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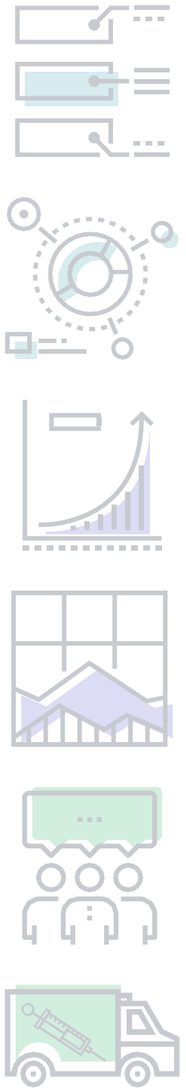
14th International Rotavirus Symposium
Bali, Indonesia
March 16, 2023

Impact and Cost-Effectiveness of Injectable Next-Generation Rotavirus Vaccine in LMICs

Frédéric Debellut
Senior Health Economist
PATH's Center for Vaccine Innovation and Access

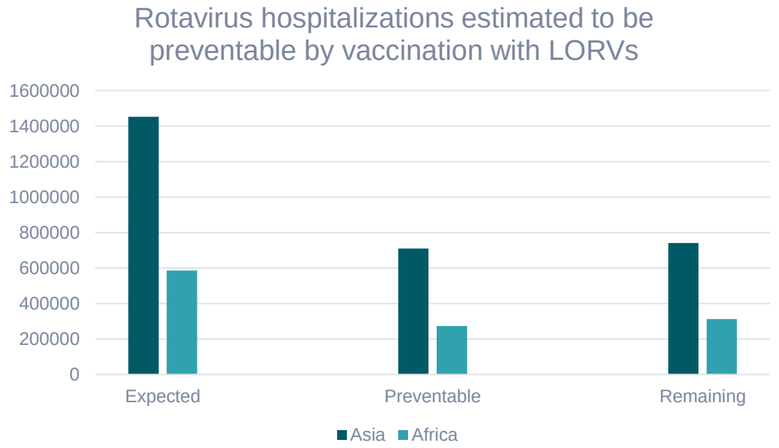


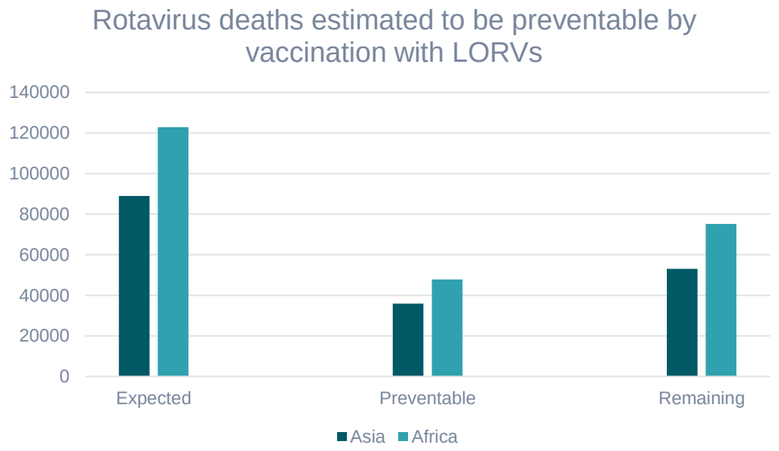
PATH

Even if LORVs were universally introduced, rotavirus disease burden would remain a public health concern

Rotavirus vaccine landscape

- Live, oral rotavirus vaccines (LORVs) show lower efficacy in high infant mortality settings.
- Rotavirus continues to negatively impact child health, particularly in Asia* and Africa** where the majority of deaths are concentrated.
- Injectable next-generation rotavirus vaccines (iNGRVs) could help mitigate the remaining disease burden.
- They would also ideally address:
  - Lingering concerns regarding safety (intussusception).
  - Financial and logistical barriers to LORV uptake and access.





*Burnett E, Tate JE, Kirkwood CD, et al. Estimated impact of rotavirus vaccine on hospitalizations and deaths from rotavirus diarrhea among children <5 in Asia. *Expert Review of Vaccines*. 2018;17(5):453-460.
**Shah MP, Tate JE, Mwenda JM, Steele AD, Parashar UD. Estimated reductions in hospitalizations and deaths from childhood diarrhea following implementation of rotavirus vaccination in Africa. *Expert Review of Vaccines*. 2017;16(10):987-995.

Goal of the iNGRV Public Health Value Proposition

The iNGRV Public Health Value Proposition

Goal: *To understand and communicate to international agencies, funders, vaccine developers, and countries the real public health value of iNGRVs.*

This could ultimately help pave the way for introduction of appropriate new iNGRVs into LMICs.

Impact and Cost-Effectiveness

An impact and cost-effectiveness analysis evaluating multiple rotavirus vaccine options

Purpose of this study

PATH assessed different use cases of iNGRVs in 137 LMICs:

- iNGRV standalone (high and medium efficacy).
- iNGRV-DTP-containing combination (high and medium efficacy) i.e. iNGRV combined with DTP-pentavalent or DTP-hexavalent
- Co-administration of a medium-efficacy iNGRV with LORVs.

