Vaccine technology costs and health impact assessment tool

Global Vaccine and Immunization Research Forum

Johannesburg, South Africa

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PATH
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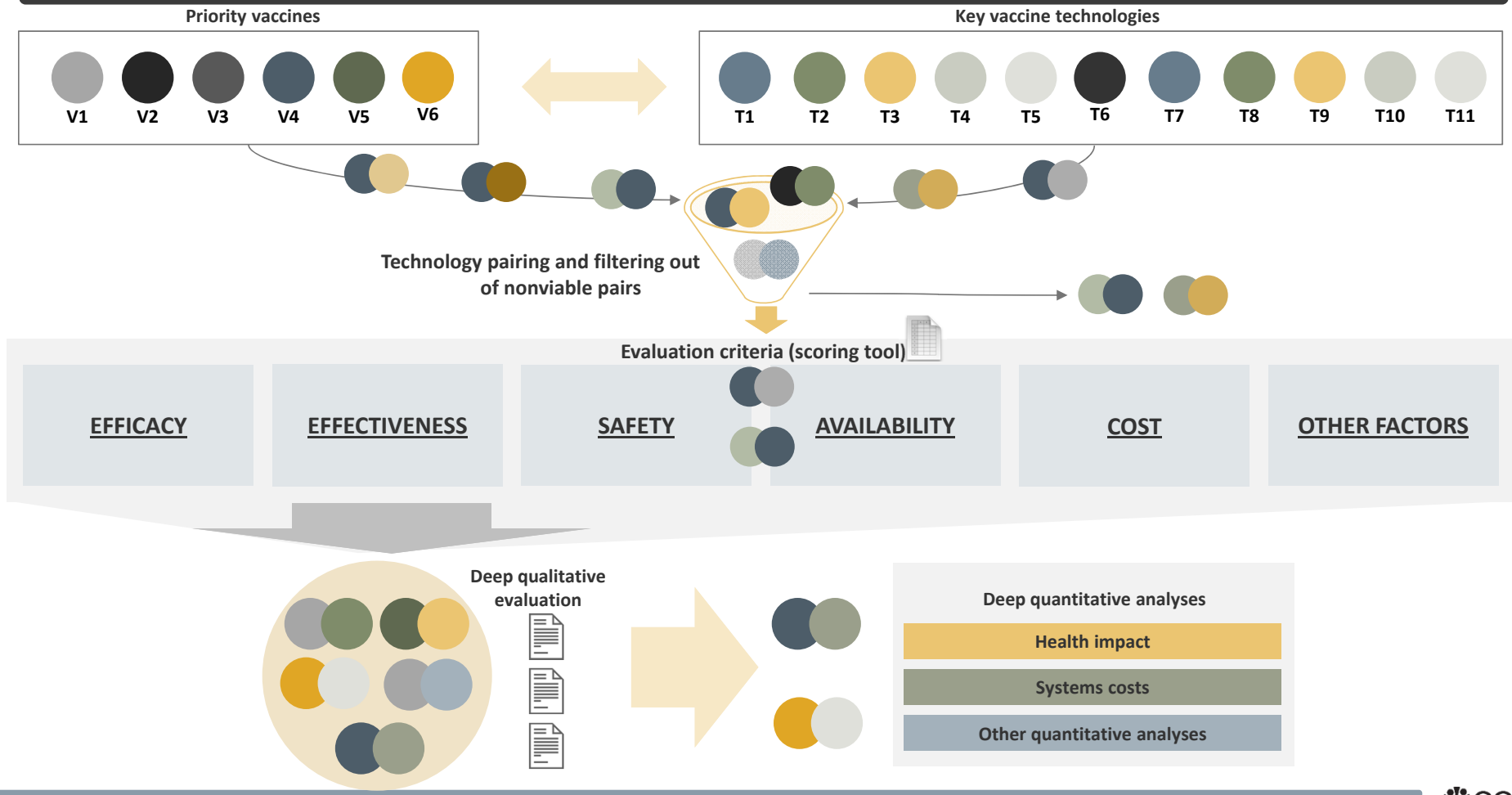
Technology prioritization: overview



