A grandes desafíos, grandes esperanzas: El ejemplo de la vacuna contra la malaria

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Una iniciativa de:

Obra Social "la Caixa"

CLÍNIC Hospital Universitari · Parc de Salut MAR · Universitat de Barcelona · upf. Universitat Pompeu Fabra Barcelona · Generalitat de Catalunya · Gobierno de España · Ajuntament de Barcelona · Fundación Ramón Areces

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1

Impacto global de las vacunas

~5.2M muertes niños anuales, de las cuales 1.5M (1/3) son prevenibles mediante vacunas

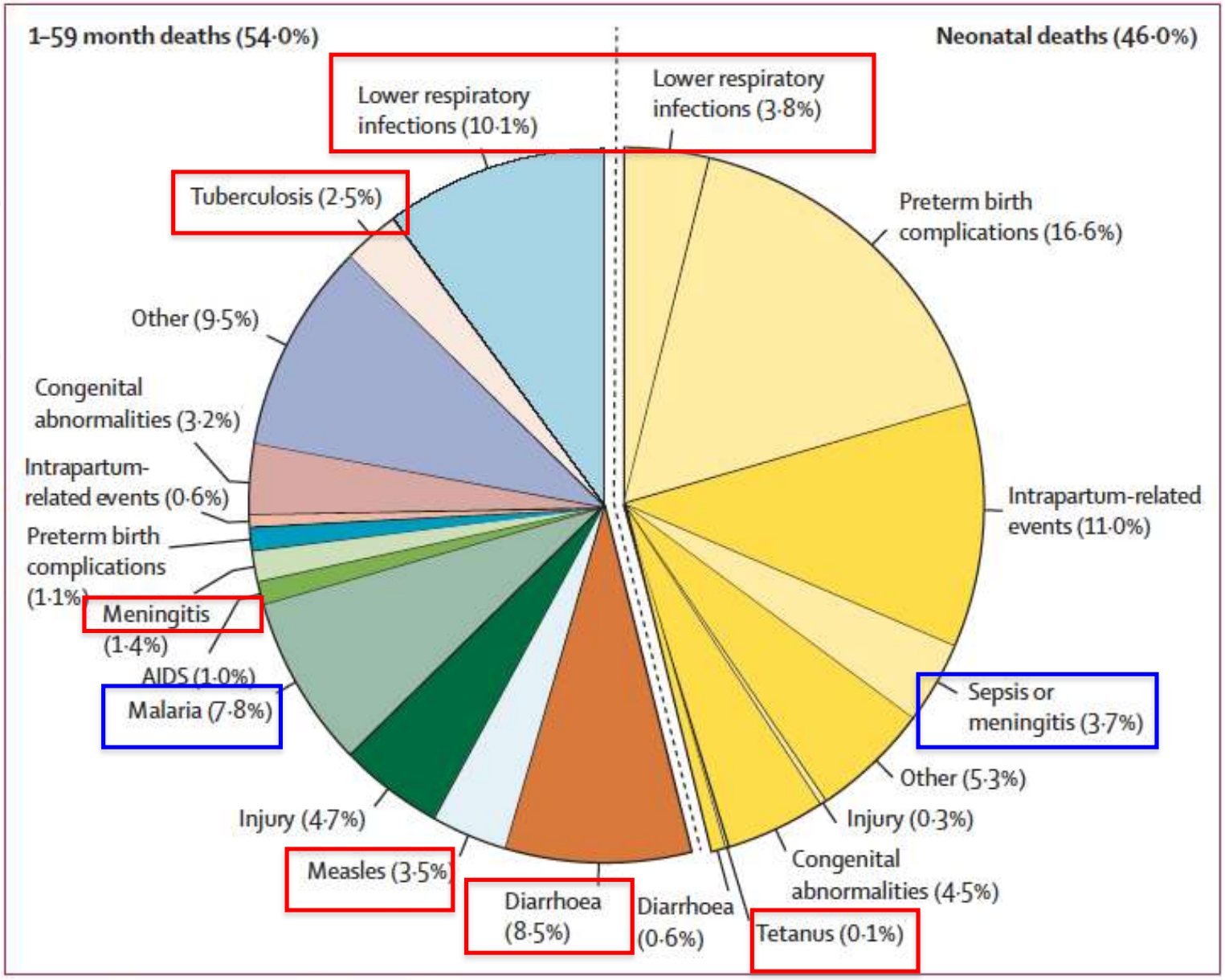
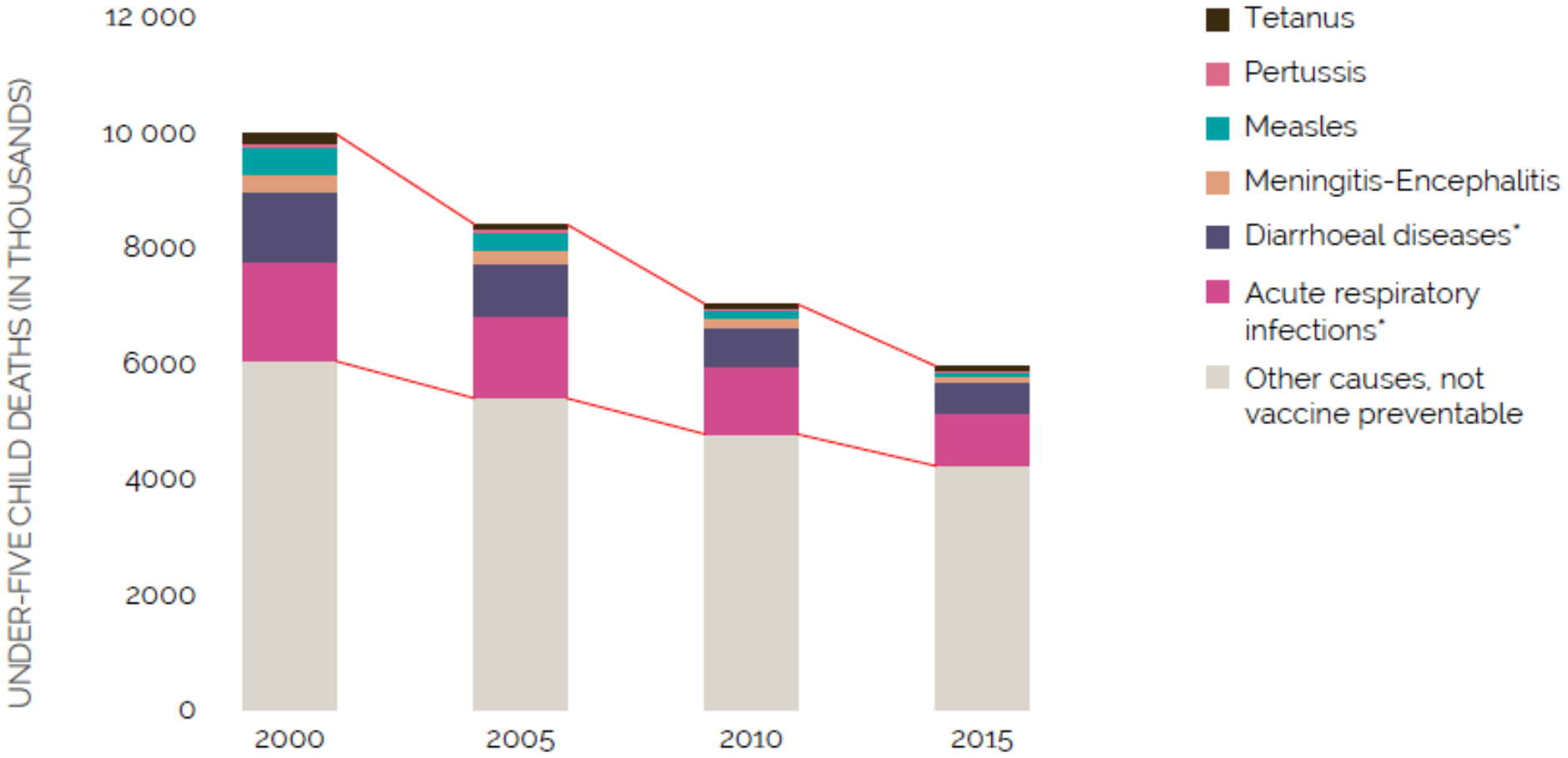