The analysis:

- Compared an iNGRV to LORVs and to an oral next-generation rotavirus vaccine (oNGRV) given on a neonatal schedule.
- Evaluated a total of 20 scenarios using the UNIVAC model.
- Looked at the societal perspective over a 10-year time horizon from 2025 to 2034.
- Assumed full vaccine prices even for Gavi-eligible countries.

Illustrative vaccine prices

Description of methods and study assumptions

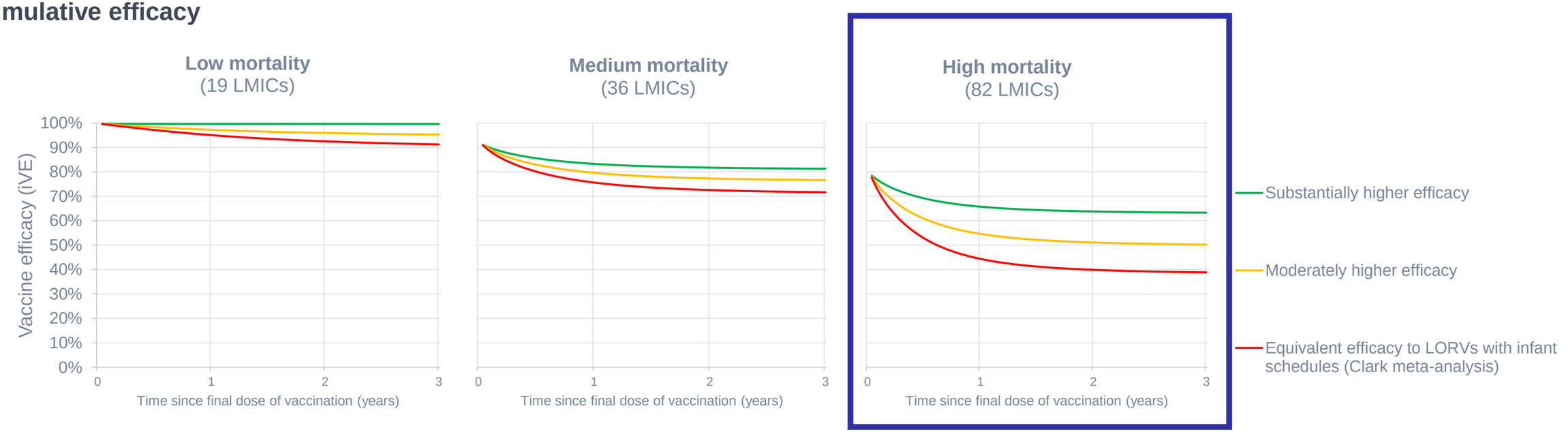
Country groups	ROTARIX	ROTAVAC	ROTASIIL	oNGRV	iNGRV	iNGRV-DTP
Non-Gavi	**$6.50-$14.77**	**$1.25**	**$1.63**	**$1.25**	**$0.81**	**$0.43**
Gavi countries	**$2.13**	**$1.14**	**$1.55**	**$1.17**	**$0.75**	**$0.40**

Data sources include Gavi DPP, PAHO RVF, WHO vaccine purchase database, manufacturers consultation, and BMGF.

Vaccine efficacy assumptions

Description of methods and study assumptions

Cumulative efficacy



Source: Clark A, van Zandvoort K, Flasche S, et al. Efficacy of live oral rotavirus vaccines by duration of follow-up: A meta-regression of randomized controlled trials. *Lancet Infectious Diseases.* 2019;19(7):717-727.

Vaccine strategies and efficacy assumptions modeled in the study

Description of methods and study assumptions

Standalone vaccine strategies	
Vaccination strategies	**Efficacy scenarios**
ROTAVAC* ROTASIIL* ROTARIX*	Base
oNGRV	Moderately higher
iNGRV iNGRV-DTP	Substantially higher

Alternative scenarios	
iNGRV-M iNGRV-M-DTP	Equivalent to existing LORVs
oNGRV-H	Substantially higher

Co-administration strategies	
Vaccination strategies	**Efficacy scenarios**
iNGRV or iNGRV-DTP with LORV or oNGRV	Substantially higher

** Currently available LORVs are assumed to provide similar impact, calculated as the average of each vaccine's impact.*

iNGRV-M = moderate-efficacy iNGRV
iNGRV-M-DTP = iNGRV-DTP-containing combination with moderate efficacy
iNGRV oNGRV-H = high-efficacy oNGRV

Impact and Cost-Effectiveness

Rotavirus vaccines are projected to prevent millions of cases and avert billions in healthcare costs

