Prioritization of vaccines for global health

Dr. Jerome Kim

GVIRF Virtual Forum 2021

International Vaccine Institute

Prioritizing Vaccine R&D for Global Health

Newly Approved Vaccines

Vaccine	Company	Approval
Dengue (Dengvaxia®)	Sanofi	COFEPRIS, Dec 2015
DTPHibHepIPV (Vaxelis®)	Merck & Co., Inc., Sanofi	EMA, Feb 2016
HPV (Gardasil 9®)	Merck & Co., Inc.	FDA, Dec 2014
HPV (Gardasil®) Controlled Temperature Chain	Merck & Co., Inc.	EMA
Meningococcal A (MenAfriVac®) 5 µg dose for children under one year	Serum Institute of India	WHO, Dec 2014
Meningococcal B (Trumenba®)	Pfizer	FDA, Oct 2014
Pneumococcal (Prevenar 13®) four-dose vial	Pfizer	EMA, Apr 2016
Rabies	Serum Institute of India	CDSCO, Jun 2016
Seasonal influenza (VaxiGripTetra™)	Sanofi	UK, Jul 2016

- 1/3 of R&D covers new vaccine targets
  - RSV
  - Norovirus
- At least 32 diseases have no vaccines from companies in review
- <u>Cost</u>
  - $500M less complex vaccine
  - $1 B more complex vaccine
- <u>Failure rate</u>
  - Only 7% of vaccines reaching preclinical development are licensed
- <u>Hi Risk, no Incentive</u> – why spend $1 B with a high risk of failure and a low ROI if successful?

Diseases without vaccine R&D

Adenovirus
Amoebiasis
Balantidiasis
Buruli ulcer
Campylobacter enteritis
Chagas disease
Cryptosporidiosis
Cytomegalovirus (CMV)
Dracunculiasis
Echinococcosis
Food-borne trematodiases
Giardiasis
Hantavirus pneumonia
Human African trypanosomiasis
Human metapneumovirus
Human monkeypox
Isosporiasis
Klebsiella pneumoniae
Lassa fever
Leishmaniasis
Leprosy
Lymphatic filariasis
Onchocerciasis
Parainfluenza
Pneumocystis jiroveci
Schistosomiasis
Severe Acute Respiratory Syndrome (SARS)
Soil-transmitted helminthiasis
Taeniasis/cysticercosis
Trachoma
Yaws
Yersinia enterocolitica