Figure 1: Global causes of under-5 deaths in 2019

Perin J.et al, Lancet Child Adolesc Health 2021

Vaccines have been key contributors to the global reduction in under-five mortality since 2000



Source: WHO

Immunization currently prevents between 2–3 million deaths every year

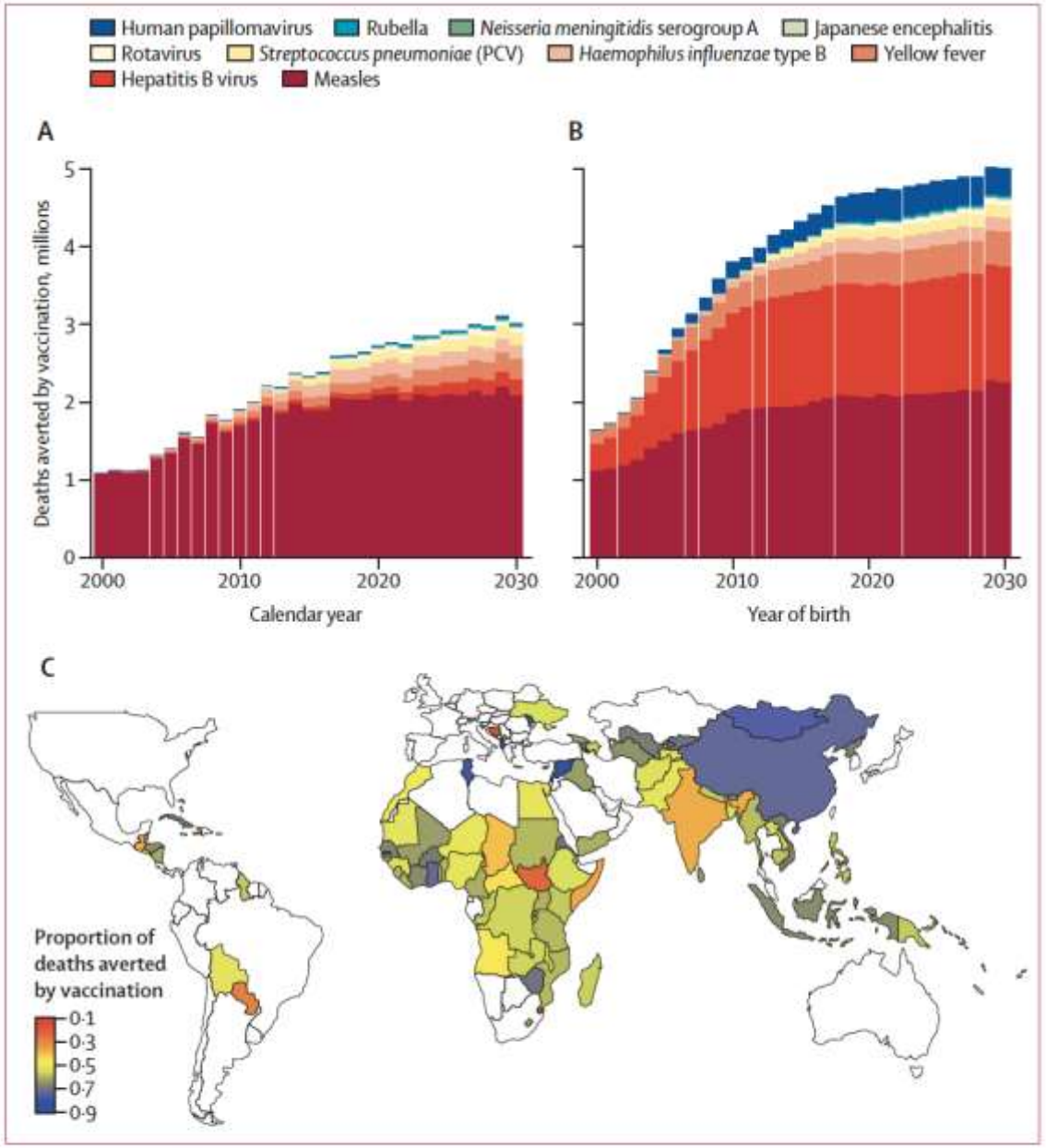


Figure 3: **Estimates of deaths averted by vaccination in 98 countries**
(A) Estimates of death averted by calendar year (summing across all ages) and pathogen. (B) Estimates of deaths averted by year of birth (summing across lifetime) and pathogen. (C) Proportion of lifetime deaths due to the ten pathogens considered in the no-vaccination counterfactual scenario that are predicted to be averted by vaccination, by country, across 2000–19 birth cohorts. PCV=pneumococcal conjugate vaccine.

Hasta **69M** muertes evitadas en el período 2000-2030, gracias a la vacunación contra 10 patógenos

Xiang Li et al; Lancet 2021

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Implementación de las vacunas

PAI: Programa ampliado de immunización ("EPI")

- **Iniciado en los años 1970**
  - en 1970, <5% de los niños en el mundo habían sifo immunizados, en comparación a >85% hoy
- **El PAI es la única plataforma de salud en PBR que garantiza un contacto regular y cercano con los niños** (por lo menos durante los primeros 12 meses de vida)
- Es la intervención de salud **más coste-efectiva** (según el banco mundial)

Immunisation programmes are increasingly ambitious and complex …

THEN …1970's

Pop'n 3.8 Billion

Infants

All countries — 4 vaccines, 6 diseases

Now, 2022

Population ~8 Billion

Infants
Children
Adolescents
WCBA
Pregnant women

	>12 vaccines >15 diseases	All countries
	>3 vaccines >3 diseases	Some regions
	>7 vaccines > 10 diseases	HR popns.
	>3 vaccines >6 diseases	Certain countries