Results

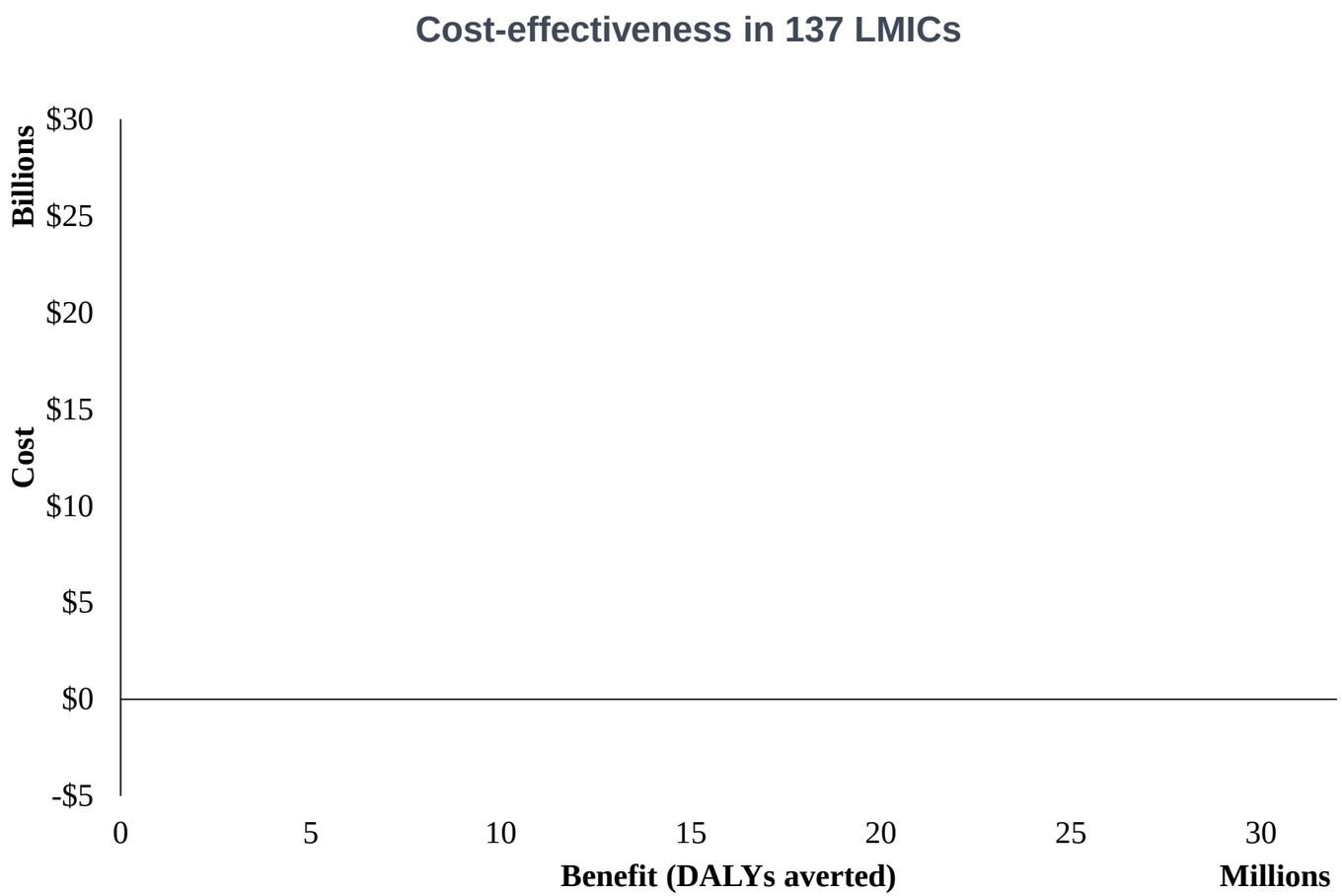
Impact results over 10 years in 137 LMICs (base case)

Vaccine option	Averted cases (millions)	Averted hospitalizations (millions)	Averted deaths	Averted health care costs (billion US$)
ROTAVAC, ROTASIIL, ROTARIX	251.2	10.2	556,000	2.3
oNGRV	288.7	11.7	636,000	2.6
iNGRV iNGRV-DTP Co-admin iNGRV or iNGRV-DTP with LORV* Co-admin iNGRV or iNGRV-DTP with oNGRV*	322.1 - 328.5	13.0 - 13.3	747,600 - 754,500	2.7 - 2.8

