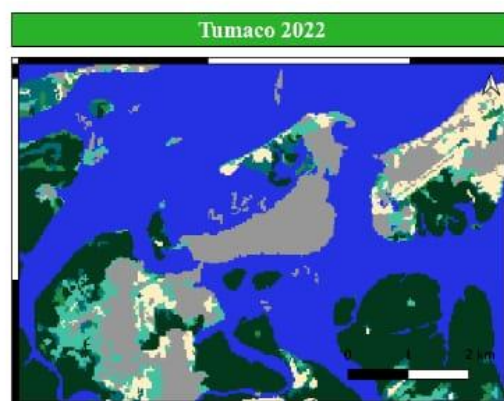
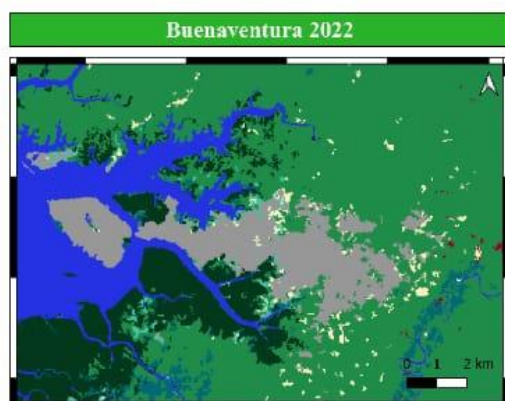
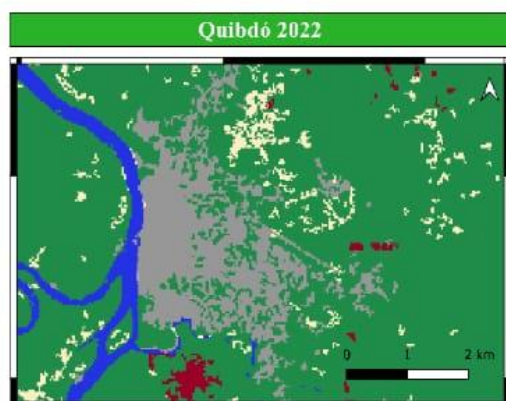
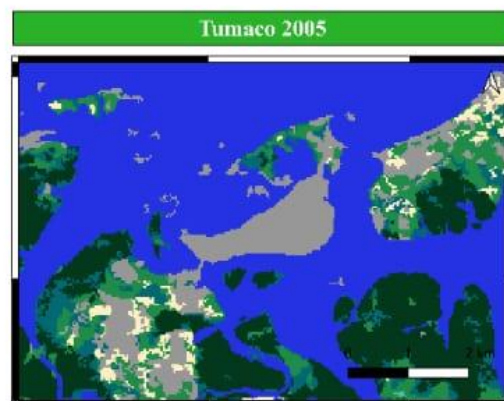
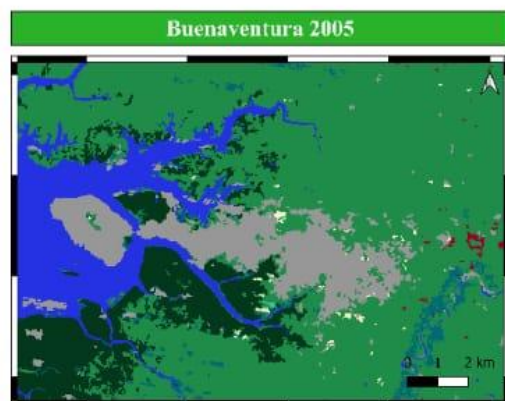