Calendari de vacunacions sistemàtiques 2022

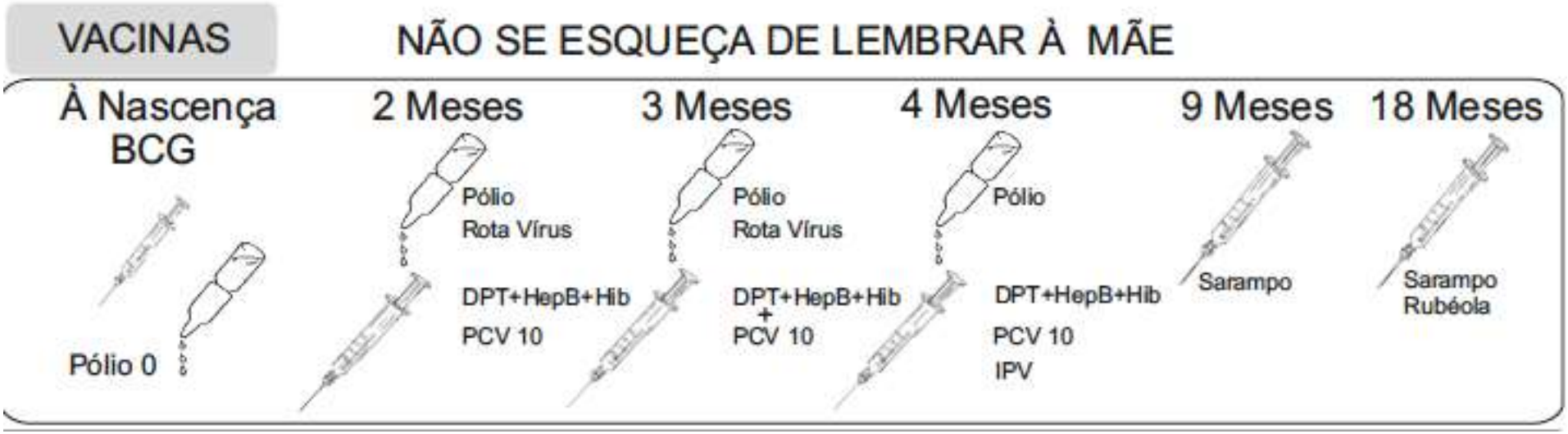
	Diftèria Tètanus Tos ferina	Poliomielitis	Malaltia per *Haemophilus influenzae* b	Hepatitis B	Malaltia per meningococ	Hepatitis A	Xarampió Rubèola Parotiditis	Infecció pel virus del papil·loma humà	Varicel·la	Grip	Malaltia per pneumococ
2 mesos	Hexavalent				Contra el meningococ B						Contra el pneumococ conjugada
4 mesos	Hexavalent				Contra el meningococ C conjugada	Contra el meningococ B					Contra el pneumococ conjugada
11 mesos	Hexavalent										Contra el pneumococ conjugada
12 mesos					Contra el meningococ C conjugada	Contra el meningococ B	Triple vírica				
15 mesos						Contra l'hepatitis A			Contra la varicel·la		
3 anys							Triple vírica		Contra la varicel·la		
6 anys	DTPa-PI[1]					Contra l'hepatitis A					
11-12 anys					Contra el meningococ conjugada tetravalent[2]	Contra l'hepatitis A[3]		Contra el virus del papil·loma humà[4]	Contra la varicel·la[3]		
14 anys	Td				Contra el meningococ conjugada tetravalent[2]						
Embarassades	dTpa[5]									Contra la grip	
40 anys	Td										
A partir de 60 anys										Contra la grip cada any	
65 anys	Td										Contra el pneumococ 23-valent

1. S'ha d'administrar la **vacuna DTPa-PI** als 6 anys d'edat als infants vacunats amb vacuna hexavalent als 2, 4 i 11 mesos. Els vacunats amb la pauta anterior, als 2, 4, 6 i 18 mesos rebran una dosi de **dTpa.**
2. **Contra el meningococ conjugada tetravalent (MACWY):** Es vacunaran els adolescents d'11-12 anys d'edat que no hagin rebut cap dosi de la vacuna MACWY des dels 10 anys d'edat. Es farà repesca fins als 18 anys d'edat als centres de salut.
3. **Vacuna contra l'hepatitis A (HA) i vacuna contra la varicel·la (V):** Només es vacunaran als 11- 12 anys els infants no vacunats o parcialment vacunats (la pauta vacunal consta de dues dosis).
4. **Vacuna contra el virus del papil·loma humà (VPH):** Es vacunaran només les noies amb dues dosis.
5. S'ha d'administrar la **vacuna dTpa a les embarassades**, en cada embaràs, al més aviat possible a partir de la setmana 27 de gestació.

Per a més informació: **061** /Salut Respon **canalsalut.gencat.cat**

/Salut Generalitat de Catalunya

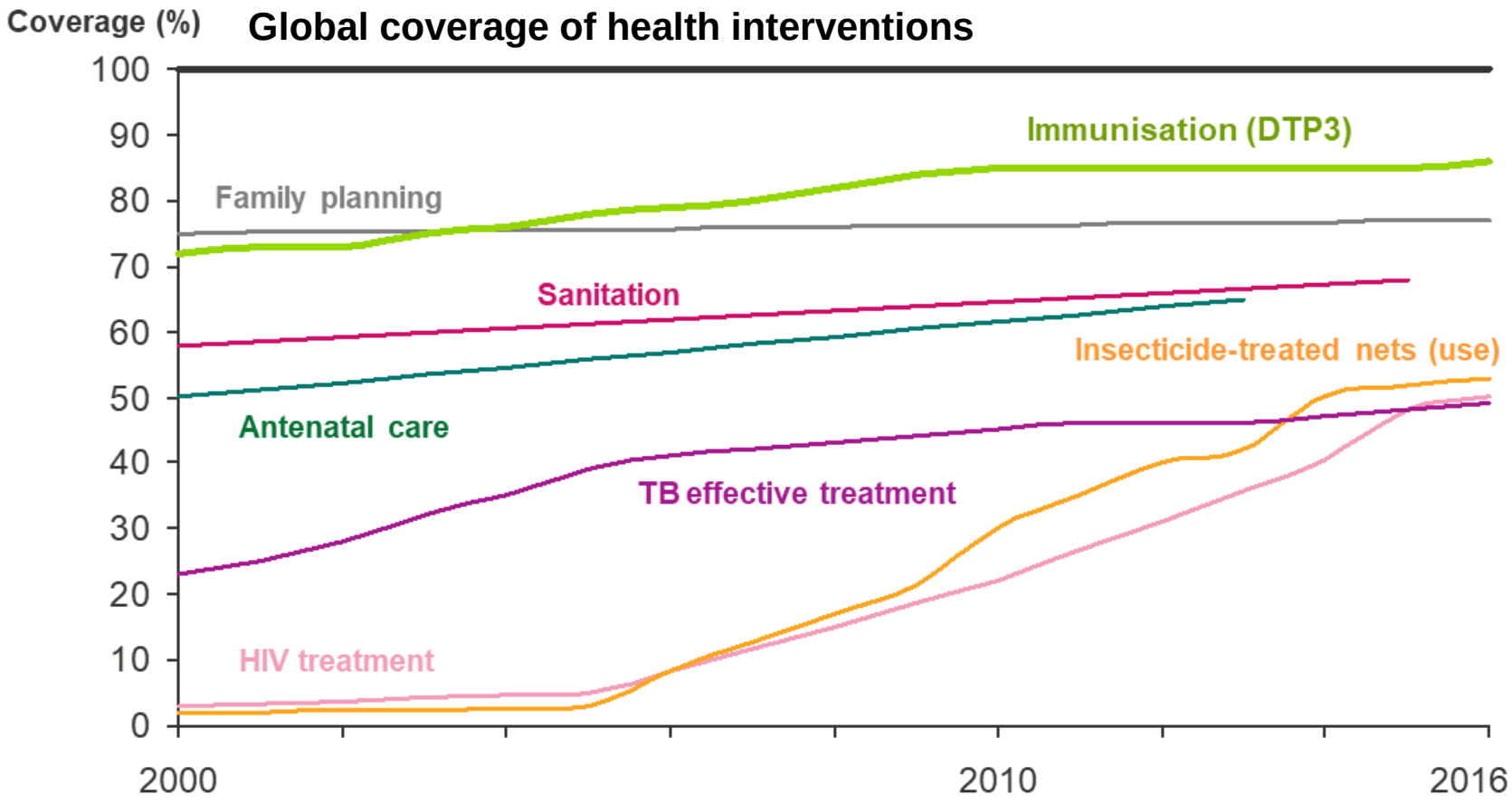
Calendario vacunal recomendado en Mozambique (2022)




