



*Initiatives*

# ~~Novel strategies~~ to improve vaccine coverage and equity

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Developing Countries Vaccine Manufacturing Network Meeting , Kunming, China

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# Partners involved



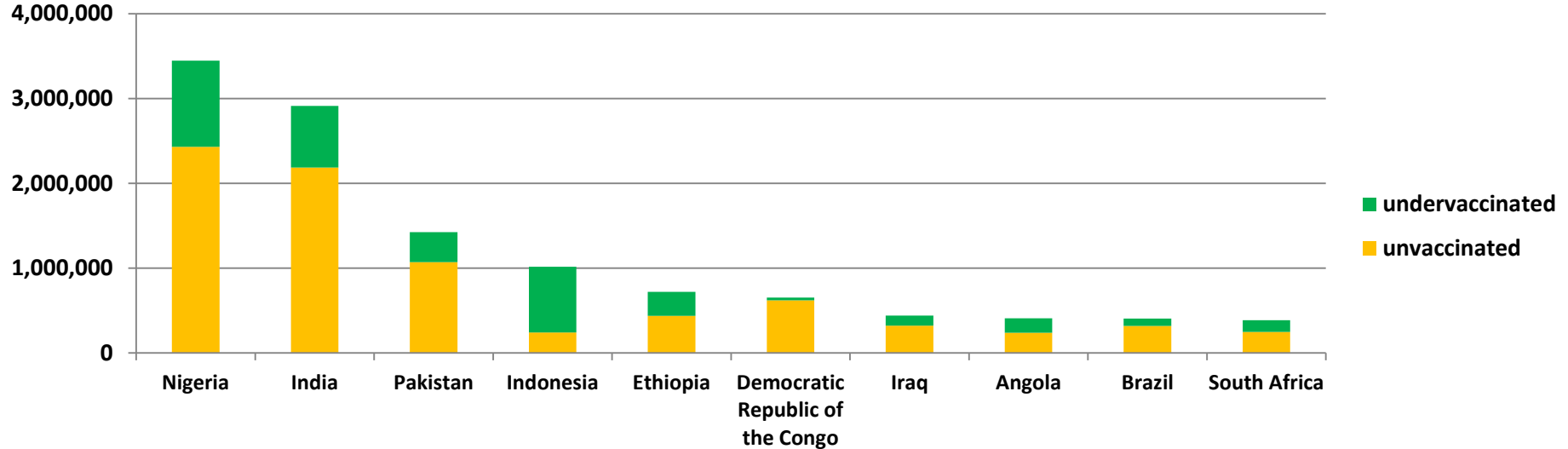
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# Overview

- Anticipated paradigm shifts in immunization strategies
- Total systems effectiveness (TSE)
- Vaccine Innovation Prioritization Strategy (VIPS)
- Specific examples of innovative vaccine delivery approaches:
  - Microarray patches (MAPs)
  - Controlled temperature chain (CTC)

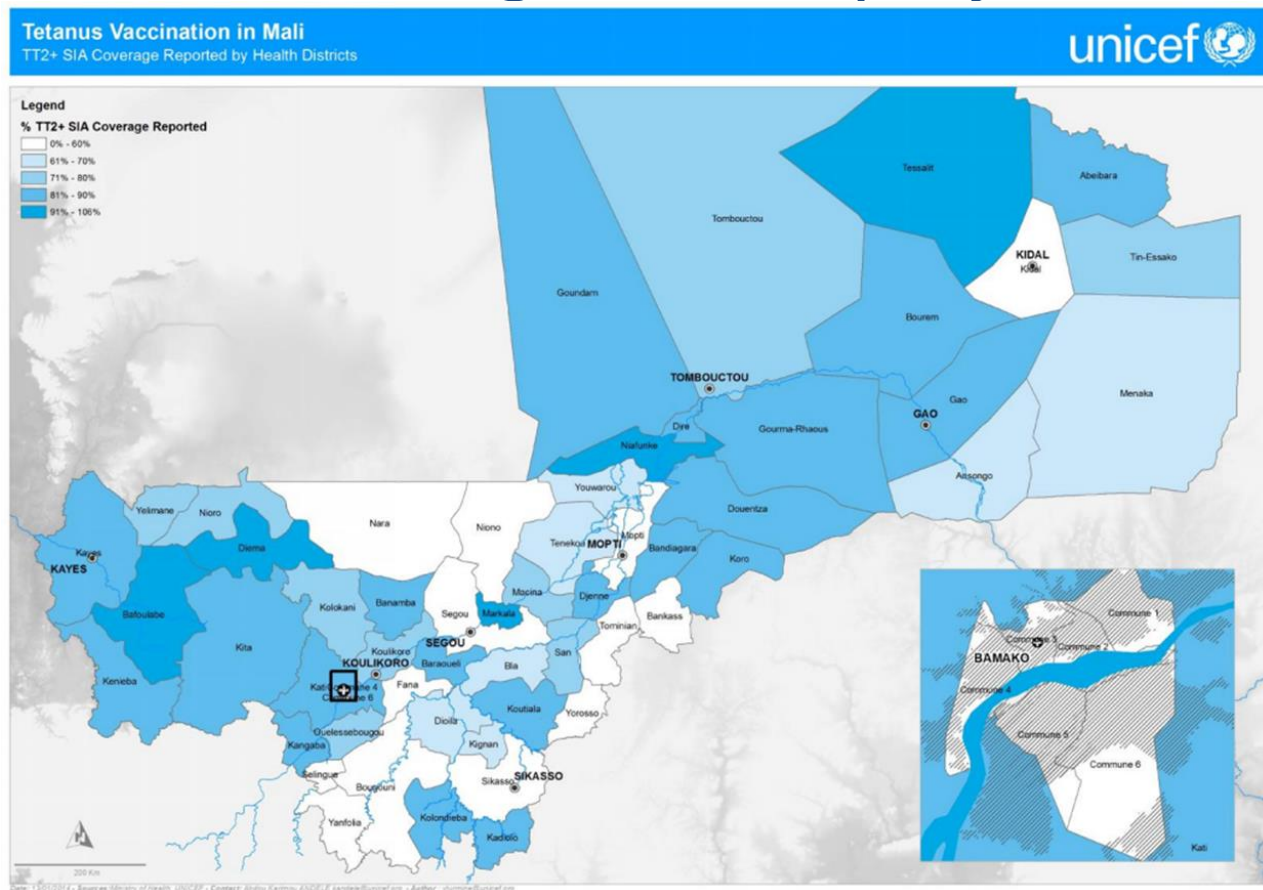
# PROBLEM: 19.9 million under 1 year olds are unimmunized, globally