**Co-administration strategies compared to no vaccine.*

Cost-effectiveness plane

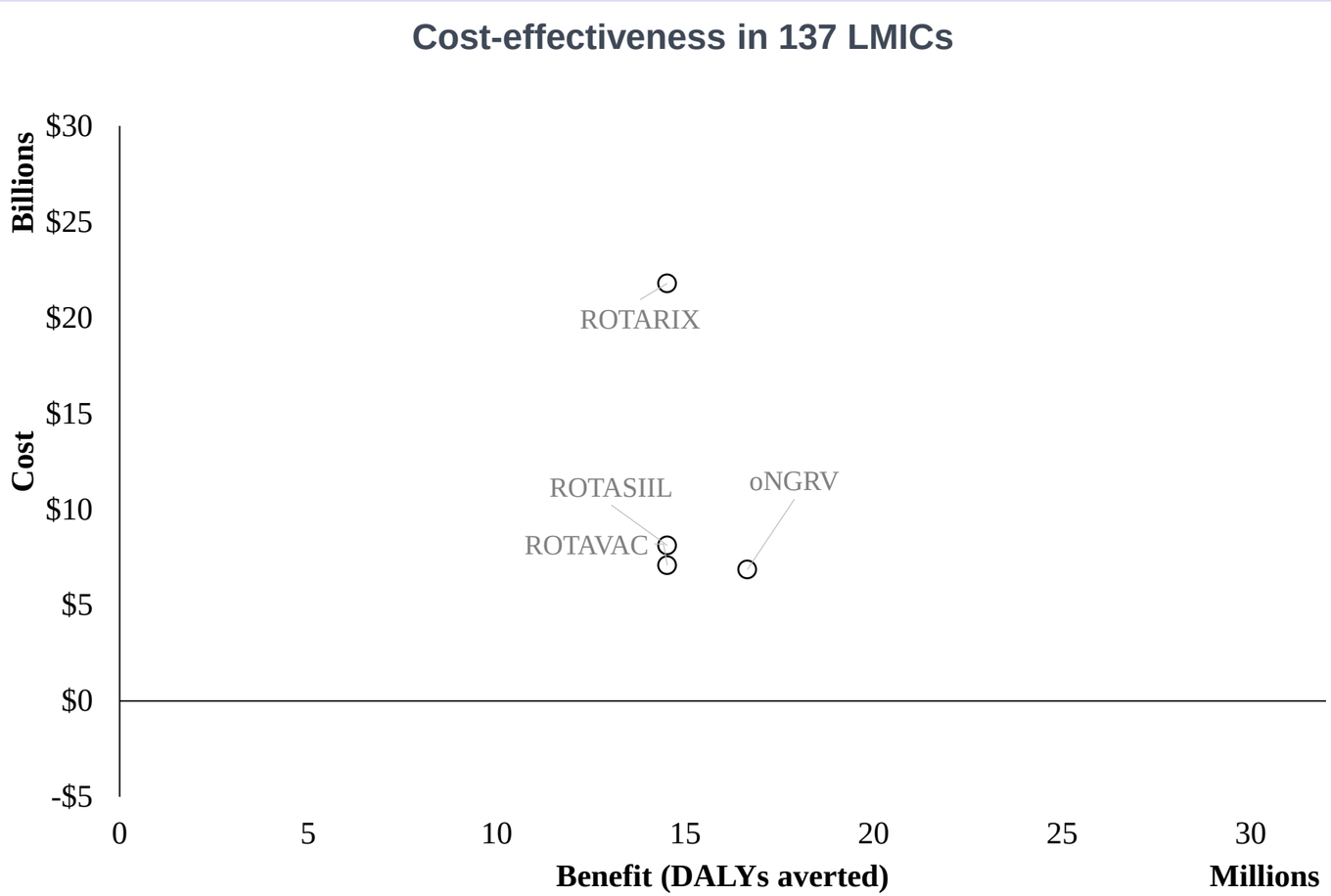
Results



Analysis using the full price not specific country co-financing shares – all options compared to no vaccination.