PESAGEM E VACINAÇÃO
Com intervalos de
3 a 5 anos
ficam mais saudáveis
Faça o planeamento familiar
A partir dos 6 meses de idade
a sua criança deve receber
VITAMINA A


CRIANÇA VACINADA,
CRIANÇA SAUDÁVEL!

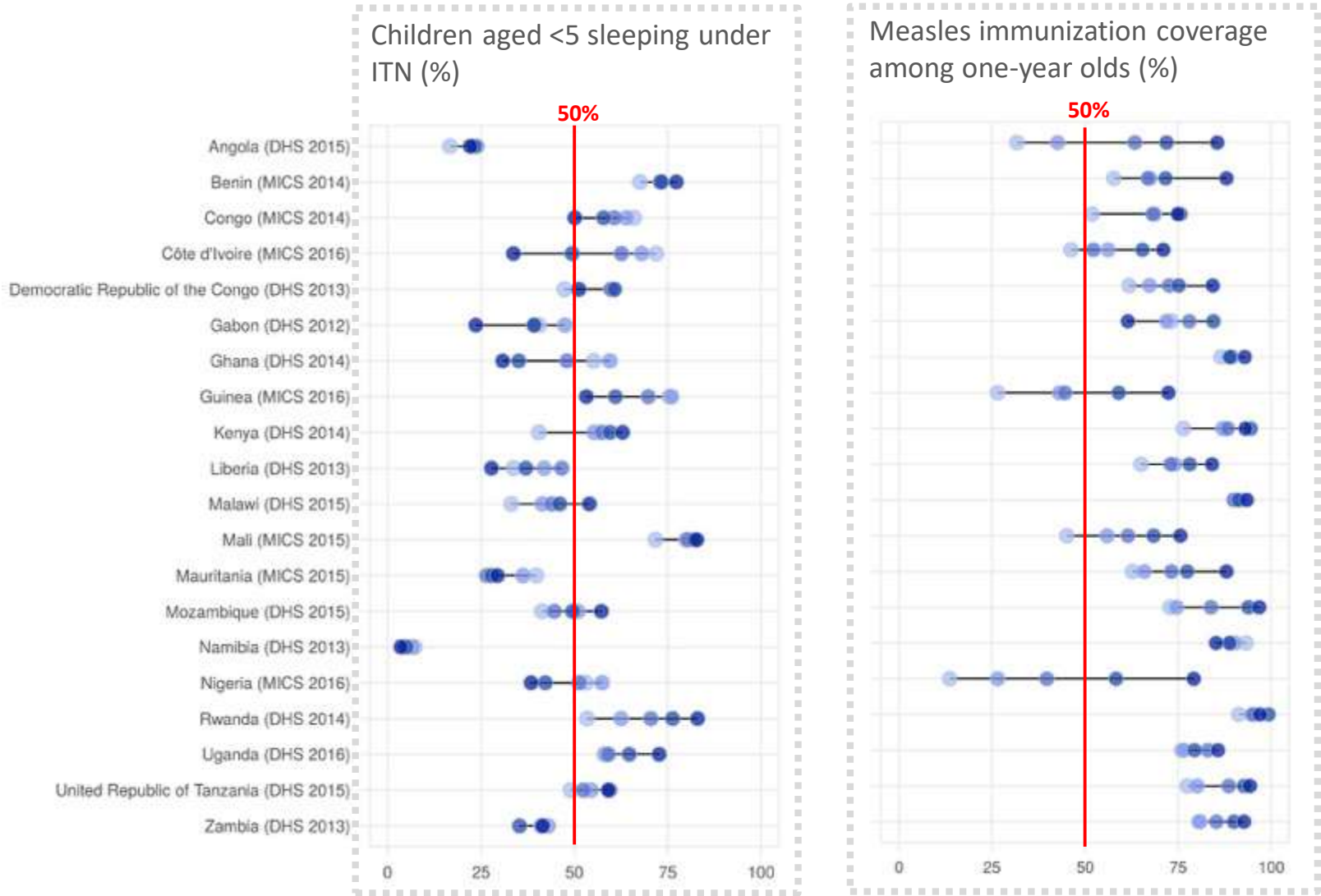
En los PBR, los programas de immunización llegan a más gente que cualquier otra intervención de salud



The immunization platform is already up and running

...y garantizan mayor equidad en la mayoría de lugares

Coverage by economic status in 20 African settings



- Source: Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 3.1. Geneva, World Health Organization, 2019.

