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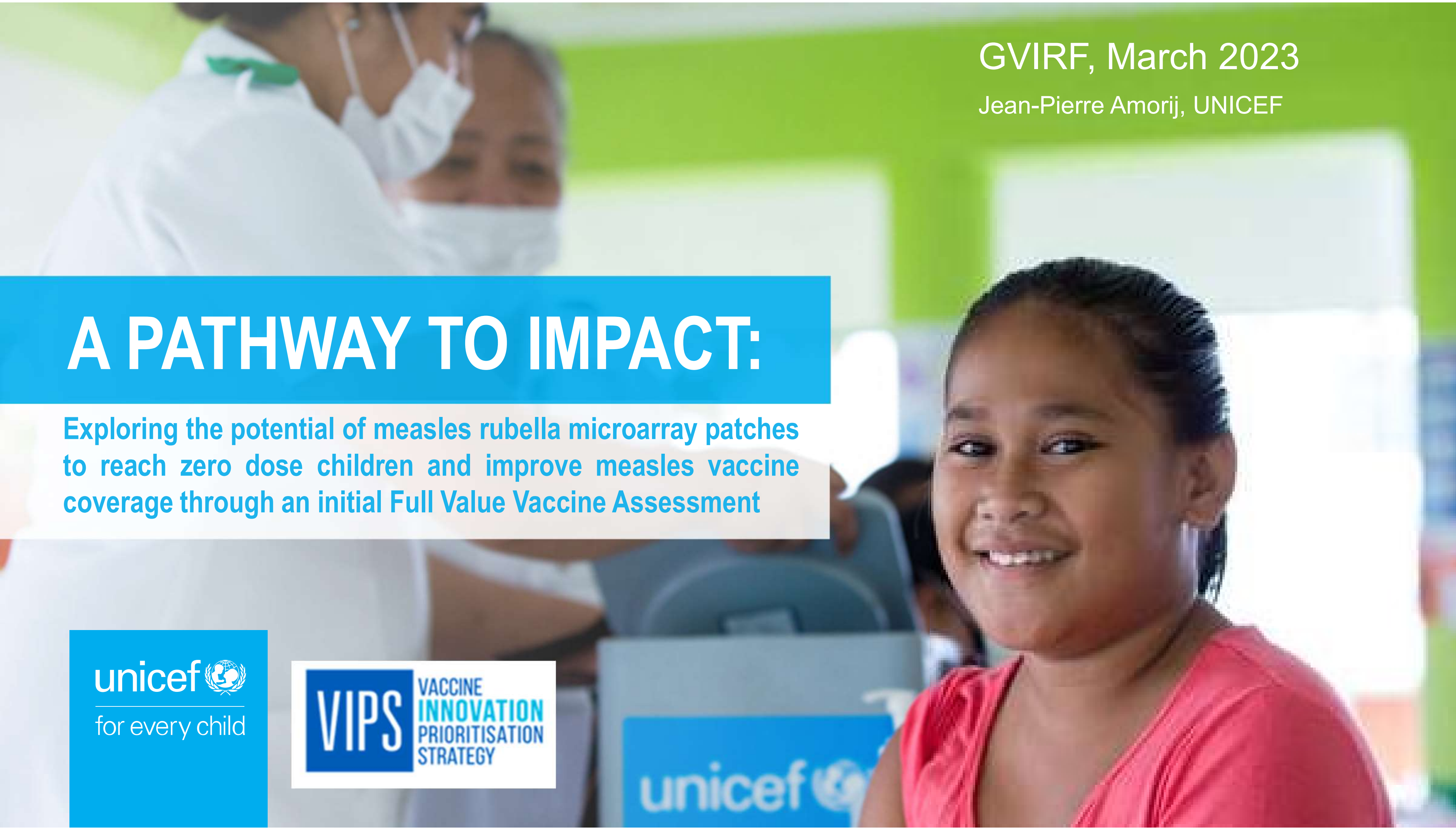
A PATHWAY TO IMPACT:

Exploring the potential of measles rubella microarray patches to reach zero dose children and improve measles vaccine coverage through an initial Full Value Vaccine Assessment



unicef for every child

VIPS VACCINE INNOVATION PRIORITISATION STRATEGY

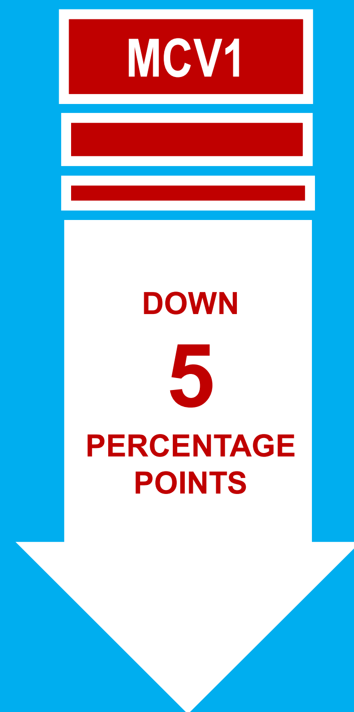
The Measles-Rubella vaccine averts the highest number of vaccine-preventable deaths in children. It has the highest return on investment in public health.[1]

However, **immunization rates have stagnated**. When vaccination coverage for measles or rubella falls below the necessary threshold, **outbreaks** of measles and rubella **occur**.

Challenges towards measles and rubella control and elimination were further exacerbated due to the COVID-19 pandemic, 5.3 million additional children were left unvaccinated against Measles in 2021 compared to 2019 – the highest number in a decade.[2]

Highlights challenges in achieving and sustaining the required high vaccination coverage

High-level messaging, all audiences



47 million total children unvaccinated in 2020 and 2021

The traditional needle-and-syringe format presents challenges to achieving MR programmatic goals

High Human Resource Requirements

- Difficult preparation requiring trained personnel and time/effort
- Difficulty in reaching the last mile (hard-to-reach populations and MOVs due to non-MDV reasons

Incorrect Administration Technique

- Reconstitution-related safety issues
- Contamination risks of multi-dose vials
- Needle-stick injuries
- Difficult to deliver vaccine to the correct injection depth

Poor TSE and Negative Environmental Impact

- Cold chain requirements during outreach; vaccine ineffectiveness /wastage due to heat exposure
- High supply chain and logistics costs
- Vaccine wastage or missed opportunities due to multi-dose vials
- Negative impact on the environment
- Challenges in integrating vaccination (needle and syringe) with other interventions

Increasing Hesitancy

- Administration of the vaccine is painful which reduces acceptability
- Vaccine hesitancy is a continuing trend
- Restrictions/ difficulty in administering multiple injectable vaccines in one session
- Fear of needle and syringe leads to non-compliance