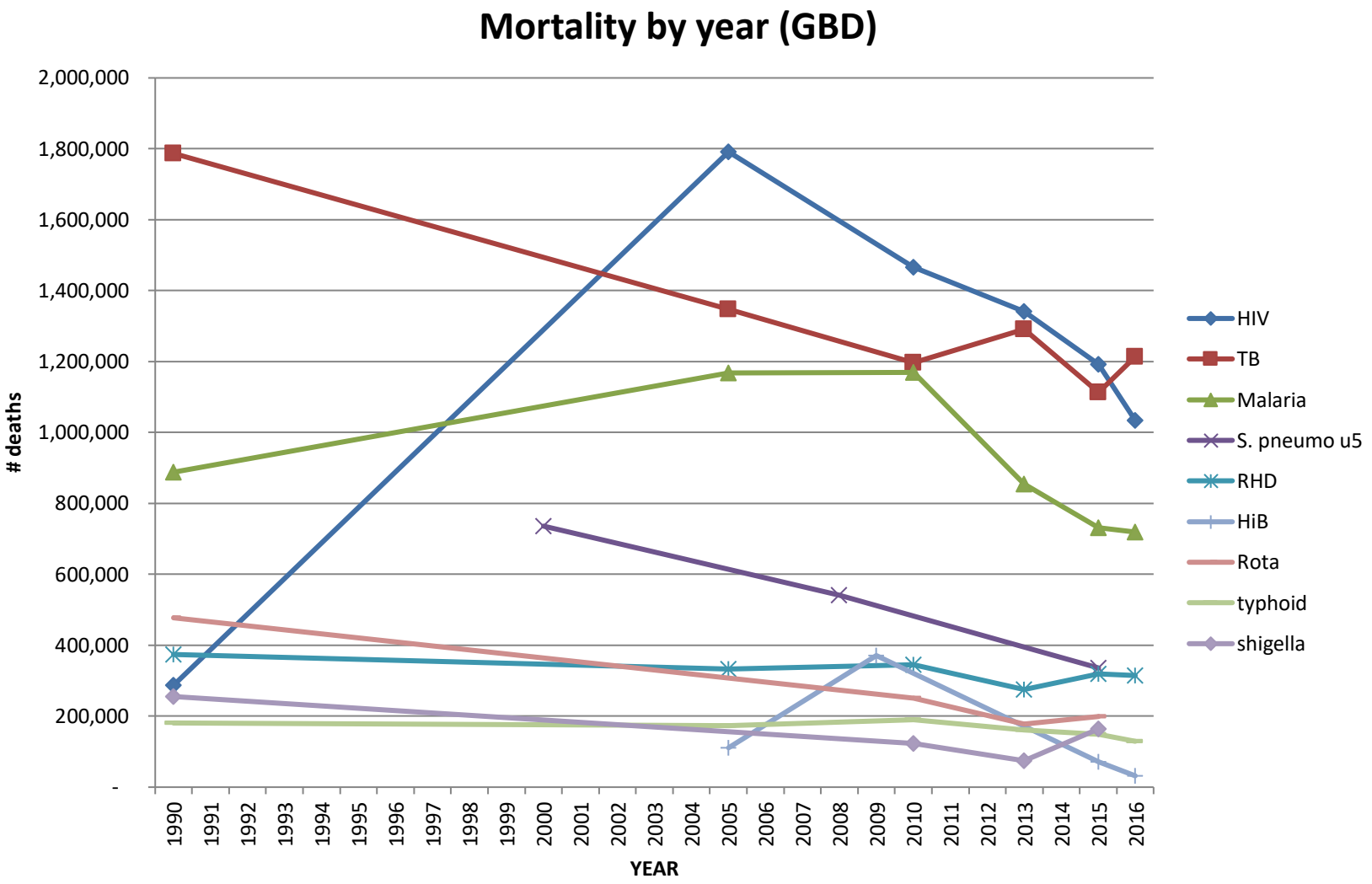
Diseases that don't make the list of diseases without vaccine R&D

- Group A Strep?
- Hepatitis E?
- Non typhoidal Salmonella?
- Shigella?

Challenge: Will we be able to develop vaccines for Poverty associated infectious Diseases: HIV, TB, malaria, GAS, NTS?