Más niños son inmunizados hoy que en toda la historia

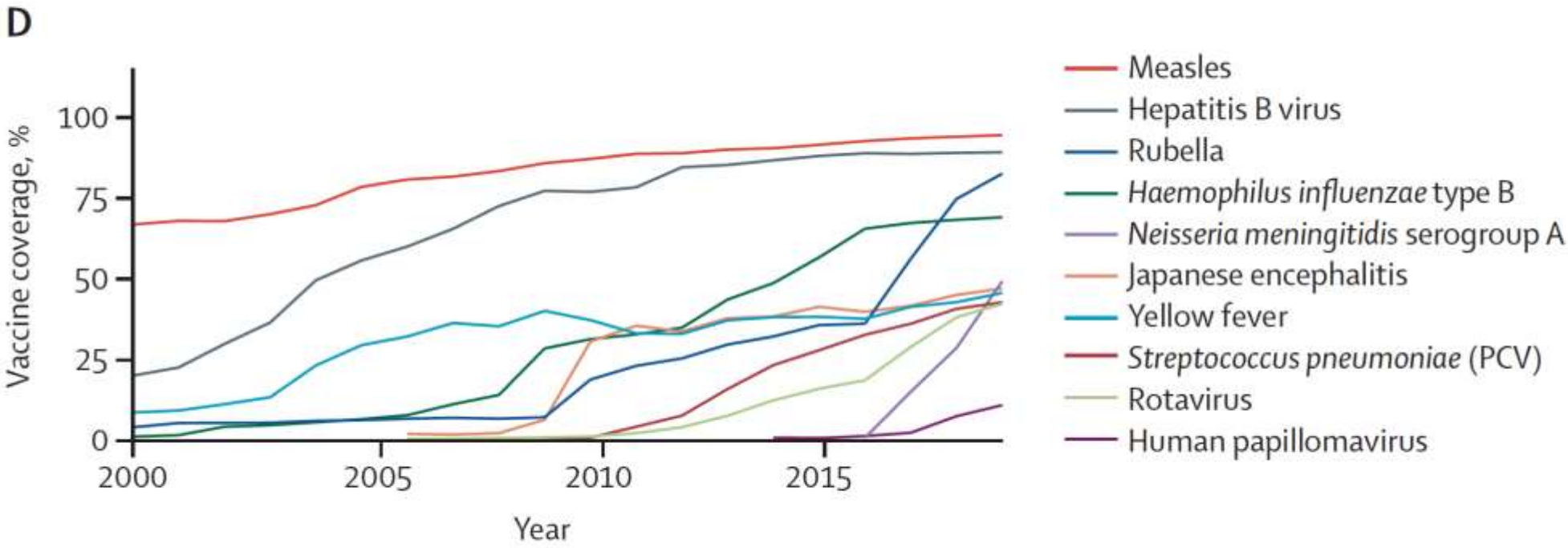


Figure 1: **Vaccine coverage across the ten pathogens considered**

Xiang Li et al; Lancet 2021

#VACCINESWORK TO LEAVE NO ONE BEHIND

About **116.5 million children** worldwide **receive basic vaccines** every year.

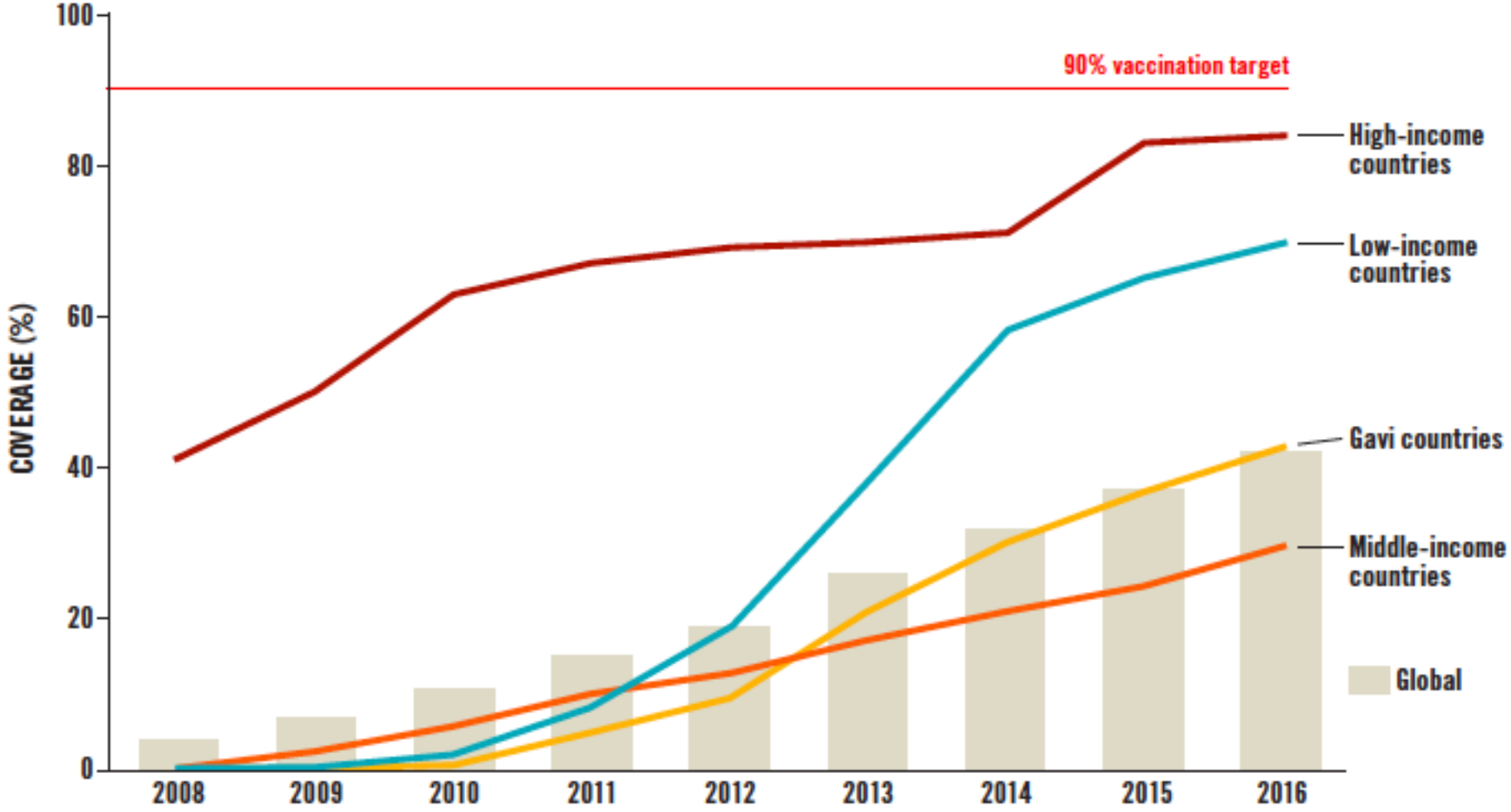
=**86%** children worldwide

But **19.5 million children** still **miss out.** About **60% of these children** live in **10 countries:**

#VACCINESWORK

World Health Organization

FIGURE 11 THE MISSING MIDDLE – PCV COVERAGE IS HIGHEST IN LOW-INCOME AND HIGH-INCOME COUNTRIES: PCV ANNUAL COVERAGE RATES BY COUNTRY INCOME GROUP



Source: World Health Organization

An important "bias" introduced by GAVI

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Vacunas en desarrollo

Progreso en la investigación y desarrollo de nuevas vacunas para PRB

- una nueva vacuna contra el **dengue** ha sido autorizada en mútiples países, aunque no está claro cuan bien protege a los niños más pequeños
- La primera vacuna contra la **malaria** acaba de ser autorizada para su uso en niños africanos
- Aumento de las nuevas vacunas en fases de desarrollo:
    - **VRS**
    - **GBS**
    - ***E coli*/Shigella/NTS**
    - **Ebola**
    - **Covid-19**
- Estrategias de vacunación Materna

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La vacuna de la malaria

241 million cases of

MALARIA

in 85 countries* in 2020

- 95% cases in WHO’s African region
- only 2% of all cases (~4.5M) due to P. vivax