oNGRV dominates other LORVs

Results

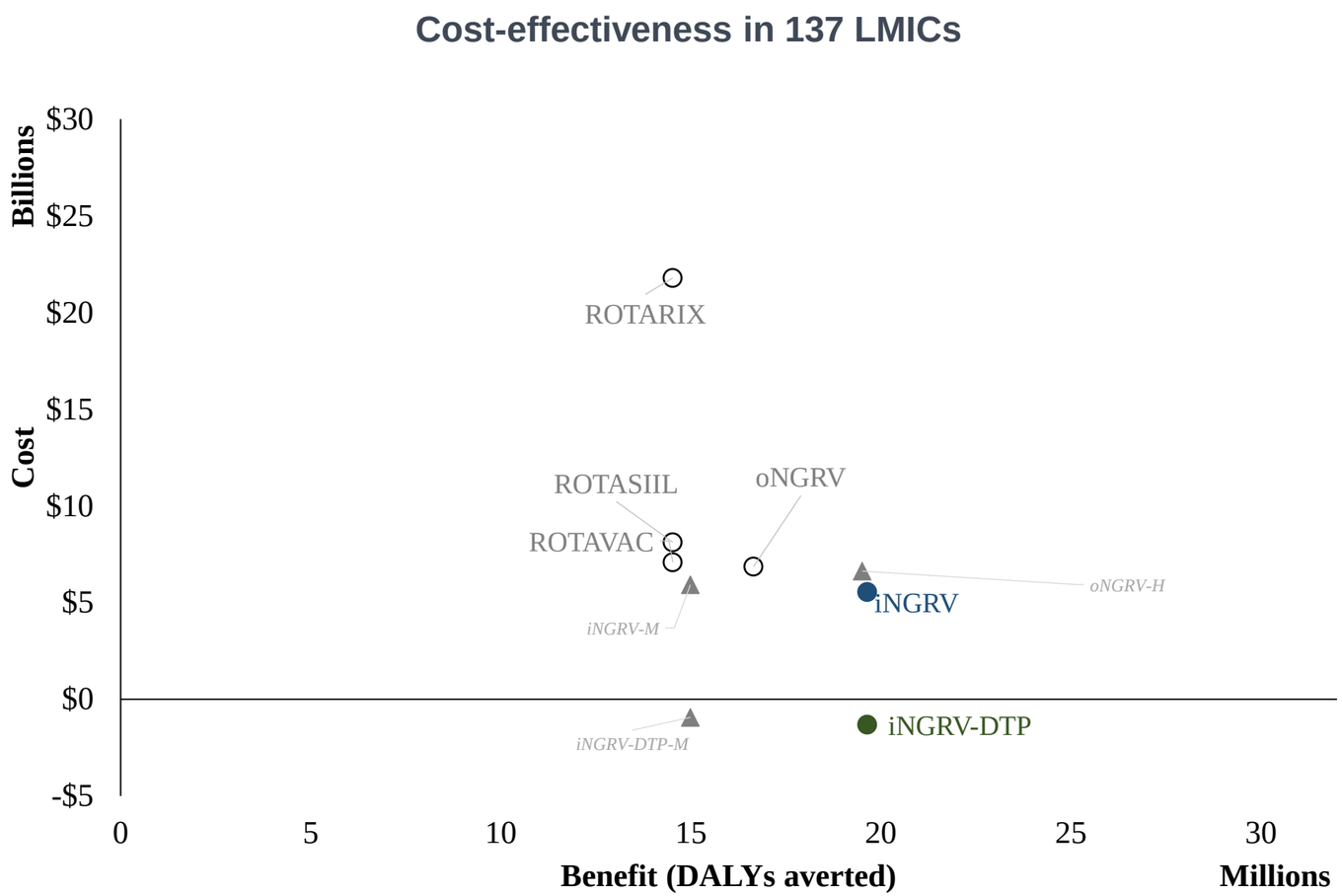


Analysis using the full price not specific country co-financing shares – all options compared to no vaccination.

Impact and Cost-Effectiveness

An iNGRV-DTP-containing combination vaccine is cost-saving in all 137 LMICs

Results



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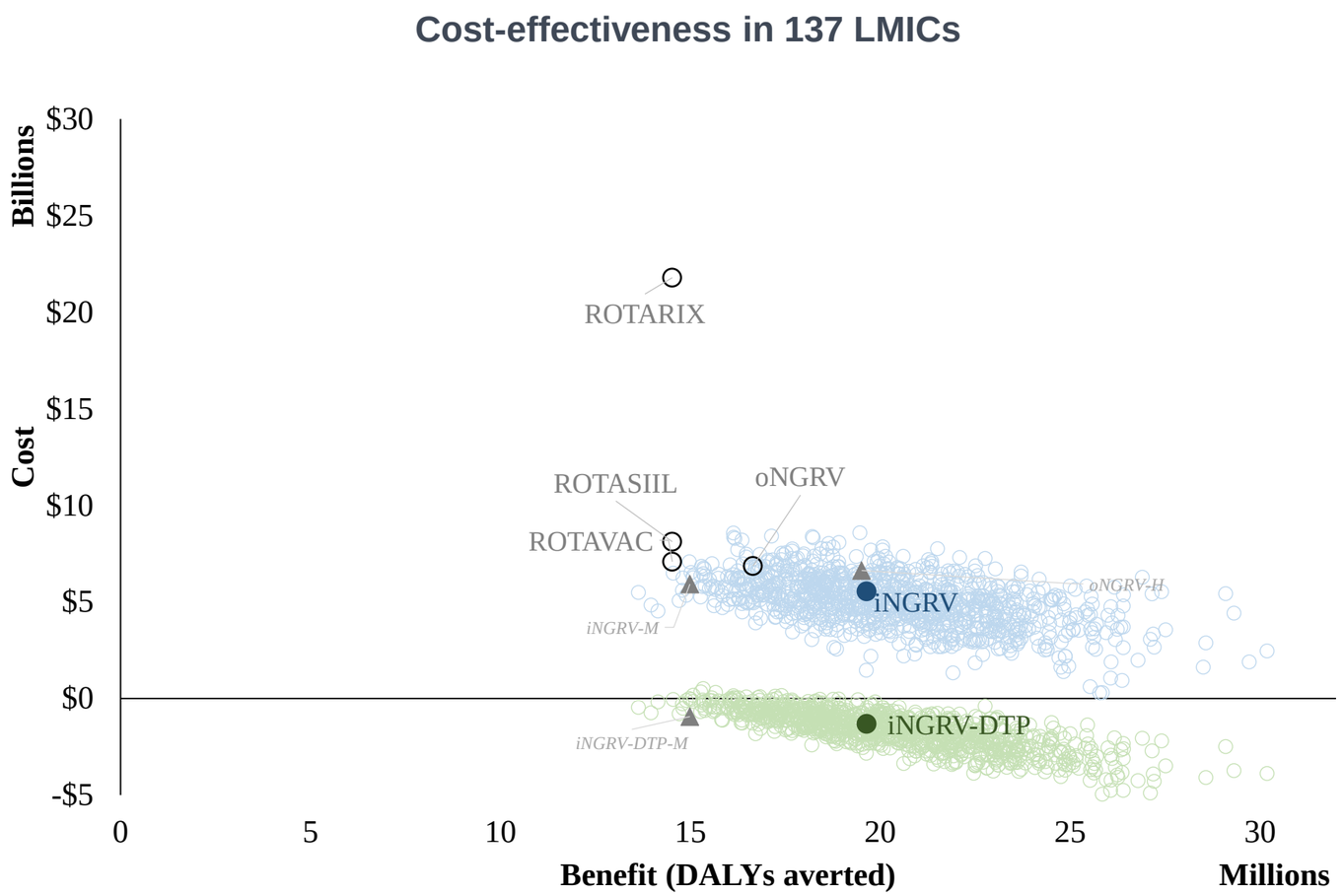