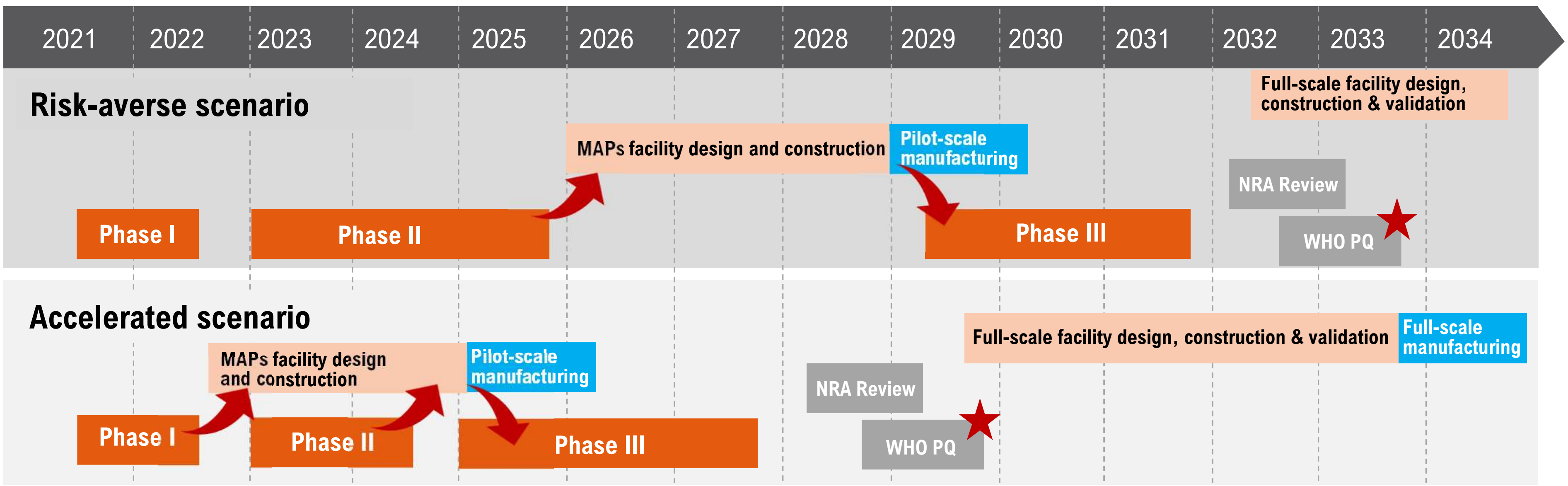
Measles-Rubella microarray patches (MR-MAPs) are a promising technology for addressing these challenges.[3]

MR-MAPs can be applied to the body like a small bandage and used to painlessly deliver a vaccine via microscopic needles.

- ☑ Improved thermostability, reducing the need for cold chain storage
- ☑ Easy to administer
- ☑ Lightweight and easier to transport
- ☑ Single-dose presentation, reducing wastage and missed opportunities for vaccination
- ☑ Relatively painless and more acceptable for patients with a fear of needles
- ☑ Safer, as they eliminate needlestick injuries reconstitution mistakes

Indicative and Projected Timelines for MAP development[5]

Alternative timelines for MR-MAP development from phase one trial to WHO prequalification and product launch



The timelines do not reflect a timeline for any MR-MAP product. The actual timelines may vary. ★ MR-MAP is ready to be used in LMICs.

To understand the potential value of MR-MAPs, UNICEF led an initial full value vaccine assessment (iFVVA)

Methodology

Desk review
- Identify barriers faced by MR programme
- Assess MR-MAP development timelines

Demand forecasts
- Assuming better reach of hard-to-reach populations and reducing missed opportunities for vaccination considering Use Cases

Financial analysis
- Price benchmarking analysis
- Discounted Cash Flow analysis

Consultations
- 34 experts across a wide range of topics

Cost, impact, and cost effectiveness
- PATH's Vaccine Technology Impact Assessment (VTIA) model
- LSHTM Dynamic Measles Immunisation Calculation Engine (DynaMICE) model

Expert Advisory Group
- 19 experts to discuss the methodology and assumptions used, and to endorse the key findings

GLOBAL HEALTH CONSULTING

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

PATH

Global Health Visions

The iFVVA modelled six scenarios to estimate demand* of MR-MAPs (2030-2040), these scenarios were used for the impact modelling

		Presentation(s) modelled		Adoption timing of MR-MAPs		Coverage assumption used	
		N/S	MAPs	Equal weight of all variables	Countries in greatest need	High	Low
1	No MR-MAPs with high coverage	✓				✓	
2	No MR-MAPs with low coverage	✓					✓
3	MR-MAPs available with high coverage	✓	✓	✓		✓	
4	MR-MAPs available with low coverage	✓	✓	✓			✓
5	MR-MAPs are implemented in countries with greatest need with high coverage	✓	✓		✓	✓	
6	MR-MAPs are implemented in countries with greatest need with low coverage	✓	✓		✓		✓