627.000 deaths due to

MALARIA

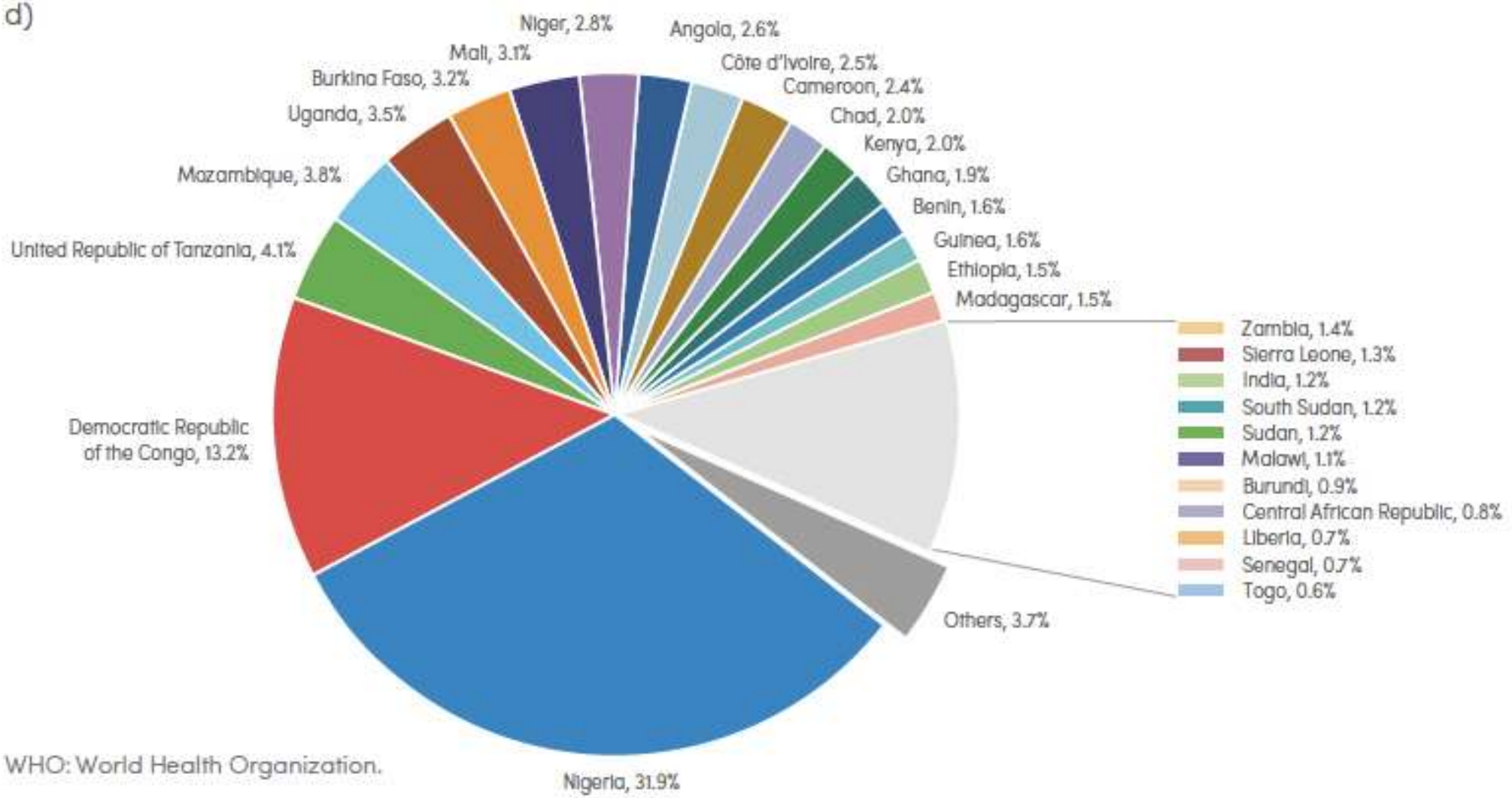
in 2020*

*>60% reduction since 2000, but 12% increase since 2019!

Around 96% of all

MALARIA

deaths occur in Africa



Four countries accounted for just over half of all malaria deaths globally: Nigeria (31.9%), the Democratic Republic of the Congo (13.2%), the United Republic of Tanzania (4.1%) and Mozambique (3.8%)

About 77% of all

MALARIA

deaths occur in children <5 years of age

RTS,S the long way towards a malaria vaccine

Principales desafíos de las vacunas contra la malaria

- No existen claros correlatos de inmunidad
- Los ensayos de fase I son subóptimos. Cómo decidir cuando llevas una vacuna candidata a las fases siguientes?
- Ensayos clínicos muy complejos: "endpoints clínicos"
- Poca capacidad en las zonas endémicas de malaria
- Coste y duración

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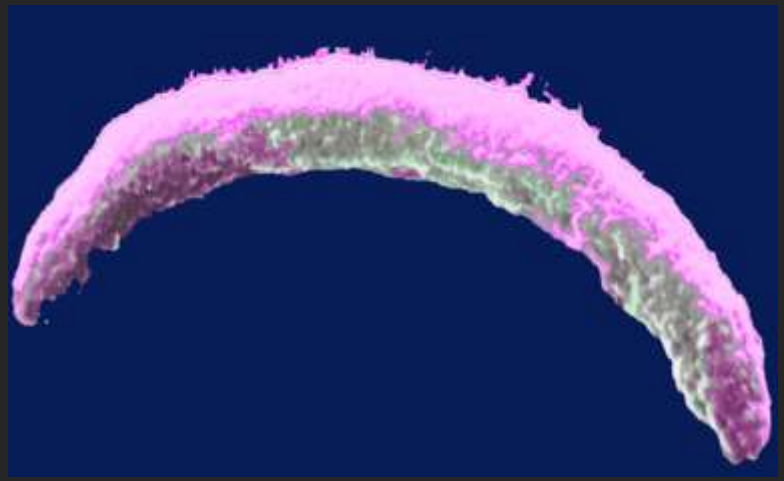
2014
2015

Cloning of the of the parasite’s CS gene



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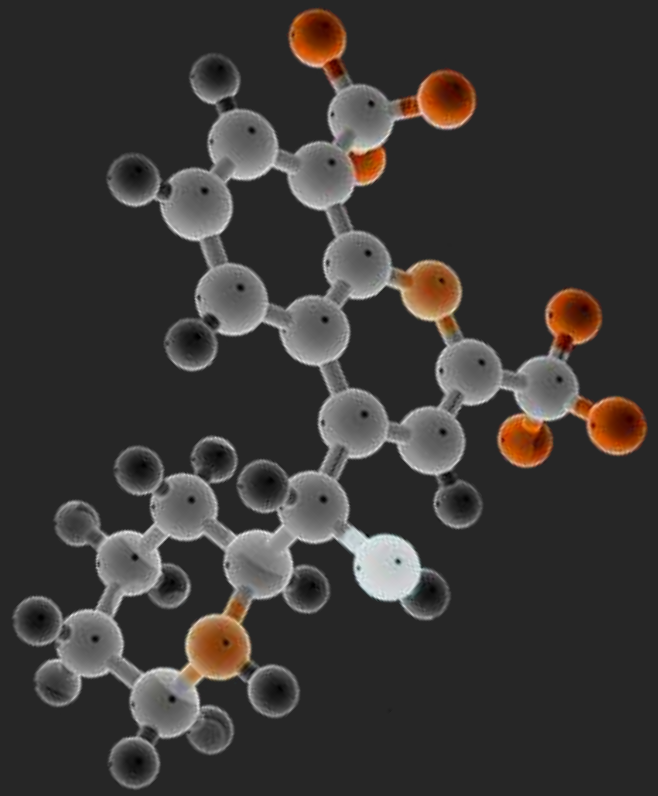
Design of the vaccines
Experimental prototype

SmithKline Beecham
Pharmaceuticals



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First clinical trials in humans

Efficacy: 25%

Vaccinated individuals: 20

1979
1984
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1992
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2009
2011
2012
2014
2015

Clinical trial in adults

Vaccinated individuals: 250

Efficacy: 34%

Duration of protection: 15 weeks

MRC | Medical Research Council

1979
1984
1987
1992
1997
2001
2004
2007
2009
2011
2012
2014
2015

Clinical trial in children
1-4 years of age

Mozambique

Vaccinated individuals: 1.857

Efficacy: 30% clinical malaria

50% severe malaria

cism centro de investigação em saúde de manhiça

CRESIB BARCELONA

CLÍNIC BARCELONA Hospital Universitari

Universitat de Barcelona

Arrival of vaccines in cold chain

>100 vaccinees per day

First hour surveillance of immediate side effects

Long-term follow up of adverse events at home


But how do you work where there are no addresses?