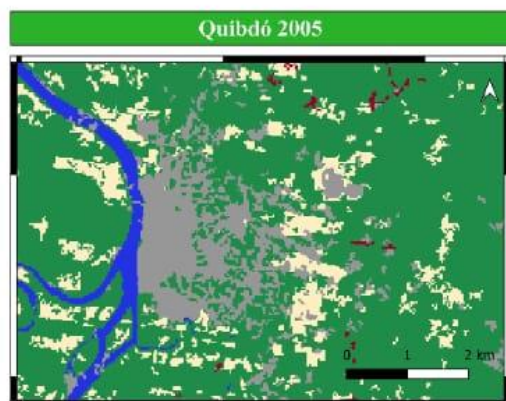
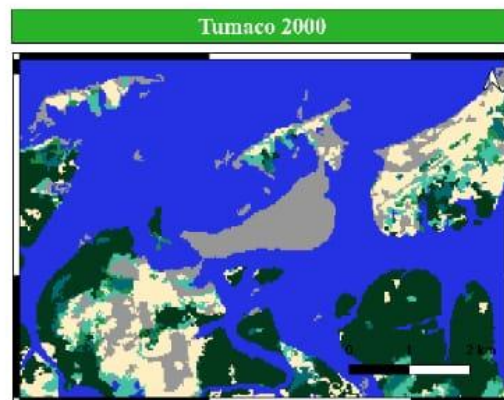
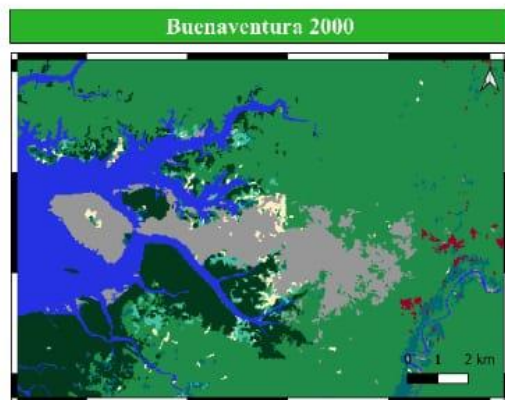
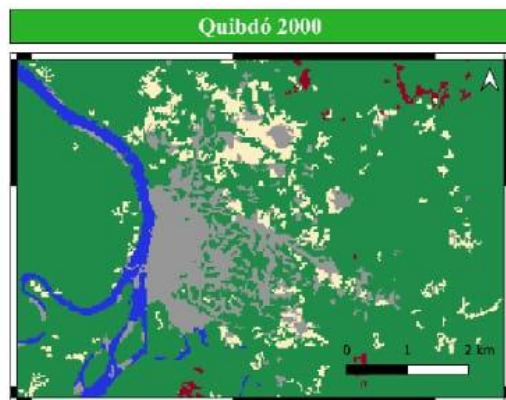
85.6% in Quibdó