# 1. Paradigm shifts for global immunization

Moving forward, most of the un-vaccinated will be in middle income countries and in **geographically clustered** areas **sub-nationally** located in key countries.

Solution? A sub-national approach to improve coverage and equity

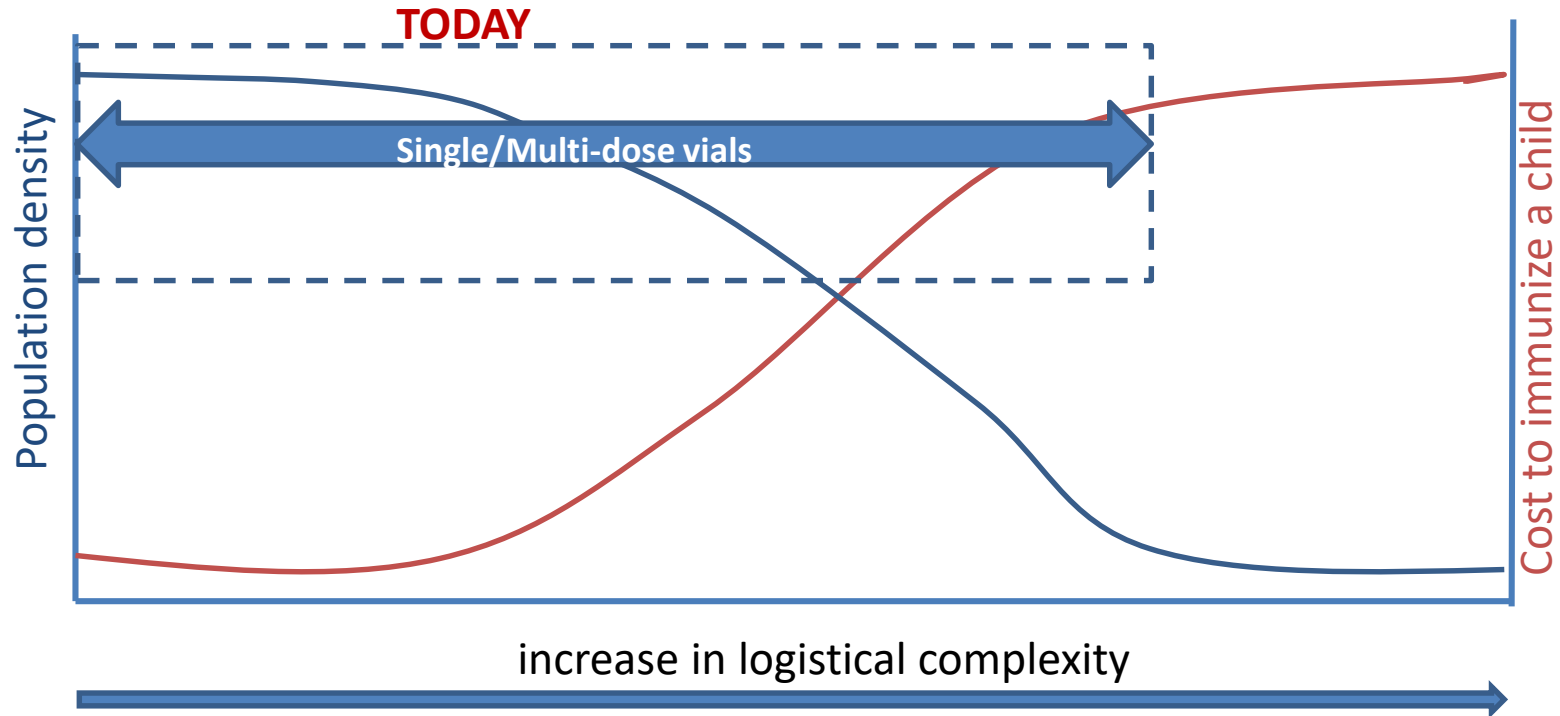


## 2. Paradigm shifts for global immunization

The next decade will likely see shift to **differentiated approaches** being used **in the same country...**

.....focusing on urban poor in the first mile, rural poor in the last mile, and vulnerable populations in fragile/conflict/post-conflict countries