1979
1984
1987
1992
1997
2001
2004
2007
2009
2011
2012
2014
2015

Proof of concept in newborns

Vaccinated individuals: 214

Efficacy: 66%

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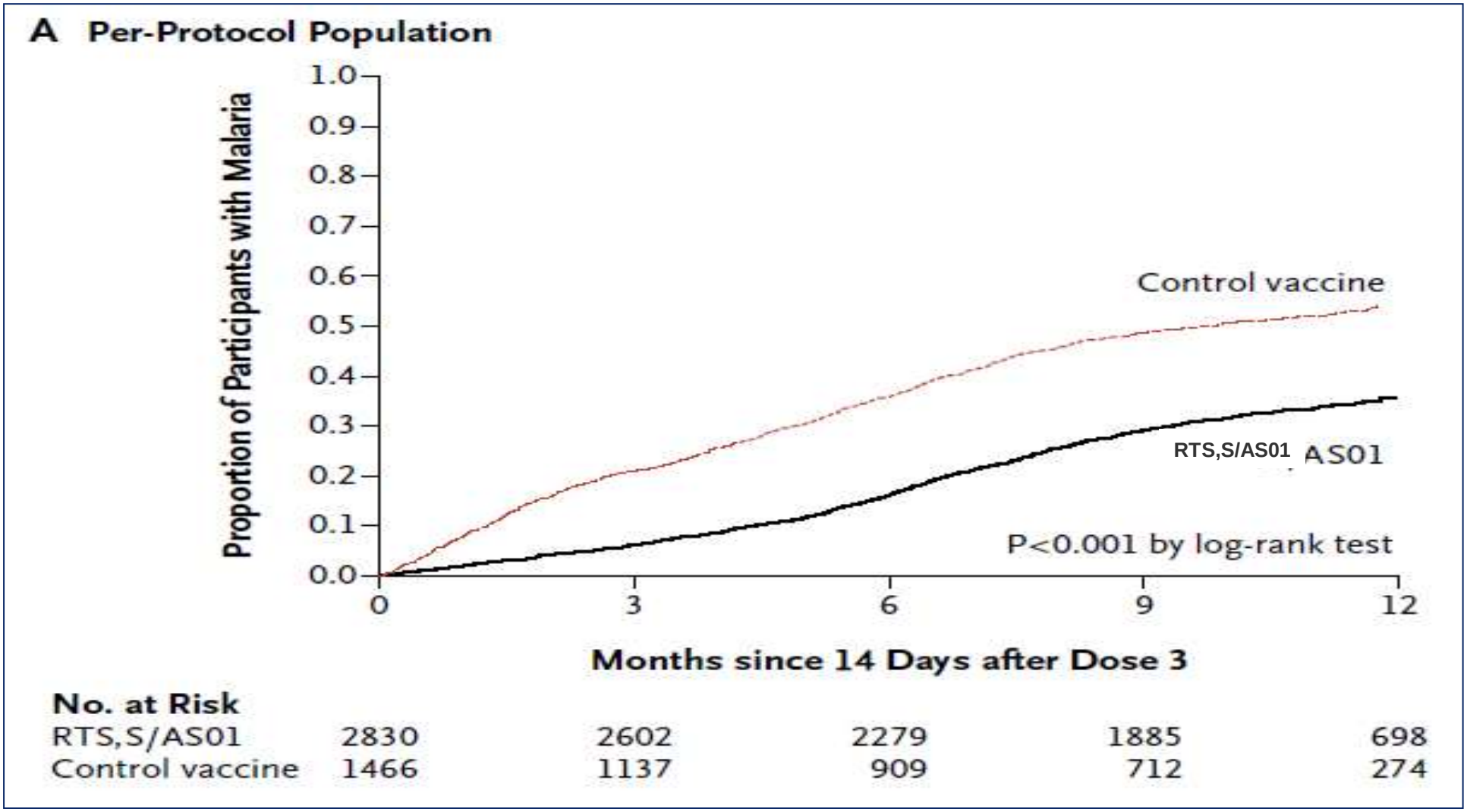
MAL055 – A phase III clinical trial