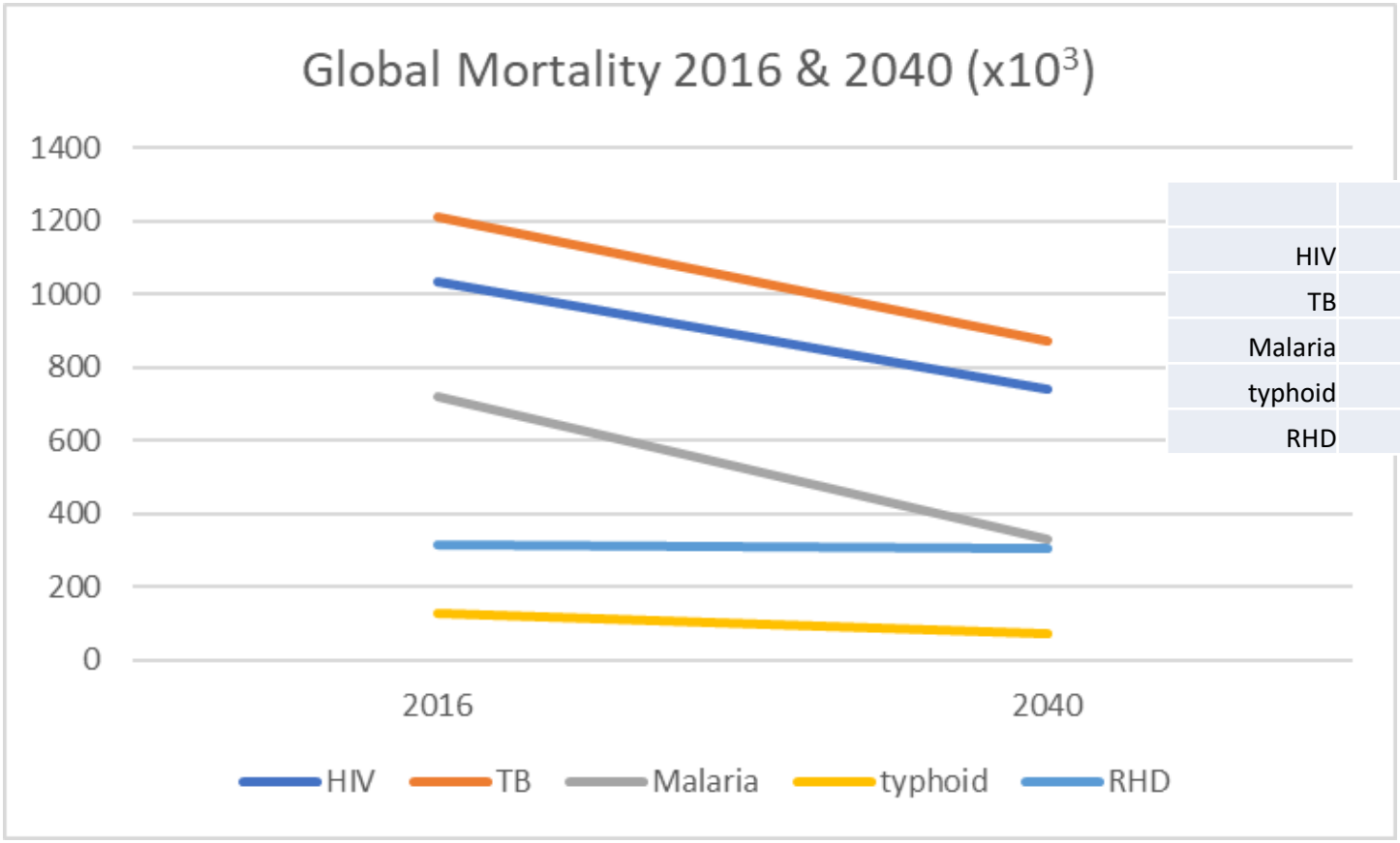
Access to Vaccines Index 2017

Prioritization by burden?