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Background: vaccine technology costs and health impact assessment tool

- Will provide a comparative evaluation of the commodity and system costs for the current vaccine/technology presentation compared to a new presentation.
  - The tool will also evaluate the potential health benefits of the current presentation compared to the new presentation.
- Sensitivity analyses will be done to identify the key drivers affecting the estimated costs and health impact for the vaccine/technology pairing.
- The analyses will use data from a sample of countries where supply chain cost data have been previously collected.
  - Conducting analyses across several countries will highlight the country-specific inputs that will drive the estimates.

The analytical framework—1

Commodity costs

* Vaccine purchase costs.
* Reconstitution and injection syringes purchase costs.
* Safety box purchase cost.

System costs

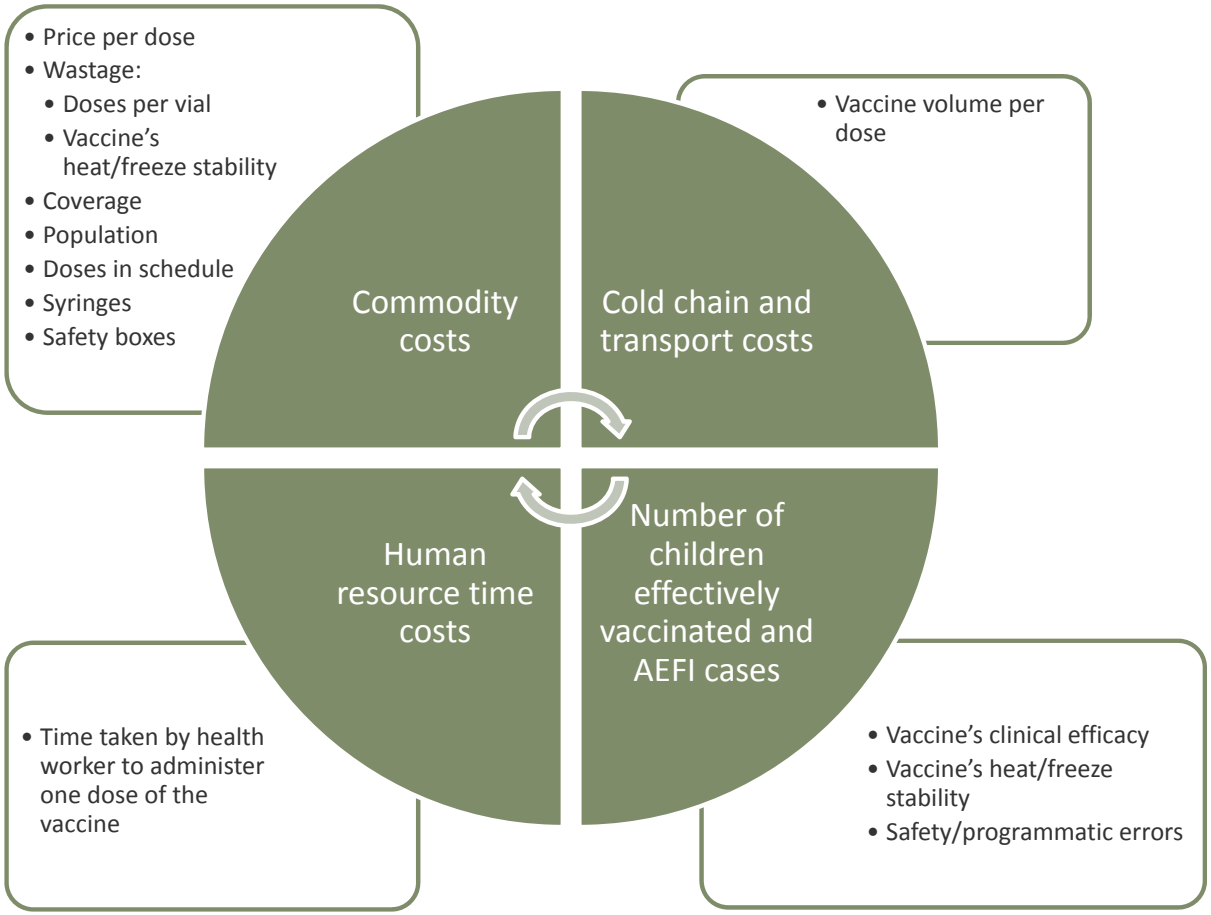
* Cold chain costs.
* Transport costs.
* Human resources costs for vaccine administration.