11 participating centres

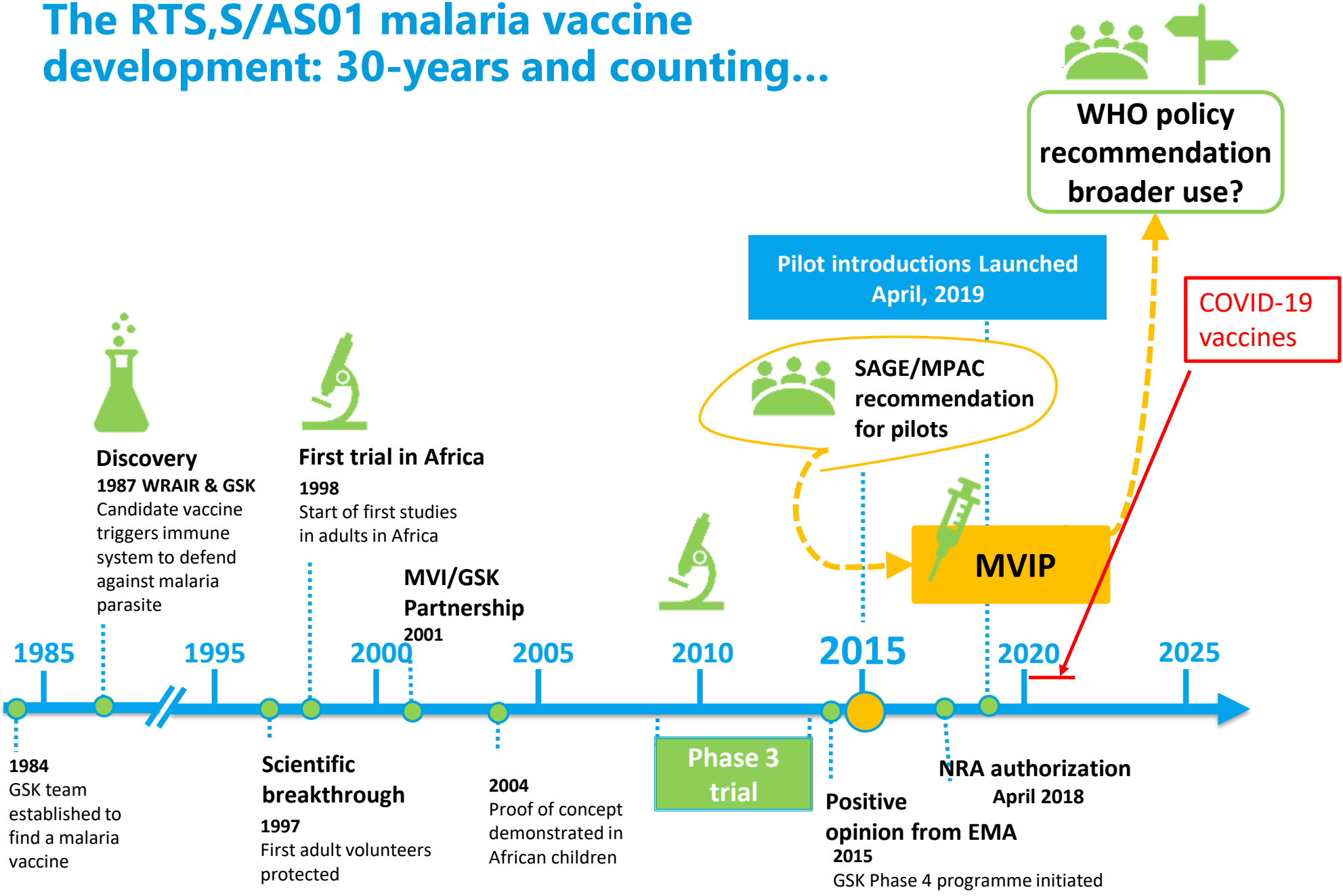
In 7 African countries

16,000 children



- During 1st 12 months of follow-up, **reduction of clinical malaria by 56%** (97.5% IC, 50.6 to 60.4)
- **Efficacy against severe malaria episodes: 47%** (95% CI, 22.4 to 64.2)

The RTS,S/AS01 malaria vaccine development: 30-years and counting…



World's first malaria vaccination – 23 April 2019 in Malawi

World Health Organization

World Health Organization (WHO) @WHO · Apr 23

's first #Malaria vaccine pilot is launched in #Malawi, the first country in Africa to roll out this landmark vaccine, known as RTS,S. The vaccine will be available to children from 5 months old to 2 years. bit.ly/2ZpASGN

You, WHOMalawi, WHO African Region and 4 others

41 970 1.5K

RTS,S malaria vaccine evaluation pilots and main results *Source: a 2021 WHO publication (13).*

Significantly reduces malaria and life-threatening severe malaria. Since 2019, delivered in childhood vaccination in three country-led pilots.

IN 2+ YEARS

2.4 million+

DOSES

830K+ CHILDREN VACCINATED

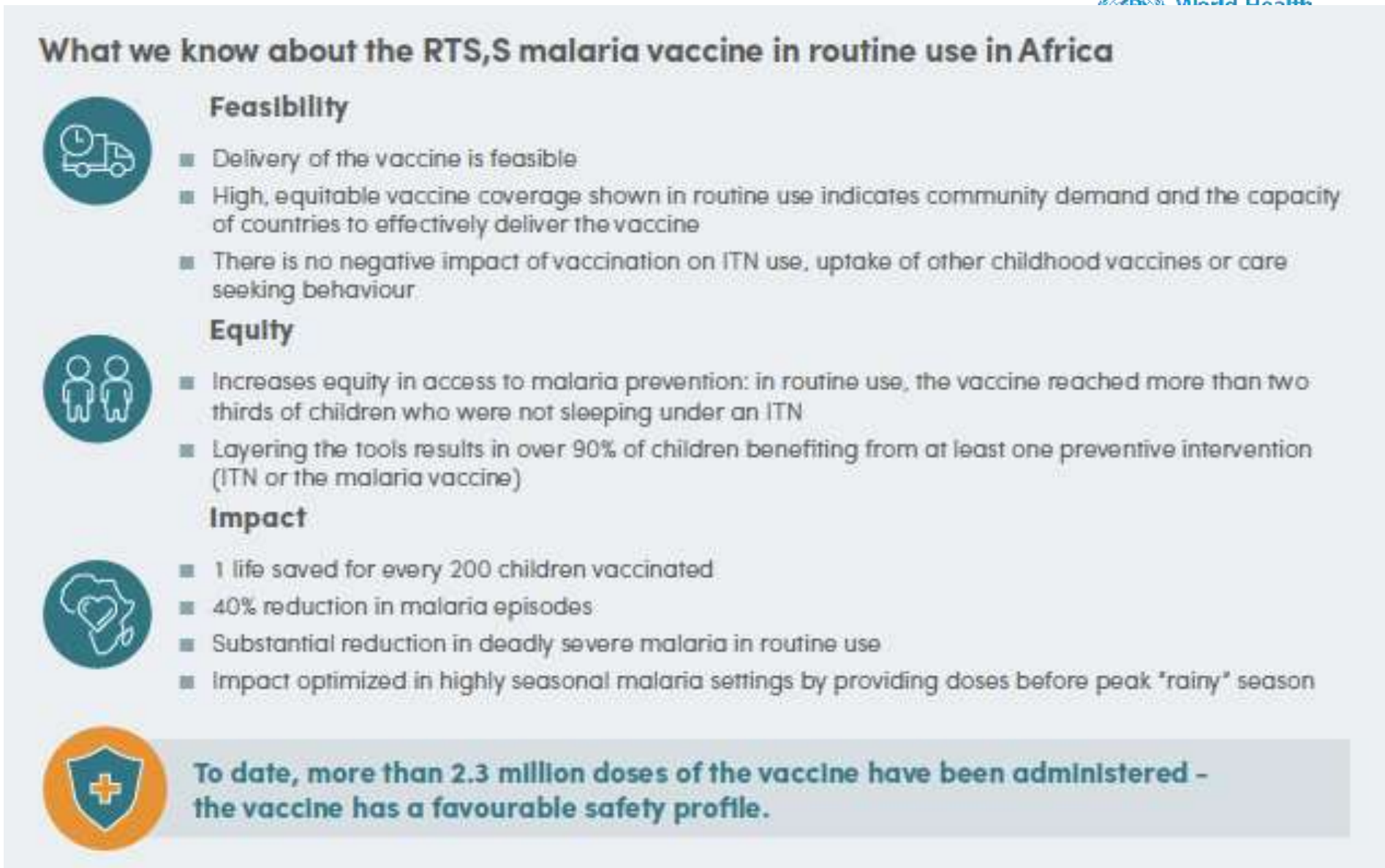
Estimated to be cost-effective in areas of moderate to high malaria transmission

30 YEARS

The result of 30 years of research and development

The RTS,S vaccine can be delivered through the existing platform for childhood vaccination that reaches more than 80% of children.

Excellent news regarding the RTS,S malaria vaccine



- **6th October 2021**, WHO endorsed its widespread use in SSAfrica

Envía VACUNA al 28033

Más de 4.000 niños mueren cada día
por enfermedades prevenibles
con una vacuna.

msf.es/ponunavacuna

MEDICOS SIN FRONTERAS