GBD multiple years

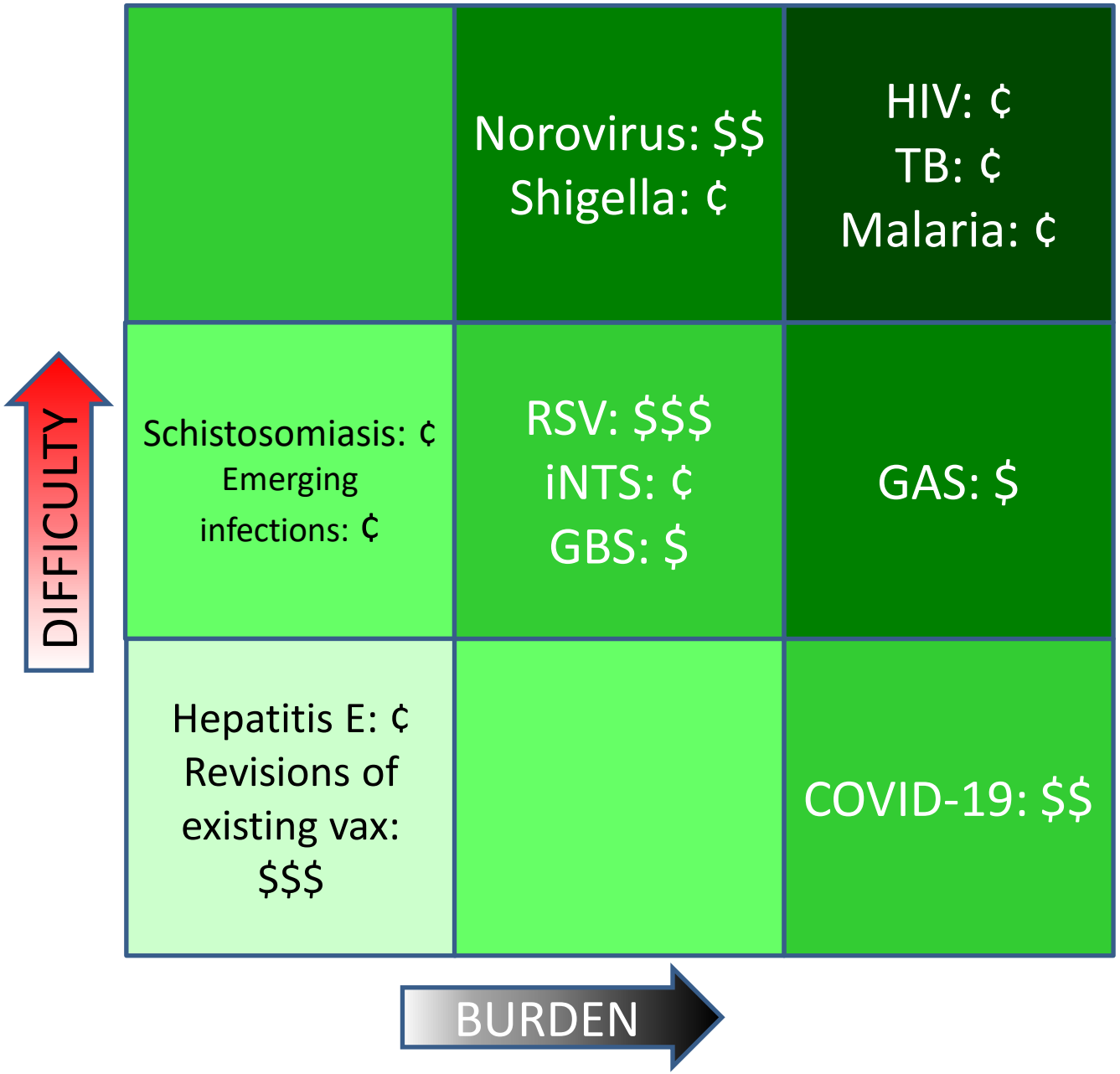
Prioritization by projected burden in 2040