# The existing approaches are not enough





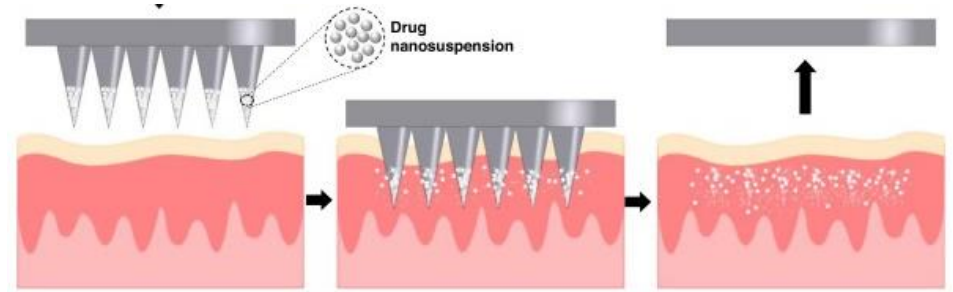
# Potential novel delivery approaches



**Controlled temperature chain (CTC)**



**Next generation compact pre-filled autodisable device**

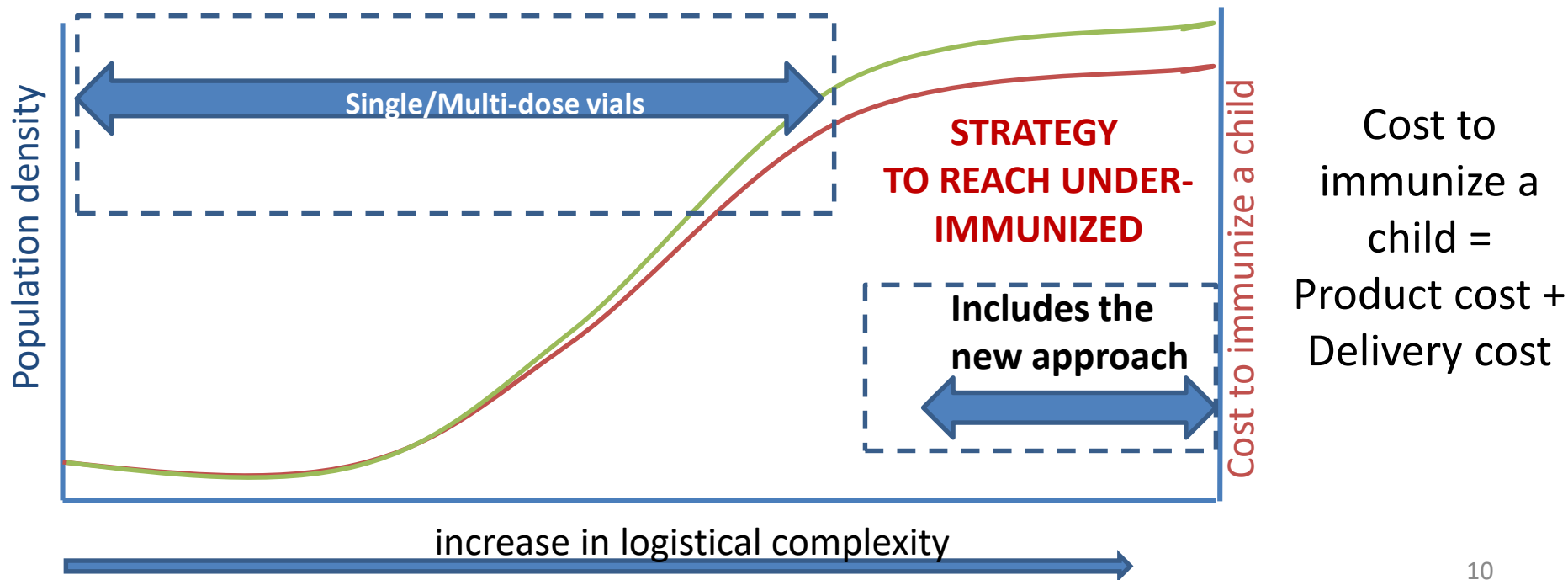


**Microarray patch**



**Integrated reconstitution device**

# Solution? Develop innovative vaccine products to improve equitable vaccine coverage



### 3. Paradigm shifts for global immunization

The next decade is likely to focus on scaling up existing vaccines and switching products (ex: OPV to IPV, Measles to MR or TT to Td)

....or **choices on product presentations / new delivery technologies**, each presenting important **trade-offs that will need to be evaluated**

# Examples of differentiated of products



- Price
- No of doses
- Wastage
- Storage
- Cold chain footprint
- Route of administration



# Solution? Better understanding of and responding to country needs



Countries have a better opportunity to express their preferences and articulate demand for different products