The **unplanned urban growth** in these cities is largely due to the forced rural-urban displacement to which historically marginalized ethnic groups, Afro-descendant and native americans, have been subjected who occupy the urban peripheries for reasons of armed conflict and climate change in the last decades in Colombia.

Victims of armed conflict in Colombia 1985-2022



Fuente: Informe Nacional sobre Desarrollo Humano Colombia: territorios entre fracturas y oportunidades, PNUD, 2024



Leyenda

Cobertura	
Bosque	Agricultura/pasto
Manglar	Malla urbana
Bosque inundable	Minería
Silvicultura	Acuicultura
	Río, lago u océano

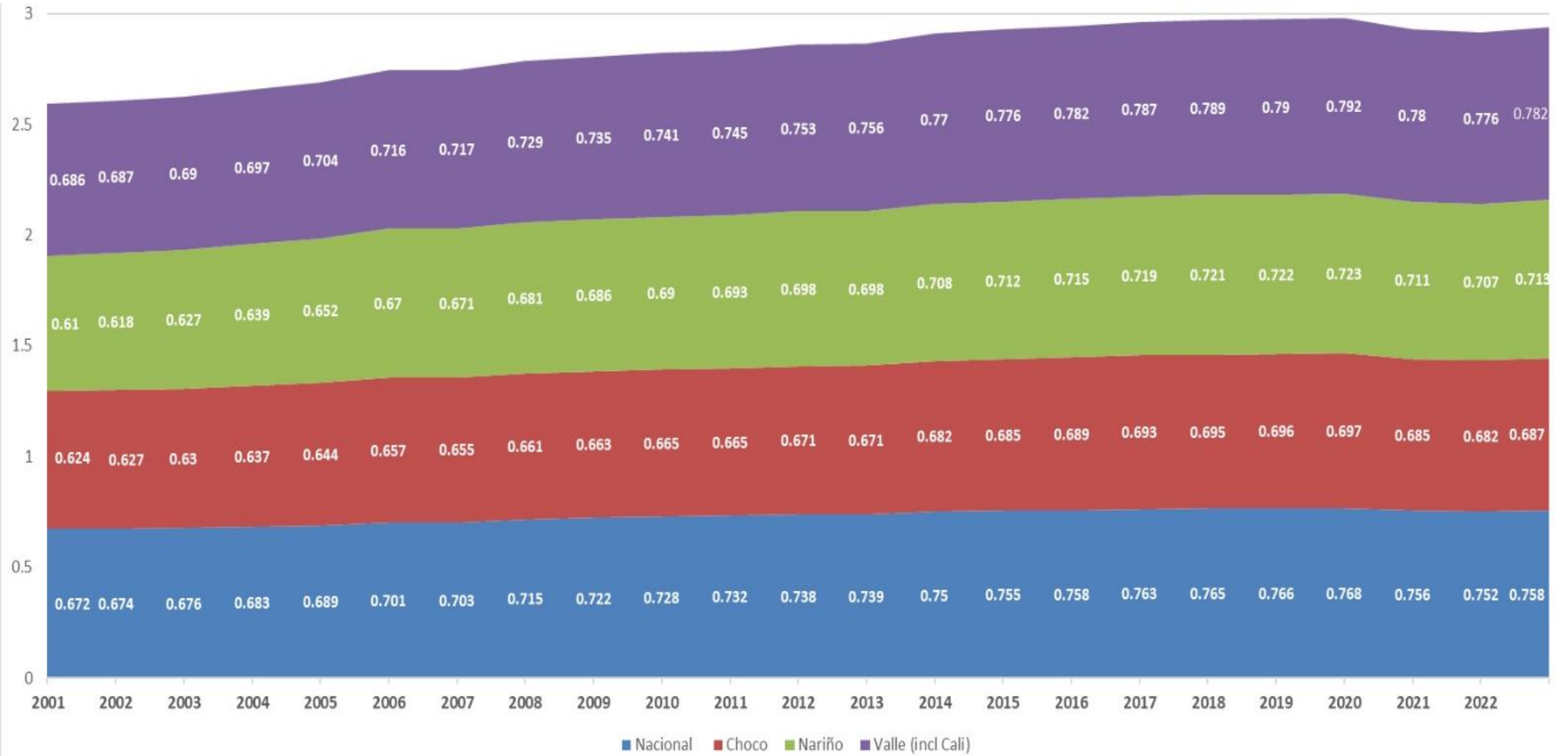


15%

20%

35%

Human Development Index



Rural environment



8 nov 2024 8:54:54 a. m.
INSTITUCION EDUCATIVA INDIGENA DE UNION curty
ALTO RIO NAPIPI
MUNICIPIO
BOJAYA
DE PARTAMENTO DEL CHOCO

Urban environment



¿What to do with climate survivors?

Highlighted findings

- These three cities alone account for 14% of malaria cases in the country.
- The city of Quibdó accounted for 9% of national cases.
- 36% of cases come from urban areas.
- 40% of cases come from rural population centers.
- Afro-descendants and Native Americans accounted for 94% of cases. The two lowest socio-economic strata accounted for 96% 77% of cases in people with subsidized access to social security.
- Growing unplanned urbanization associated with low human development index

**¿How to promote sustainable and healthy
land use in emerging cities in Colombia?**