	2016	2040
HIV	1033	741
TB	1213	873
Malaria	719	332
typhoid	128	75
RHD	314	303

Foreman et al, Lancet 2018

Guesstimates of technical feasibility vs burden (and payoff)

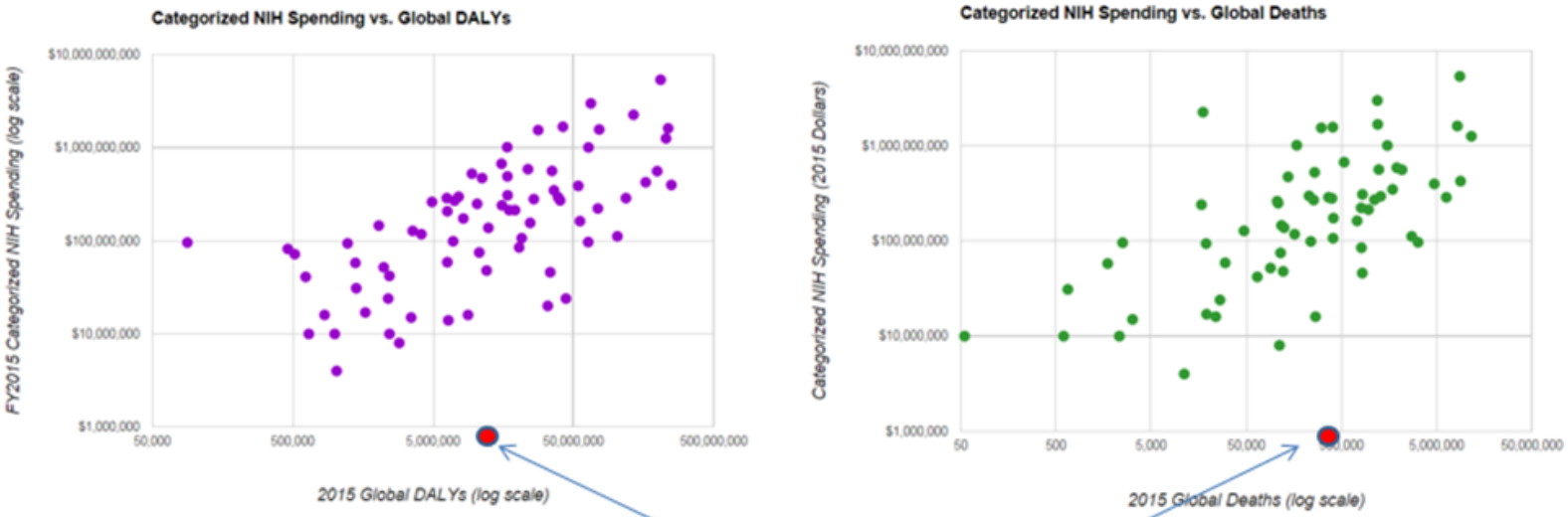


G-Finder 2019 (2018 data): Funding for vaccine R&D

Name	2007	2012	2018	% of 2018 budget
HIV/AIDS	$ 830,674,896	$ 717,822,234	$ 757,028,023	62%
Malaria	$ 100,063,693	$ 148,037,271	$ 156,153,679	13%
S. pneumoniae	$ 17,804,172	$ 78,852,708	$ 70,926,709	6%
Tuberculosis	$ 93,041,853	$ 116,587,893	$ 64,896,207	5%
Rotavirus	$ 25,520,505	$ 60,142,186	$ 54,694,474	4%
Typhoid and paratyphoid fever (S. Typhi, S. Paratyphi A)	$ -	$ 11,640,296	$ 35,998,967	3%
Shigella	$ 11,495,600	$ 9,753,926	$ 22,771,129	2%
N. meningitidis	$ 11,728,221	$ 17,669,769	$ 11,141,876	1%
Enterotoxigenic E. coli (ETEC)	$ 14,090,994	$ 3,311,121	$ 10,587,076	1%
Multiple diarrhoeal diseases	$ 19,994,363	$ 10,585,691	$ 10,257,182	1%
Cholera	$ 7,483,364	$ 12,840,379	$ 7,714,733	1%
Leishmaniasis	$ 3,140,213	$ 6,014,359	$ 3,654,416	0%
Schistosomiasis (bilharziasis)	$ 8,775,363	$ 2,614,624	$ 3,256,283	0%
Multiple Salmonella infections	$ -	$ 957,047	$ 2,247,146	0%
Trachoma	$ -	$ 1,079,724	$ 1,971,538	0%
Rheumatic fever	$ 2,020,482	$ 993,007	$ 1,652,914	0%
Cryptosporidiosis	$ -	$ 148,031	$ 893,439	0%
Hookworm (ancylostomiasis & necatoriasis)	$ 8,778,620	$ 5,408,862	$ 855,527	0%
Onchocerciasis (river blindness)	$ -	$ 849,419	$ 710,232	0%
Leprosy	$ -	$ -	$ 480,000	0%
Non-typhoidal S. enterica (NTS)	$ -	$ 4,099,193	$ 401,663	0%
Hepatitis C	$ -	$ -	$ 395,267	0%
Multiple helminth infections	$ -	$ 1,013,115	$ 243,064	0%
Enteroaggregative E. coli (EAEC)	$ -	$ -	$ 231,211	0%
Chagas' disease	$ 1,596,136	$ 261,710	$ 18,023	0%
Other	$ 1,539,422	$ 2,160,001	$ 17,057	0%
TOTAL	$ 1,157,747,897	$ 1,212,842,566	$ 1,219,197,835	

G-finder Report, 2019

Work in Progress:
Spending on Vaccine R&D, 2016



Group A Strep
non-typhoidal Salmonella

National Institutes of Health, 2016

Incentivizing Vaccines for Global Health

RESEARCH FUNDING

Global Health Vaccine

SUPPLY

VIRTUOUS CYCLE

USE

BUSINESS CASE

INVESTMENT CASE

WHO FULL VALUE OF VACCINES

Thoughts

It is not enough to highlight that additional funding for work in vaccine R&D is necessary and a good investment.

- Greater uptake of vaccines in HIC that have burden in LMIC >> rotavirus, HPV, PCV (is this an R&D question or a delivery question)?
- COVAX'ing new vaccines would be a good thing, if possible
- Prioritizing work on vaccines that have a sound business case, feasible development plan, and good cost : total benefit
- Leveraging other efforts (making efficient use of other research platforms): epidemiology, clinical trials, health services / policy, vaccine hesitancy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