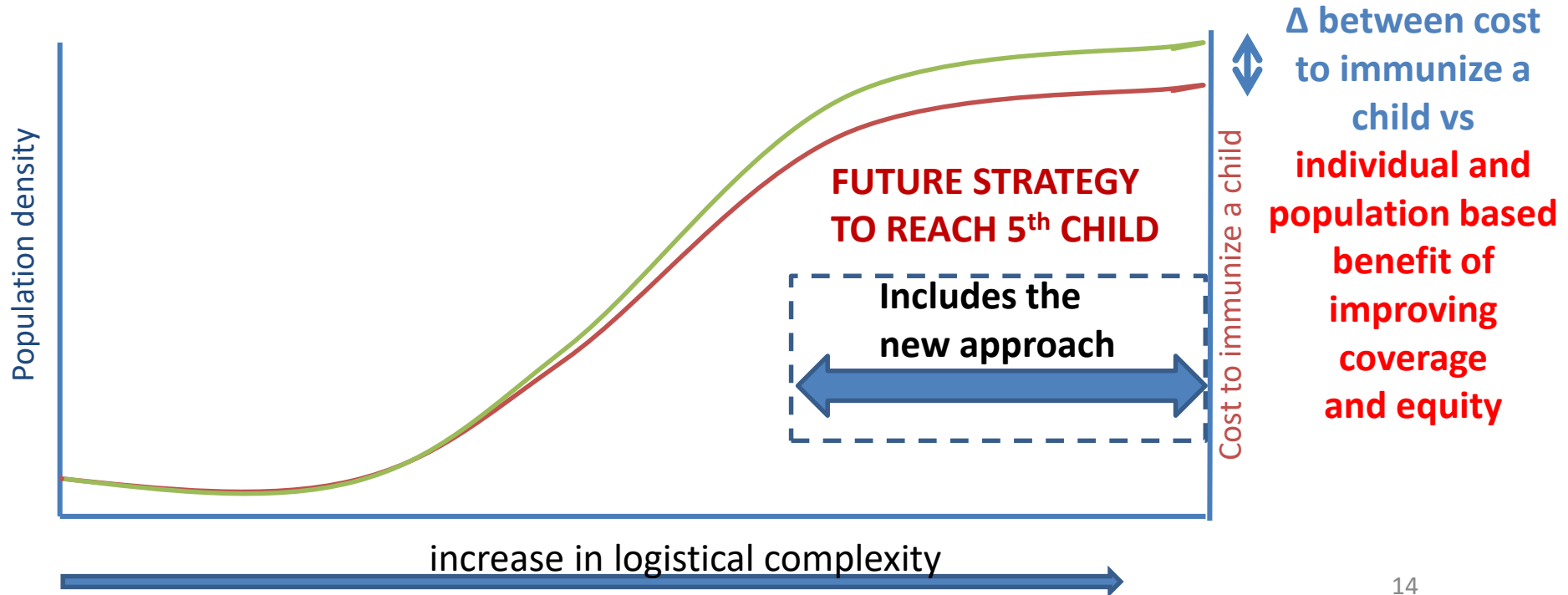


Need a tool and a process to be able to evaluate the trade offs between different products, in the context of their immunization barriers



Better representation of country needs, including needs related to innovation, at the global level

# Total Systems Effectiveness (TSE) is an approach to evaluate tradeoffs

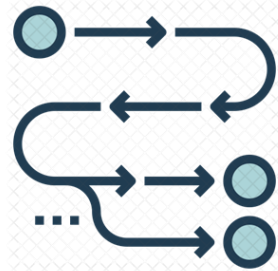


# What is the status of TSE today?



## INTRODUCTION

Rationale for TSE, role of the pilot



Current decision-making process



Critère	Pondération du critère	Attribution des scores (de 1 à 5)		Score
		Rotaleq	Rotavac	Rotale
Efficacité	44	3	2	132
		Rotaleq	Rotavac	Rotale
Impact sur la Santé (sur la maladie)	34	2	2	68
		Rotaleq	Rotavac	Rotale
Coût	22	1	4	22

**Activity:** using TSE for decision-making



**Discussion:** Is TSE useful? For which decisions? Recommendations?

# Vaccine Innovation Prioritisation Strategy (VIPS)



## VIPS: Vision and goal

### VISION

- **Innovation** is one of the **Alliance priorities** for shaping markets to the benefit of Gavi-supported countries
- In this strategic period, the Alliance aims to pursue a common agenda of **driving vaccine product innovation to better meet country needs** and support Alliance goals on immunisation coverage and equity

### GOAL

- **Prioritise innovations in vaccine product attributes** to provide greater clarity to manufacturers and partners to make investment decisions



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# Scope of antigen agnostic vaccine innovations

## Primary containers

i.e. Compact pre-filled autodisable device (cPAD);  
Blow-fill-seal (BFS) container;

## Delivery technologies

i.e. Disposable-syringe jet injector;  
Dry powder inhaler; Nebuliser;  
Electroporation device



