Vaccine Coverage and Development: Value, Spending, and Financing

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Key Messages

- Population health has been routinely and substantially undervalued.
- This undervaluation has led to the corresponding undervaluation of health technologies.
- The undervaluation of health technologies translates into underspending on access and innovation.
- A key step toward remediating this shortfall involves changing the way we conduct health technology assessment.

Model Description

Vaccine R&D Projects -> {Approach = k , Number = l }

Expected Benefit of funding an additional project {k , l} =
Expected remaining harm approach k can reduce *X*
Fraction of remaining harm a new success would reduce *X*
Probability project succeeds

Cost of funding a project (fixed)

Fund highest benefit projects until benefit of next project less than cost

Count number of funded projects

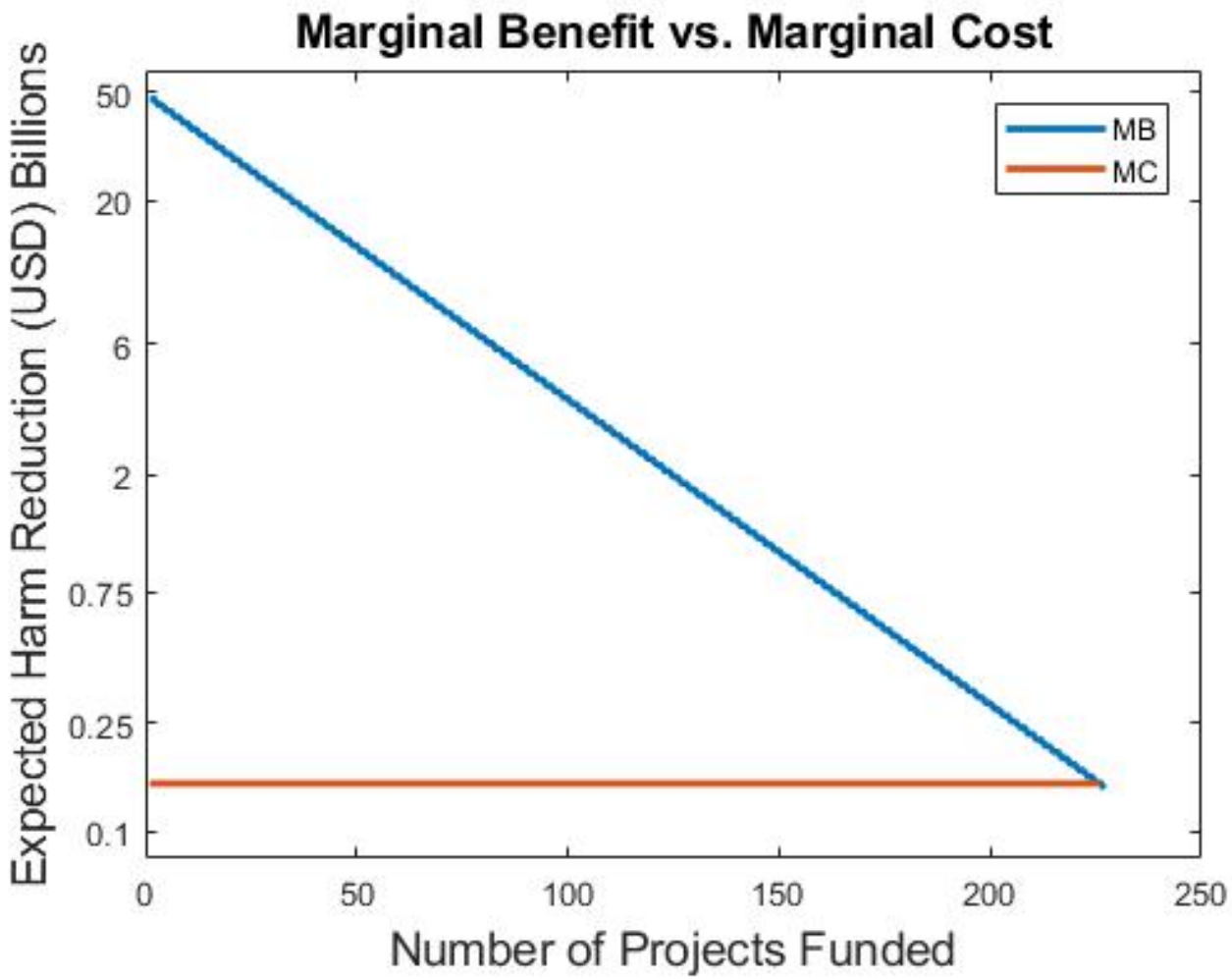
Optimal Funding = # of funded projects *X* cost of funding a project

Model Based On: Athey, Baker, Castillo, Glennerster, Kremer, Lee, Snyder, Tabarrok, Tan (2020)

Parameters (Group A Streptococcus)

Approaches		Value	Basis
	Number of Approaches	2	M-protein/Other, Steer et al. (2016)
	Fraction of Harm Each Approach Can Alleviate	1/2	Assumption
Probability Project Succeeds			
	Approach	90%	Consultation with industry experts
	Overall	15%	Wong, Siah, Lo (2018), Struck (1996), Consultation with industry experts
Fraction of Harm Success Alleviates		30%	Cannon et al. (2018)
Total Dollar Value of Harm		2.1 trillion	Extrapolation Cannon et al. (2018), Ferranna (2021), VSLY Approach
Development Cost of Success Inclusive of Failures		1 billion	Gouglas et al. (2018), Andre (2002), Consultation with industry experts

All monetary values in 2020 USD


Marginal Benefit vs. Marginal Cost
Expected Harm Reduction (USD) Billions
50
20
6
2
0.75
0.25
0.1
0
50
100
150
200
250
Number of Projects Funded
MB
MC

Results

Baseline Calibration	Projects Funded	Optimal Spending	Social Surplus	Internal Rate Ret.
	226	33.9 billion	1.85 trillion	23%
Sensitivity				
Harm Reduction = 70%	108	16.2 billion	1.87 trillion	29.4%
Success Probability = 5%	278	41.7 billion	1.84 trillion	21.5%
Total Strep A Harm 2x	252	37.8 billion	3.74 trillion	28.1%
Require 4 Approaches	396	59.4 billion	1.82 trillion	18.8%

Internal Rate Return (IRR) calculated assuming 10-year delay before harm reduction begins and assuming harm reduction spread out evenly over 30 years.

Conclusions

Lessons of COVID apply to other pathogens as well

- R&D costs billions for trillions in benefits—very large annual IRR

Full value of vaccination is important

- Include productivity loss, valuation of health and longevity
- Otherwise, R&D is underfunded

Optimal R&D Spending depends subtly on

- Success probabilities
- Expected harm reduction

Public vs. Private funding

- Basic research should be publicly funded since hard to patent
- Public funding of basic research can crowd-in private funding by improving the investment risk/reward ratio
- Robust public funding needed to insure equitable access

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