Health impact

* Number of children effectively immunized.
* Potential for increase in coverage.

VACCINE TECHNOLOGY COSTS AND HEALTH IMPACT ASSESSMENT TOOL

The analytical framework—2



Abbreviation: AEFI, adverse event following immunization.

An example of an analysis done using the tool

An analysis to evaluate the commodity and system costs and the potential benefits to the health system of having the MR vaccine in a MAP compared to the current (baseline) vaccine presentation.

MR vaccine in current presentation: lyophilized vaccine and diluent

versus

MR vaccine in microarray patch

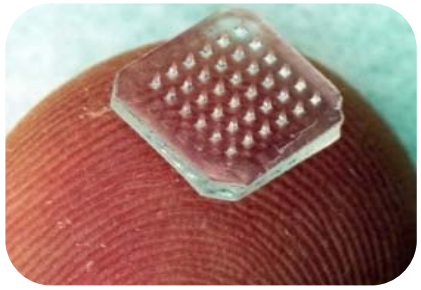


Photo: Georgia Institute of Technology.

Abbreviations: MAP, microarray patch; MR, measles and rubella.

Model description

- Excel-based model.
- Focuses on costs when the MR vaccine is used for **routine immunization**.
  - Additional analyses will be done for other vaccine/technology pairs and delivery channels.
- Estimates the economic costs for one birth cohort.
- Example presented here used data for Tanzania.

Abbreviations: IPV, inactivated poliovirus vaccine; MAP, microarray patch; MR, measles rubella.

Model inputs: country statistics and vaccine data

- Country: Tanzania.
- Year of analysis: 2014.
- Surviving infants: 1,873,000.
- MR vaccine coverage rates:
  - Coverage for first dose: 99%.
  - Coverage rate for second dose: 29%.
- MR vaccine clinical efficacy:
  - First dose: 90%.
  - Second dose: 99%.
- Baseline MR vaccine presentations: 10-dose vial and 1-dose vial, lyophilized vaccine, and diluent.
- Baseline MR vaccine wastage rates: 30% for 10-dose vial; 1% for 1-dose vial.

Abbreviation: MR, measles rubella.

Model inputs: baseline MR vaccine presentations versus in MAP

	Baseline comparator—MR 10 dose	Baseline comparator—MR 1 dose	MR in MAP—lower range assumptions	MR in MAP—mid-range assumptions	MR in MAP—upper range assumptions
Vaccine price (US$)	$0.61	$1.85	$0.80	$1.20	$2.00
Number of doses per vial	10	1	1	1	1
Wastage rate	30%	1%	1%	1%	1%
Cold chain volume per dose (cm^3)	2.61	26.11	2.61	5.00	26.00
Price of injection syringe per dose (US$)	$0.04	$0.04	0	0	0
Price of reconstitution syringe per dose (US$)	$0.004	$0.040	0	0	0
Sharps volume per dose (cm^3)	46	77	0	5	26
Time taken by nurse to administer (and monitor) one dose (seconds)	20.9	48.3	7.6	30.0	120.0

Abbreviations: MAP, microarray patch; MR, measles rubella.