## Formulation

i.e. Heat-stable formulations;  
Freeze-stable formulations

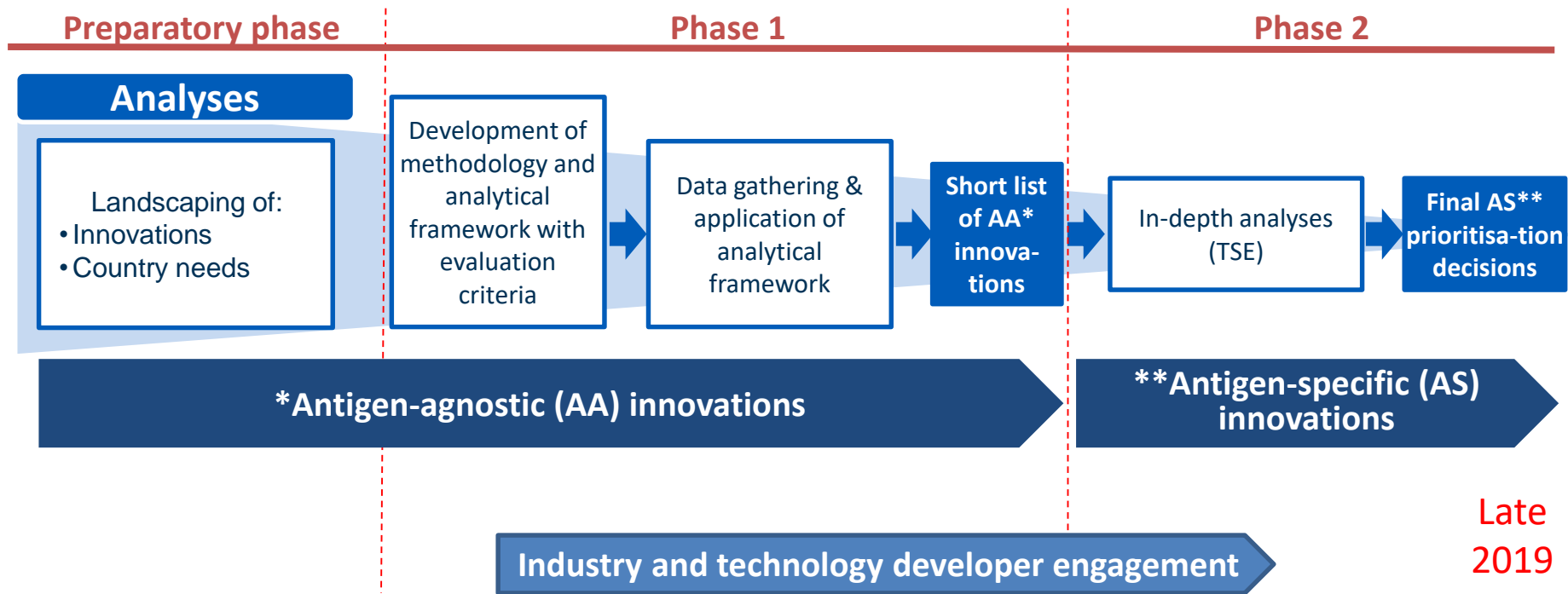
## Labelling

i.e. barcode including global trade item number (GTIN); temperature indicators

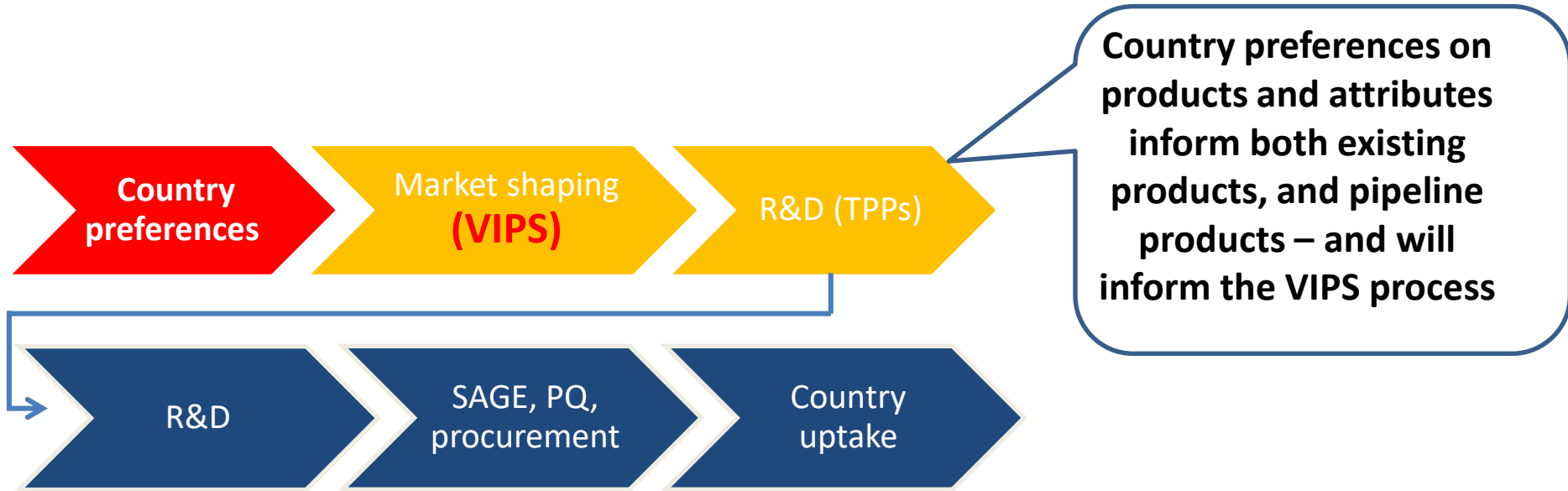
## Packaging

i.e. Bundling accessories; Packed volume