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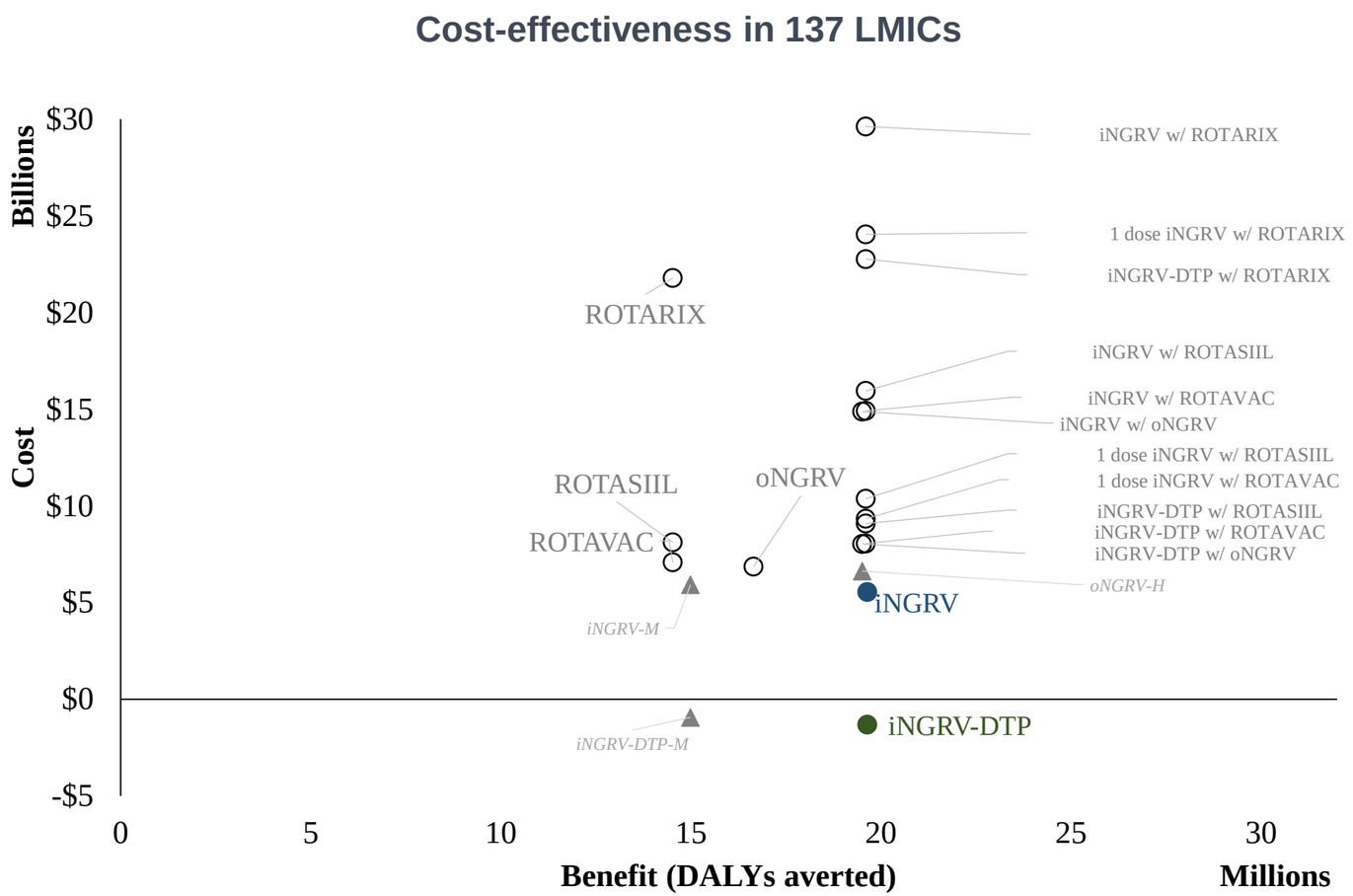