Model inputs: MR current presentation versus in MAP

Other model assumptions:

- The MAP will maintain the same clinical efficacy and stability as the lyophilized MR vaccine (before reconstitution).
  - Risk to the vaccine's potency while vaccine is in the supply chain is very low for MR.
- Literature review found that AEFI rates for MR (and MMR) range from 0.8 to 22.0 per 1,000 children immunized.

Additional analyses:

- Additional number of children immunized if MAP can increase coverage.
  - Modeled second-dose MR coverage increasing by 5% and 10%.
- Modeled the reduction in AEFIs if MAP could reduce AEFIs by 1%, 5%, and 10%.

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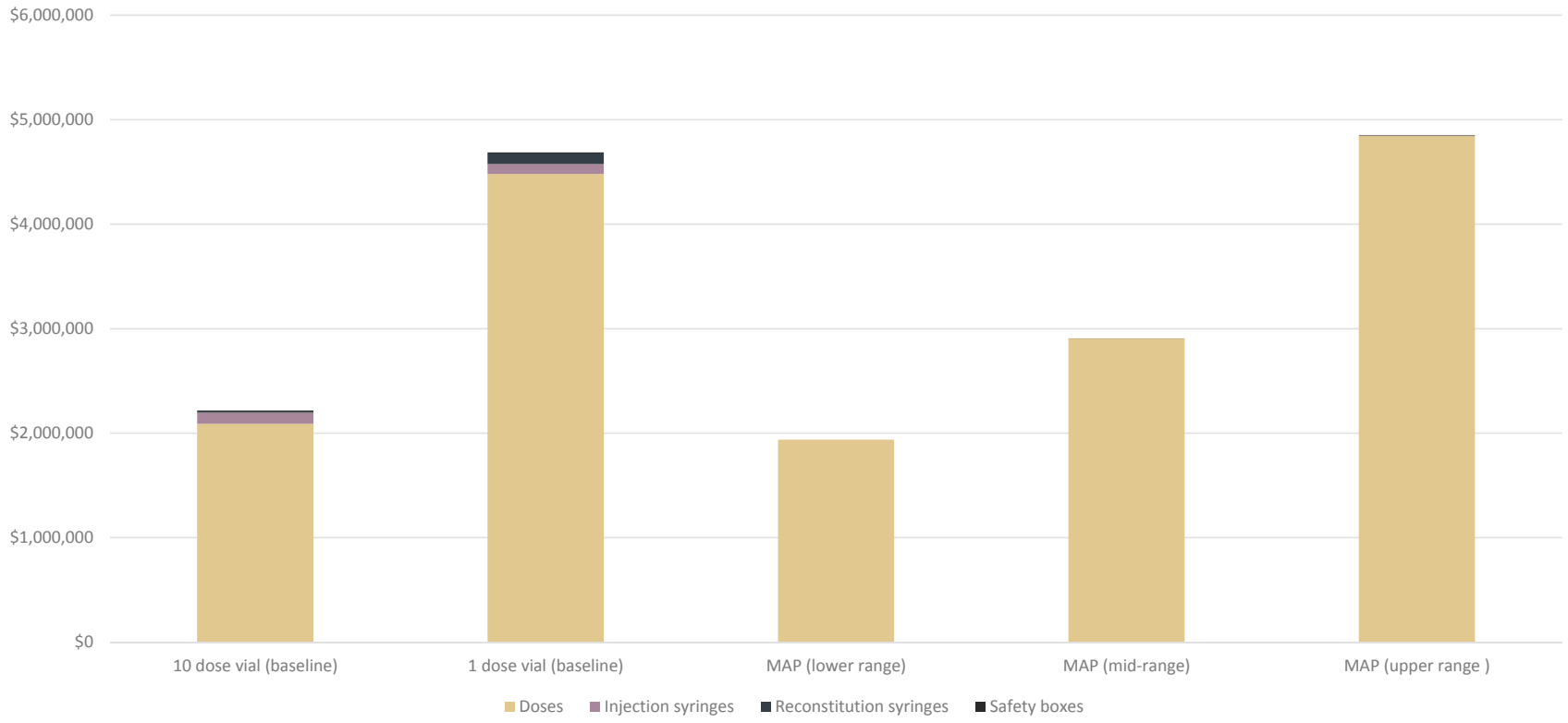
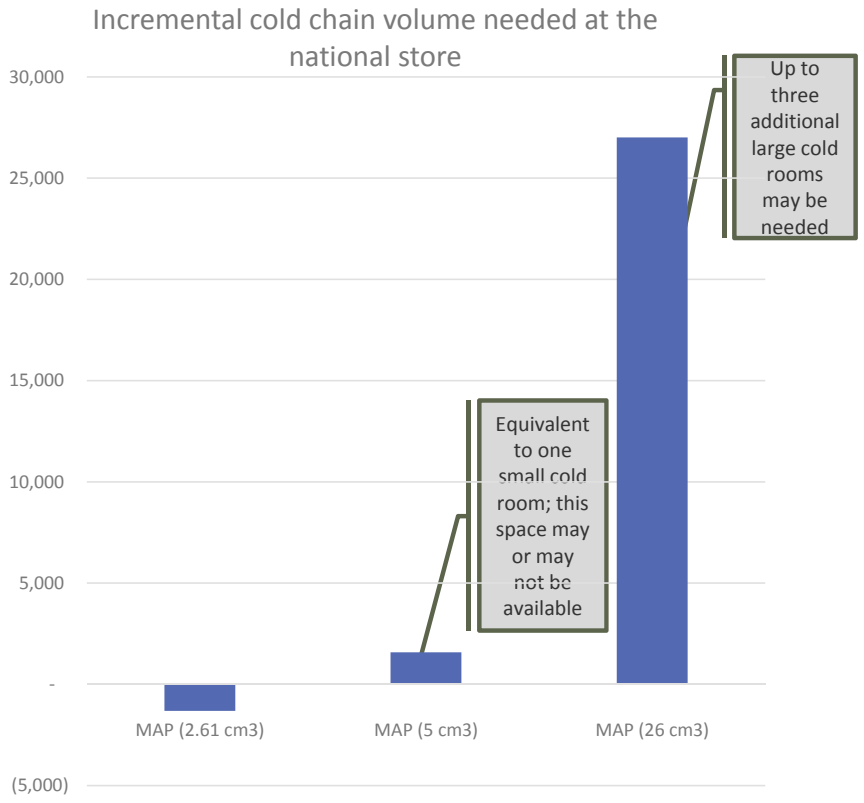
Abbreviations: AEFI, adverse event following immunization; MAP, microarray patch; MMR, measles, mumps, rubella; MR, measles rubella.