# VIPS will prioritise first antigen-agnostic innovations, then antigen-specific innovations

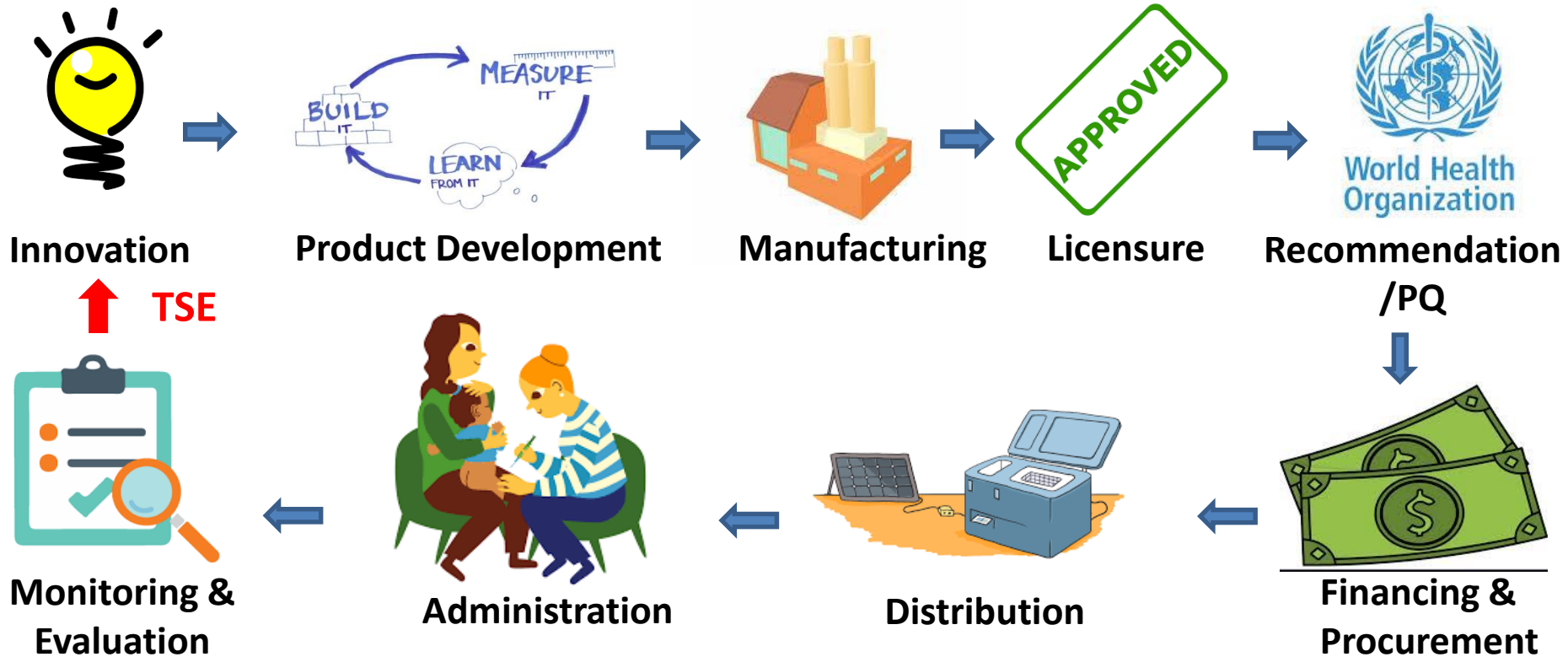


# How are TSE and VIPS related?

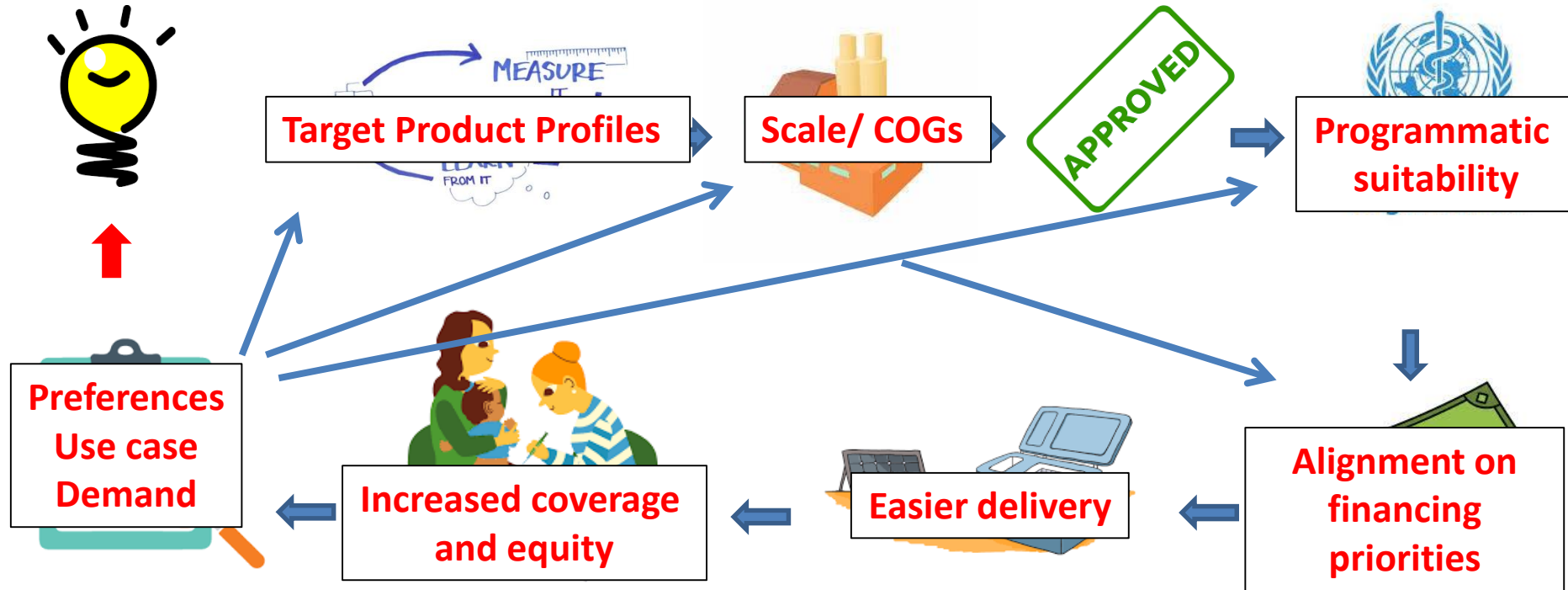


**TSE informs the PUBLIC HEALTH VALUE PROPOSITION  
for new products**

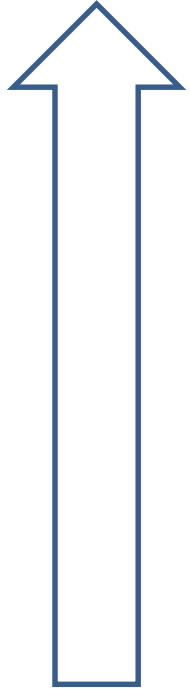
# Product development of VIPS prioritized innovations