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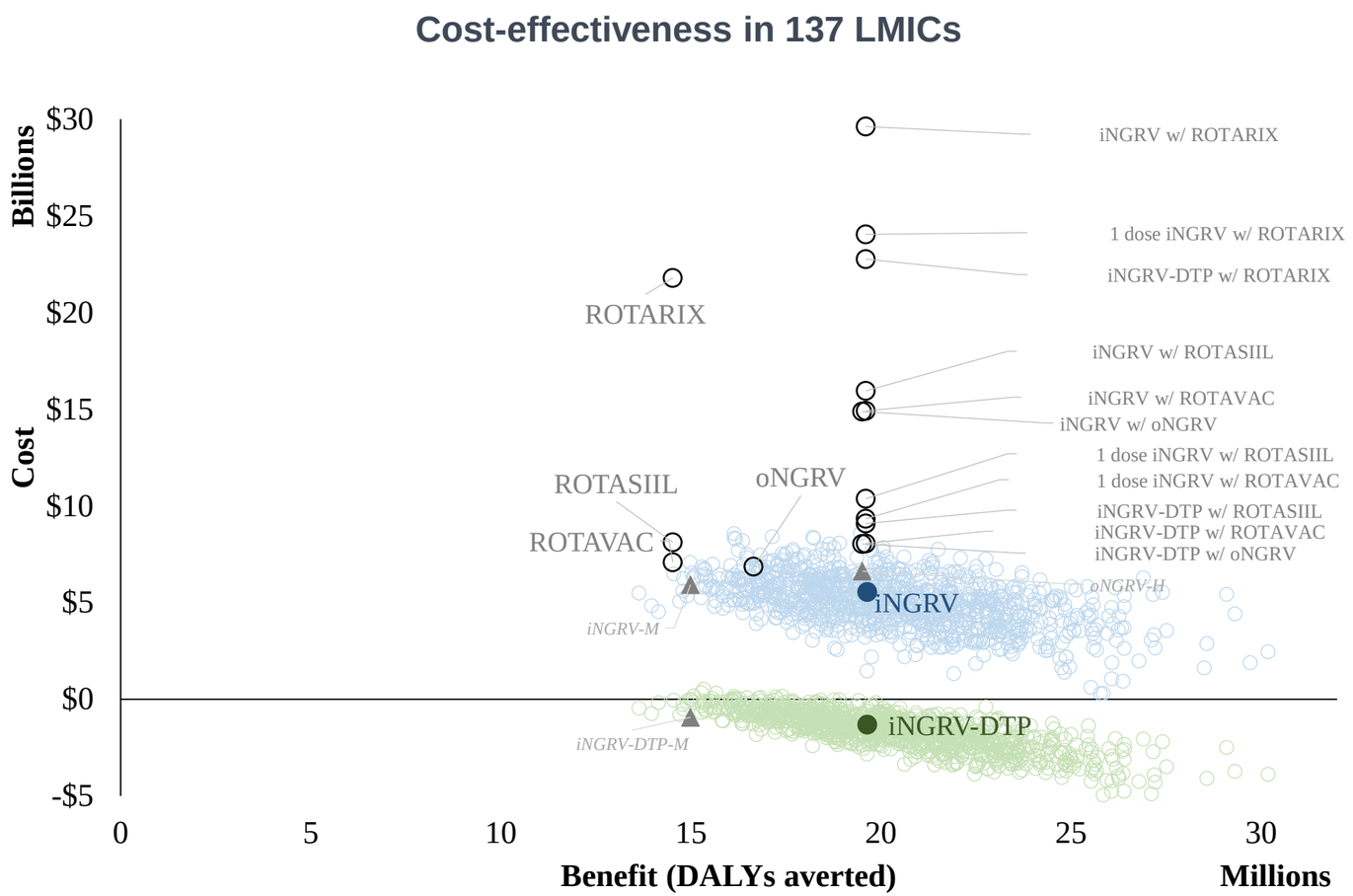


Analysis using the full price not specific country co-financing shares – all options compared to no vaccination.

An iNGRV-DTP-containing combination vaccine is the most cost-effective option, even if efficacy is equivalent to LORVs

Cost-effectiveness interpretation

Number of countries* with an ICER≤ 0.5 GDP per capita **

Standalone vaccine strategies (compared to no vaccine)		
Vaccination strategies	**Efficacy scenarios**	**Number of countries**
ROTAVAC, ROTASIIL	Base	84-91
ROTARIX		54
oNGRV	Medium	101
iNGRV	High	114
iNGRV-DTP		135