Results: commodity purchase costs

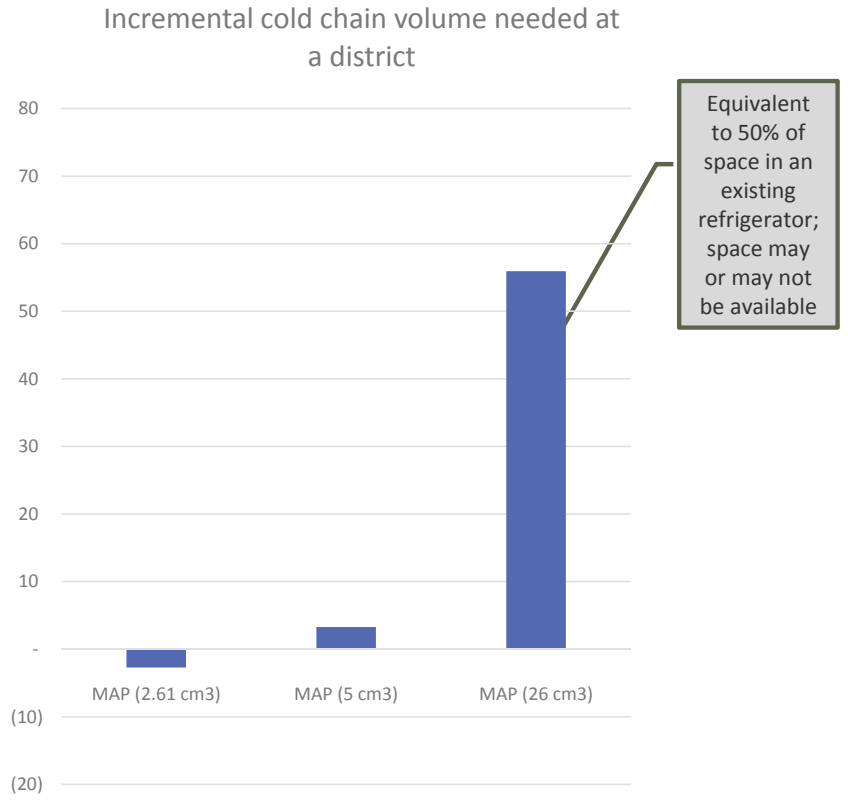


Abbreviation: MAP, microarray patch.

Results: incremental cold chain volume needed (liters)



Note: A small cold room has a net storage capacity of approximately 1,500 liters; a large cold room has a net capacity of approximately 10,000 liters.



Note: A typical refrigerator at the district has a net capacity of about 120 liters.

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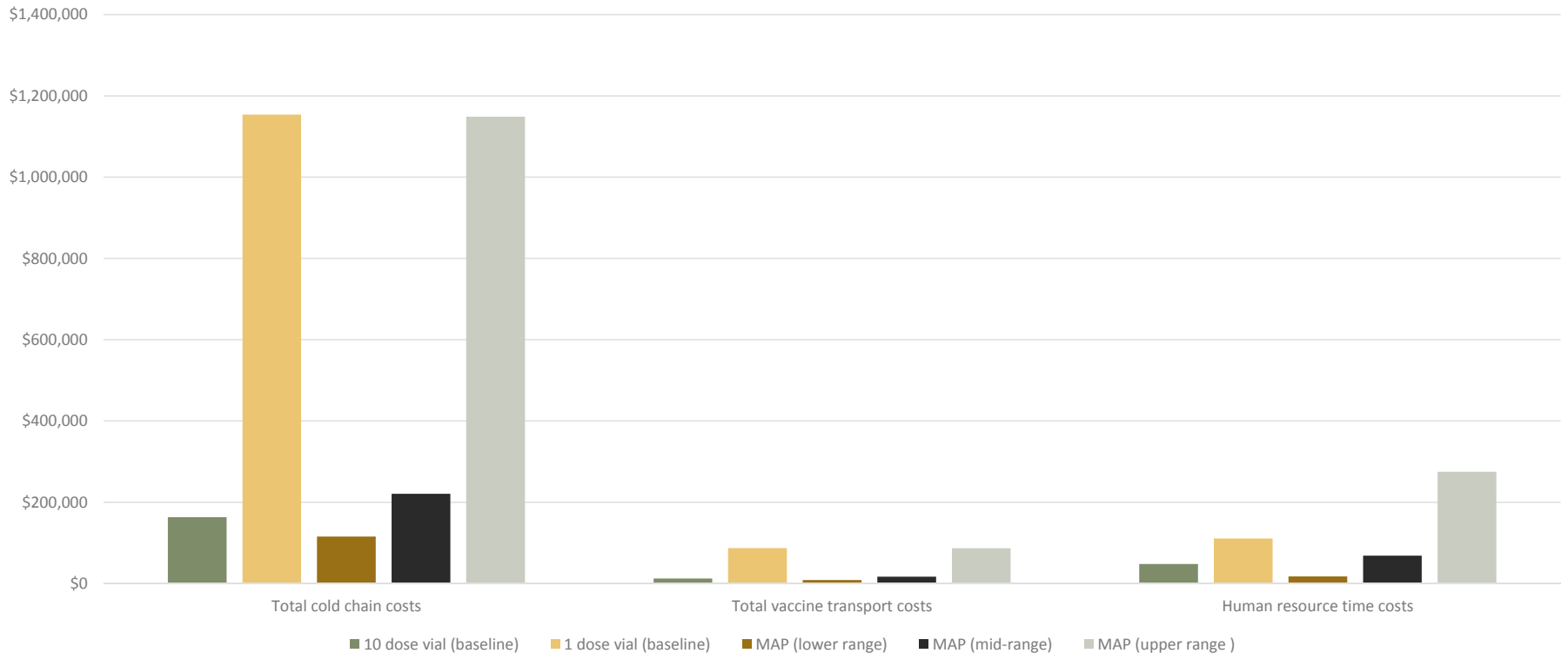
Abbreviation: MAP, microarray patch;