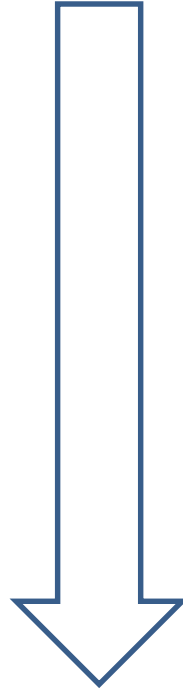
# How can TSE inform product development of VIPS prioritized innovations?



# Benefits and current limitation of the TSE/VIPS approach



- Products shaped by country need
- Alignment across global stakeholders
- Consistent messaging on priorities
- Holistic, end to end approach
- Better use of resources



- TSE and VIPS initiatives are early stage
- In parallel to prioritization, we are working on how to increase resources for development
- Investment by manufacturers may depend on other aspects: market assessment, pathway, procurement mechanism...

**The environment is dynamic and likely to change in the lifespan of product development**

Specific examples of innovative vaccine delivery approaches:

1. Microarray patches (MAP)
2. controlled temperature chain (CTC)



# What are Microarray Patches (MAPs)?

- Needle-free
- Consist of an array of hundreds of small solid-coated or dissolvable projections, up to 1 mm in length, that deliver a dry formulation of vaccine into the upper layers of the skin.
- Target the high density of antigen-presenting cells in the dermis responsible for the immunologic response (potential for dose sparing)
- Likely to be single dose, single use
- May require an applicator, either integrated, or separate, with the potential for re-loading
- Disposal in biohazard waste



# Potential game-changing attributes of MAPs

Syrian children's deaths 'caused by vaccine mix-up'



This girl survived the immunisation mistake but 15 other children died

Medics carrying out a vaccination programme in rebel-held northern Syria accidentally administered a muscle relaxant to up to 75 children, killing 15 of them, the opposition says.

Syria's war

**Remove the need for reconstitution**

**San Francisco Chronicle**  
NORTHERN CALIFORNIA'S LARGEST NEWSPAPER

TUESDAY, OCTOBER 27, 1998

**DEADLY NEEDLES**  
Part of Syria's Fight Against Polio

**Fast Track to Global Disaster**



**Remove the needle waste**

**Storage Capacity**

More and new vaccines fill limited space



More vaccines being recommended but not enough space to store them effectively

**Reduce the storage needs, and need for a cold chain**



**Ease of administration**

# The challenges in product development of MAPs

- Unclear use case: unclear market
- Requires capital investment in manufacturing line
- Partnership between Vx and MAP developer: complexity
- Uncertain procurement mechanism: willingness to pay
- Unclear value proposition for investment



**Will understanding country preferences, use case, potential market, by applying TSE, and prioritization by VIPS be helpful to vaccine manufacturer decision making?**

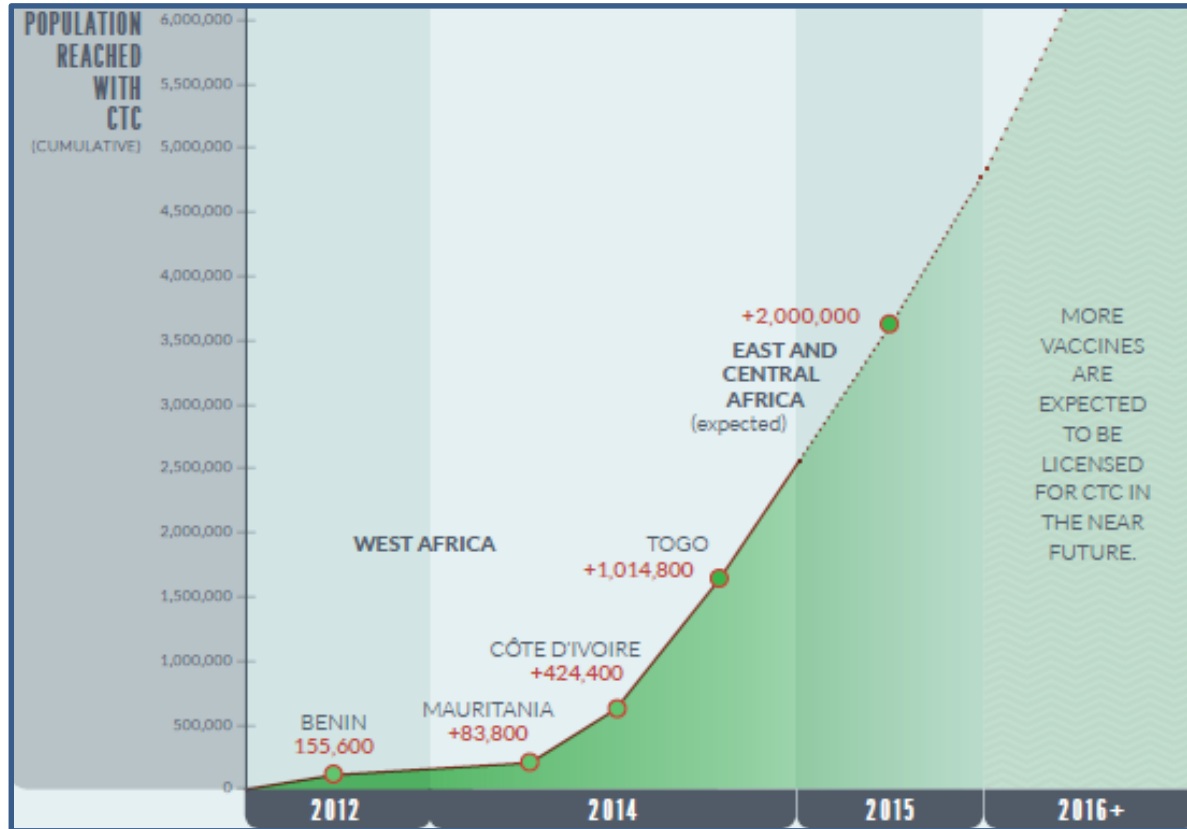
# Programmatic definition of Controlled Temperature Chain (CTC)