iNGRV-M	Base	103
iNGRV-M-DTP		135
oNGRV-H	High	106

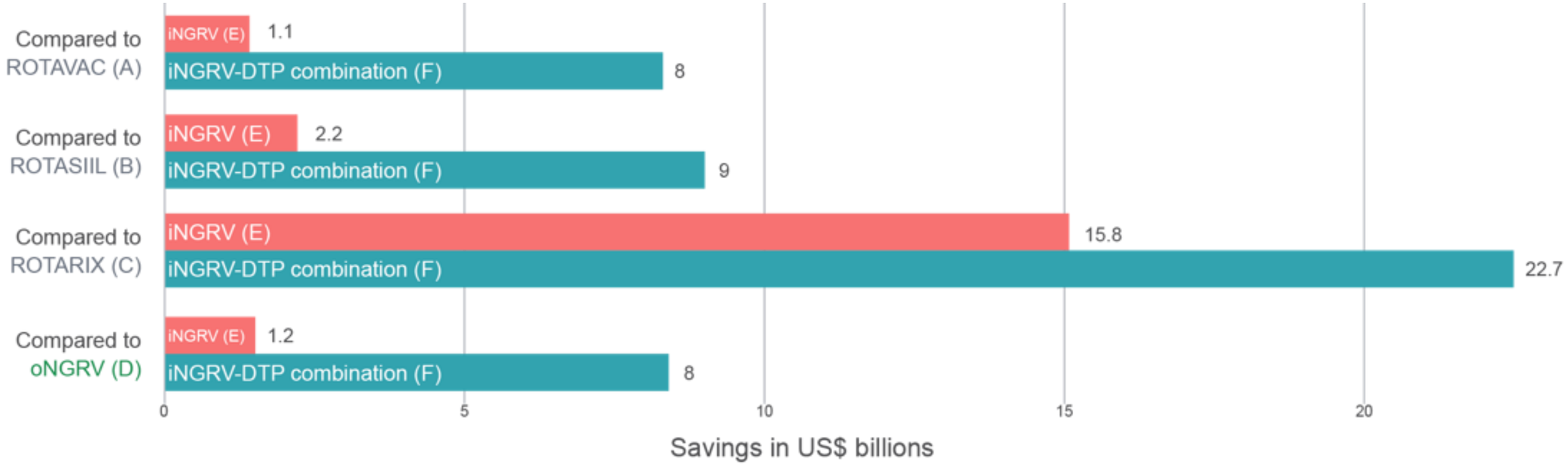
**135 LMICs included as no GDP p.c. data is available for Korea DPR and Somalia.*
*** Analysis using the full price, not specific country co-financing shares.*

Impact and Cost-Effectiveness

Vaccination programs with iNGRV could save billions of dollars compared to all oral options

Results

Vaccination program cost savings in 137 LMICs over 10 years starting from 2025 if all countries were using LORVs



Note: The distribution of vaccination program cost savings between Gavi and countries is dependent on each countries co-financing share and how quickly they transition from Gavi support.

Impact and Cost-Effectiveness

iNGRV and iNGRV-DTP are likely to be cost-effective, cost less than oral options, and provide substantial health impact

Overarching conclusions

- A high efficacy iNGRV would avert an additional 200,000 deaths over 10 years compared to LORVs.
- The least costly and most cost-effective option by far is iNGRV-DTP, followed by iNGRV – even if iNGRV shows efficacy similar to LORVs.
  - iNGRV-DTP is likely cost-effective (ICER < 0.5 GDP p.c.) in all LMICs and is cost-saving in many. A standalone iNGRV is likely cost-effective in 84% of LMICs.
- Compared to LORVs, iNGRV would generate economic cost savings between US$1 and 15 billion; iNGRV-DTP would save between US$8 and 23 billion.
- Co-administration of iNGRV with LORVs or oNGRV is likely not cost-effective. However, co-administration of iNGRV-DTP with oNGRV, ROTAVAC, or ROTASIIL is likely cost-effective in the majority of LMICs.

Thank you!

HUMAN VACCINES & IMMUNOTHERAPEUTICS
2022, VOL. 18, NO. 1, e2040329 (10 pages)
https://doi.org/10.1080/21645515.2022.2040329

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RESEARCH PAPER

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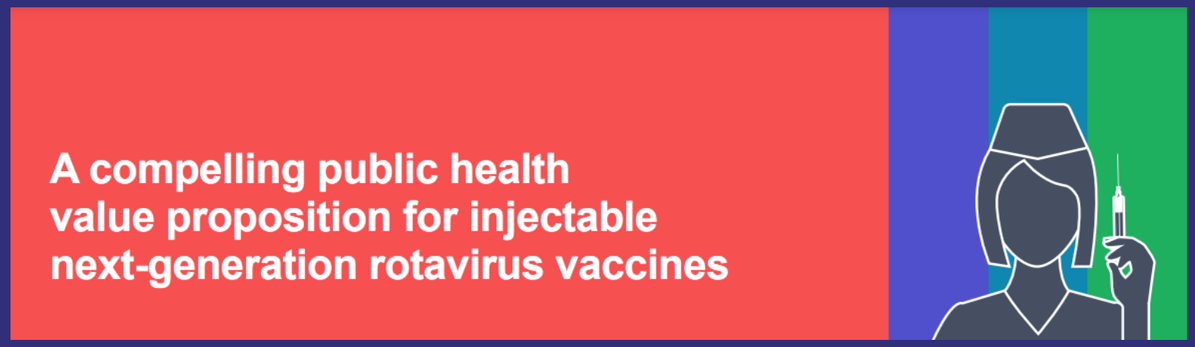
Potential impact and cost-effectiveness of injectable next-generation rotavirus vaccines in 137 LMICs: a modelling study

Frédéric Debellut[a], Clint Pecenka[b], William P. Hausdorff[c,d], and Andrew Clark[e]

[a]PATH, Center for Vaccine Innovation and Access, Geneva, Switzerland; [b]PATH, Center for Vaccine Innovation and Access, Seattle, WA, USA; [c]PATH, Center for Vaccine Innovation and Access, Washington, DC, USA; [d]Faculté de Médecine, Université Libre de Bruxelles, Brussels, Belgium; [e]Faculty of Public Health and Policy, Department of Health Services Research and Policy, London School of Hygiene and Tropical Medicine, London, UK



https://www.path.org/resources/compelling-public-health-value-proposition-injectable-next-generation-rotavirus-vaccines/

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