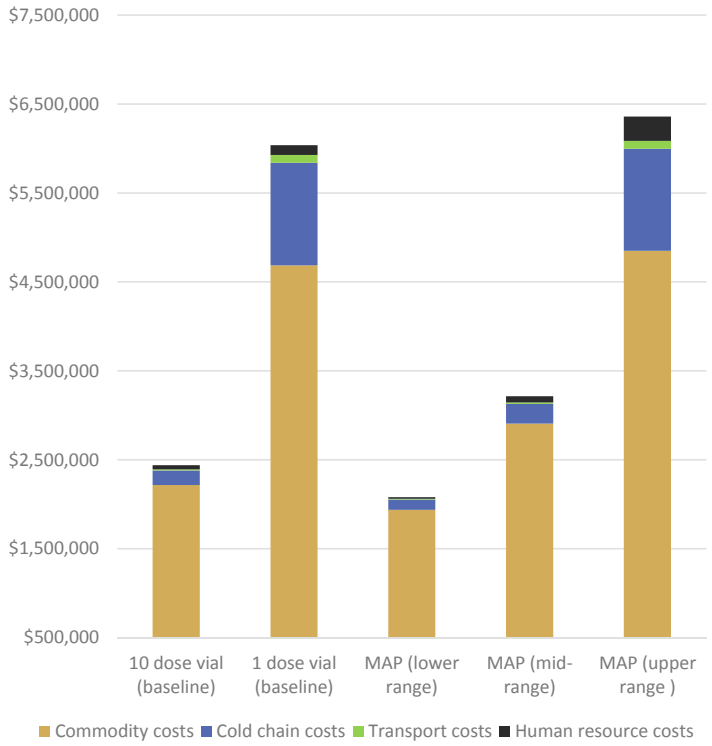
Results: system costs



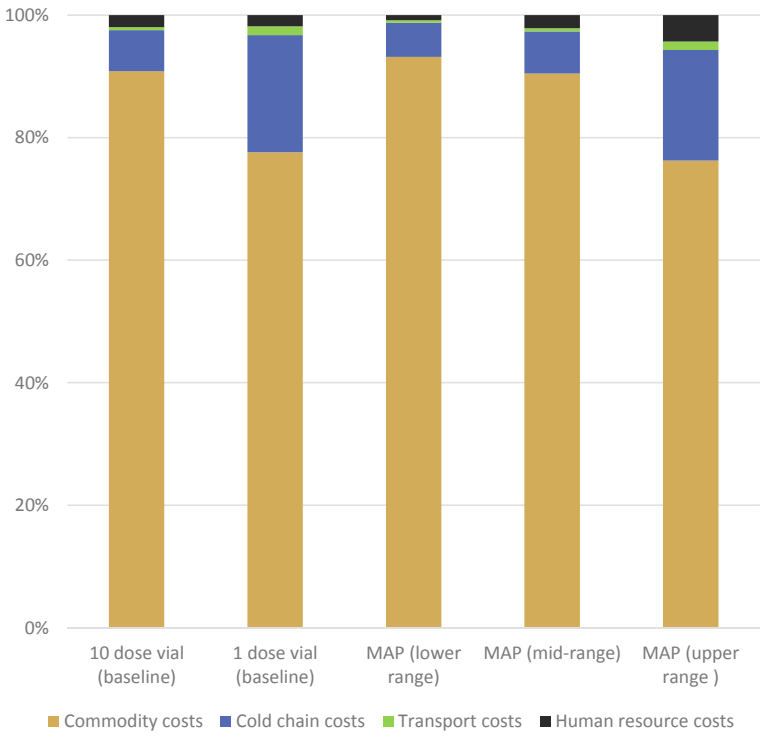
Abbreviation: MAP, microarray patch.

Results: commodity and system costs and cost shares

Commodity and systems costs in US$



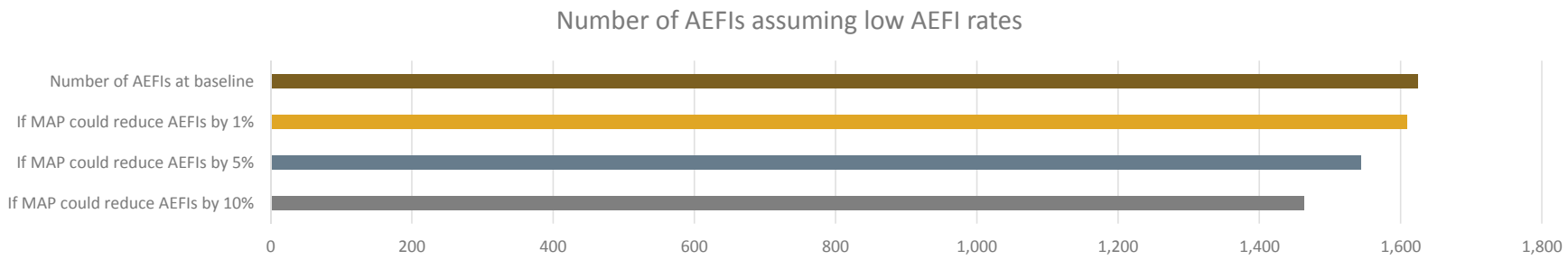
Cost shares



Abbreviation: MAP, microarray patch.

Results: health impact

- A total of 1,854,270 children vaccinated with first dose.
  - A total of 1,661,526 effectively protected from disease given MR vaccine's clinical efficacy.
- At current second-dose coverage rates (29%), only 543,170 children vaccinated with second dose.
- If MAP could increase second-dose coverage, then:
  - A total of 93,650 more children would be vaccinated if coverage increased by 5%.
  - A total of 187,300 more children would be vaccinated if coverage increased by 10%.
- If there are 0.876 AEFIs per 1,000 children immunized, and the MAP can reduce these cases, then the potential impact is shown in the graph.



Abbreviations: AEFI, adverse event following immunization; MAP, microarray patch; MR, measles rubella.

Data needed to improve the modeling results

- Specifications for the “market-ready” MAP.
  - Cost of goods data.
  - Secondary and primary volume per dose.
  - Clinical efficacy compared to current vaccine presentation(s).
  - Time to administer each vaccine dose: How long does the patch need to stay on and does the health worker need to supervise the client during entire process?
  - Need for an applicator?
  - Programmatic errors with MAP (e.g., probability of ineffective immunization due to lack of pressure?).
- Rates of programmatic errors for vaccine in current presentation.

Abbreviation: MAP, microarray patch.

Contact information

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Devices and Tools Program
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