.....a specific set of conditions allowing for a vaccine to be stored and transported outside of the traditional 2° to 8°C cold chain

- One excursion, just prior to administration
  - Ambient temperatures up to 40°
  - Specifically limited duration (at least 3 days)
- Currently limited to vaccines used in special campaigns



# The extra reach of CTC



Priority vaccines for CTC:

- Human papillomavirus (HPV);
- Oral cholera vaccine (OCV);
- Tetanus toxoid vaccine;
- Hepatitis B vaccine birth dose (HepB-BD)

**CTC's greatest value is in the last mile, to facilitate outreach**

# The challenges in product development of CTC

- Limited to specific vaccines that are delivered in special campaigns, not in a bundle
- Requires manufacturers to generate stability data at 40C, and license for CTC
- In-country uptake and demand generation has been challenging
- Longer thermostability timeframes may be technically feasible for some vaccines which would bring significant programmatic advantages over the current 3 day window



**TSE intends to help countries to better understand the value and potential impact of CTC**

**...and to inform country preferences for thermostability requirements, and appropriate vaccine bundling**

**Will prioritization of CTC by VIPS be informative and compelling to vaccine manufacturer decision making?**

# Thanks!

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# Innovative Technologies

## Panel Discussion

DCVMN meeting – Kunming, China

31 October 2018

How can the TSE and VIPS initiatives better identify and advance priority innovations for vaccines that will help countries meet their immunization coverage and equity goals and other needs?






# Examples of Successful Innovations Advanced to Date

Vaccines and Biologicals

## Safety of injections

WHO-UNICEF-UNFPA  
joint statement\* on the use of  
auto-disable syringes in  
immunization services

1. The reuse of standard single-use disposable syringes<sup>1</sup> and needles places the general public at high risk of disease and death.
2. The auto-disable syringe, which is now widely available at low cost, presents the lowest risk of person-to-person transmission hepatitis B or HIV) because it cannot be reused as equipment of choice for administering vaccines in mass campaigns.





## Auto-disable Syringes



## Vaccine Vial Monitors

7.6 billion supplied

Before	After
	
First-generation rotavirus vaccine: <b>156 cm<sup>3</sup> per dose</b>	Third-generation rotavirus vaccine: <b>12 cm<sup>3</sup> per dose</b>

## Volume Reductions

# Examples of Successful Innovations Advanced to Date

## Controlled Temperature Chain (CTC) Qualified Vaccines

**MenAfriVac®**  
meningitis A  
vaccine



4 million doses  
delivered  
in a CTC

**Gardasil™** human  
papillomavirus vaccine



**Shanchol™** oral cholera vaccine



## Novel Primary Containers



**Euvichol®** oral cholera vaccine

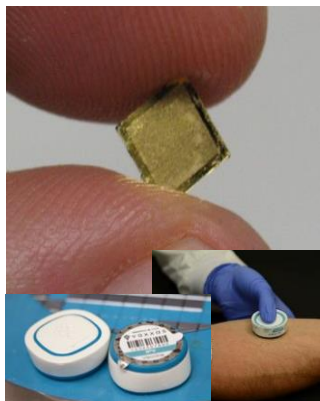


**Rotarix™** rotavirus vaccine

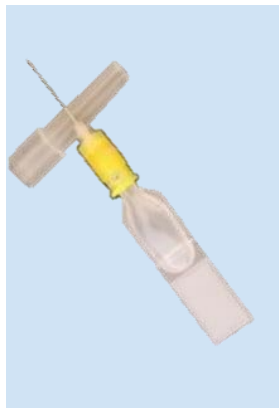


**Rotasiil®** rotavirus  
vaccine

# Examples of Emerging and Future Innovations for Vaccines



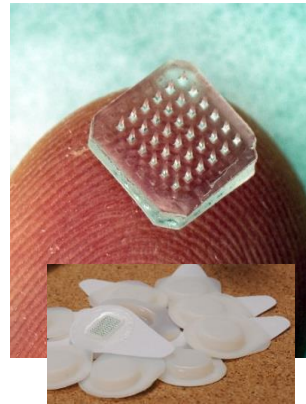
**Coated microarray  
patch**



**Blow-fill-seal compact  
prefilled auto-disable  
device**



**Blow-fill-seal  
container with insert  
(septum)**



**Dissolving microarray  
patch**



**Sublingual fast  
dissolving tablets or  
gels**



**Integrated reconstitution  
technology**



**Disposable-syringe jet  
injector**