*Estimating the future global dose demand for measles-rubella microarray patches Front Public Health, 2023 doi: 10.3389/fpubh.2022.1037157

The iFVVA demonstrates the strong potential of MR-MAPs to reduce measles morbidity and mortality

Results

Reduction in measles

CASES

by up to **37** million cases

35% reduction

Reduction in measles

DEATHS

by up to **397** Thousand deaths

35% reduction

Reduction in measles-related

DALYs lost

by up to **26** million DALYs

35% reduction

Increase in MCV coverage

MR-MAPs could reach an estimated **80 million** more **children (8%)** between 2030 and 2040 than would be reached using a needle and syringe presentation alone

Cost-effectiveness analysis

Cost 2020 USD

Vaccine procurement + Vaccine delivery + Cost-of-illness −

Uncertainty of MR-MAP price

Varying by routine or SIA

Effectiveness

Averted DALYs + DynaMICE model-based estimates

Incremental cost-effectiveness ratio (ICER)

3% of annual discount rate for both cost and effectiveness

Health opportunity costs

Treshold for cost-effectiveness

[Ochalek et al. (2018) BMJ Global Health](#)

Introducing MR-MAPs has different cost effectiveness considering country types

		Scenario 3 High coverage growth MR-MAPs available in 2030	Scenario 4 Low coverage growth MR-MAPs available in 2030	Scenario 5 High coverage growth Accelerated intro in countries with greatest need in 2030	Scenario 6 Low coverage growth Accelerated intro in countries with greatest need in 2030	Threshold Health opportunity cost
		ICER	ICER	ICER	ICER	ICER
High income countries (n=12)	Low MR-MAP price	(106,711)	(118,106)	(92,222)	(110,808)	55,871 (5,845-180,794)
	High MR-MAP price	(102,109)	(116,597)	(85,219)	(108,987)	
Upper middle income countries (n = 16)	Low MR-MAP price	(1,766)	(648)	(2,192)	(1,026)	5,311 (581–14,152)
	High MR-MAP price	(581)	(92)	(825)	(270)	
Lower middle income countries (n = 33)	Low MR-MAP price	349	40	435	52	339 (116–7,043)
	High MR-MAP price	961	133	1,189	176	
Low income countries (n=20)	Low MR-MAP price	319	10	395	12	137 (72–432)
	High MR-MAP price	1,323	71	1,557	78	
Total	**Low MR-MAP price**	**22**	**(47)**	**149**	**(17)**	
	High MR-MAP price	**779**	**44**	**1,043**	**95**	

- Introducing MR-MAPs in **HIC** and **UMIC** will create significant savings due to the reduction of measles treatment costs rather than reduction of DALYs
- Introducing MR-MAPs in **LMIC** and **LICs** will increase total cost, but assuming a stagnation in MR vaccination coverage, it will be a cost-effective intervention regardless of the low or high price estimate

Values in red indicate cost effectiveness for the income group when compared against health opportunity costs

With the either the low or high estimates for MR-MAP prices and stagnant growth in coverage, introducing MR-MAPs would be a cost-effective strategy in most countries, based on relative comparisons of health opportunity costs.

Introducing MR-MAPs has different cost effectiveness considering country types

Main dependents for CEA (aside from modelled coverage gains and estimated MR-MAPs price) are:

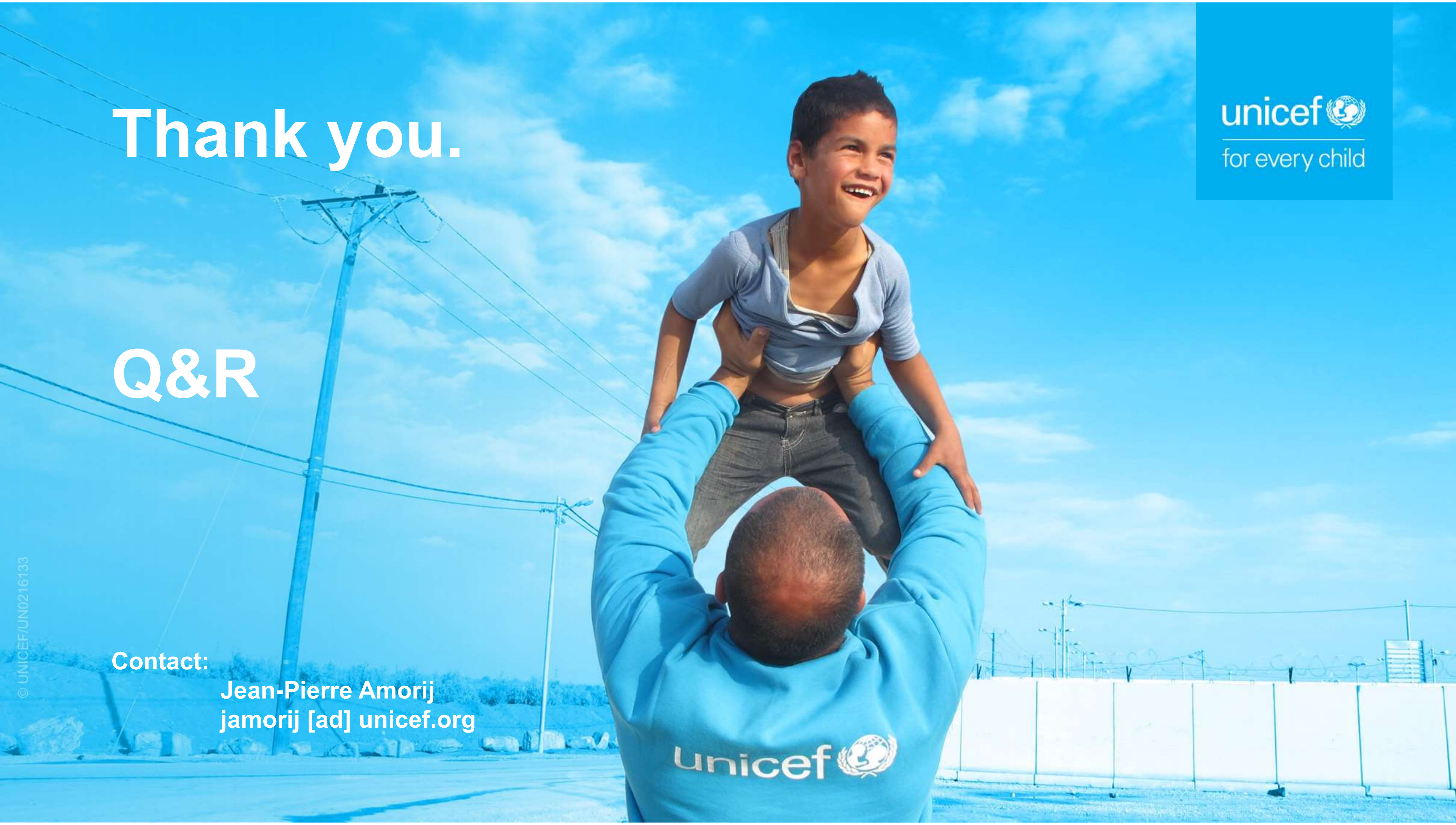
- Country archetypes and their costs of treatment (health opportunity costs) of measles cases
- Threshold criteria for cost effectiveness

CEA has not factored in;

- Broader economic gains for preventing disease of introducing MR-MAPs
- Potential savings from earlier Measles elimination
- Valuation of increased equity (e.g. in the country specific threshold criteria)

Microarray patches could be an important tool for achieving greater equity in vaccine delivery.

Reaching zero-dose children requires innovative approaches and solutions. MR-MAPs might be one tool that can successfully reach children in rural areas and other hard-to-reach locations as well as those who are underserved by the primary healthcare system.



Thank you.

Q&R

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