HARVARD T.H. CHAN | SCHOOL OF PUBLIC HEALTH
Powerful ideas for a healthier world

Global health and economic benefits of prospective Strep A vaccines

Maddalena Ferranna

Harvard T.H. Chan School of Public Health

June 6, 2022

Introduction

- Vaccination yields both health and socioeconomic benefits (e.g., gains in education, cognition, productivity).

- Rational and fair allocation of public funds requires information on the full value of vaccination.
  - Comparison between different uses of fixed health budget or between health and non-health interventions.

Approach

- Traditional health-centric cost-effectiveness analysis fails to capture the full value of vaccination.

- We estimate the full value of prospective Strep A vaccines using a societal perspective benefit-costs analysis.

- We rely on the concept of Value-per-Statistical-Life (VSL) to estimate the full value of Strep A vaccines.

Value per Statistical Life

- VSL is derived from individuals' willingness to trade off small changes in income for small changes in risk of death.
- VSL is estimated based on individuals' reported preferences or based on workplace or consumption behavior (e.g., wage premium for risky job; bike helmet purchase).
- VSL captures both the intrinsic and the instrumental value of being alive (i.e., any averted earnings or income loss).

Example of VSL

- If someone accepts a pay cut of $1000 per year to reduce their annual mortality risk by 1 in 10,000, the monetary value of their statistical life is $10 million.

- Equivalently, each of 10,000 people, identical in all relevant ways, would be willing to pay an equal share of a $10 million cost for a project that reduces the expected fatalities in a year by one.

- U.S. VSL ≃ $10 million
- OECD VSL ≃ $3 million

Issues with VSL

- VSL estimates are mostly from high income-countries.
- VSL typically increases with income. This can have unacceptable ethical consequences in global analyses since the interests of the well-off tend to count more than the interests of the worse-off.
- Not many estimates on the willingness to pay for averting nonfatal cases.

Assumptions

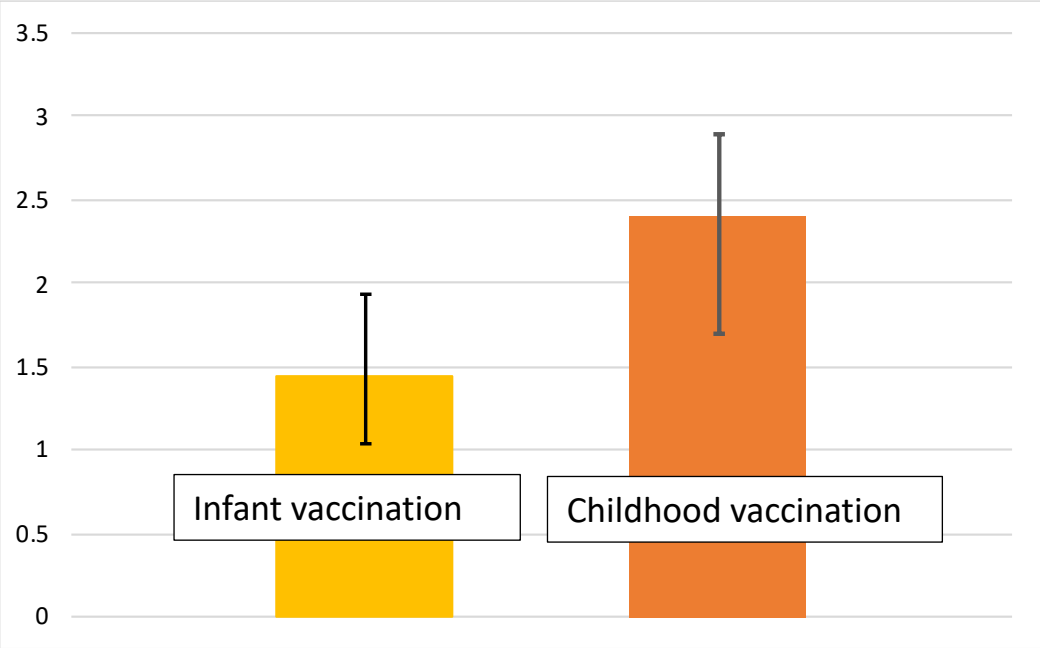
HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH
Department of Global Health and Population

- VSL is proportional to income.
  - Elasticity of VSL to income $\simeq 1$.
  - Income grows over time.

- The monetary value of being alive for an additional year is equal to the value-per-statistical-life-year (VSLY) (=VSL divided by remaining life expectancy).
  - VSLY from 1 to 5 times income per-capita (depending on baseline VSL estimate).

- The monetary value of averting a year with disability is also equal to VSLY.
- Future monetary benefits are discounted at a constant annual rate.
- Same VSLY is applied to all countries independently of their income level.

Expected total benefits of Strep A vaccines for 2022-2051 birth cohorts across the six vaccination scenarios (in trillion US$)



Assumptions: 3% discount rate; VSLY evaluated at three times global GDP per-capita ($11,000); 2% growth rate.

Expected benefits of prospective Strep A vaccines amount to $1.44 trillion if the vaccine is administered at birth (1.7% of global income in 2020), and to $2.41 if the vaccine is administered at age 5 (2.8% of global income in 2020).

Importance of normative assumptions

Total benefits of Strep A vaccination at age 5 for 2022-2051 birth cohorts by scenario and normative assumptions (in trillions US$)

Scenario	Baseline assumptions	Least favorable assumption	Most favorable assumption
Scenario 1	$2.7	$0.6	$7.7
Scenario 2	$2.8	$0.6	$8.0
Scenario 3	$2.2	$0.5	$5.9
Scenario 4	$2.1	$0.5	$5.9
Scenario 5	$2.9	$0.4	$4.8
Scenario 6	$1.7	$0.3	$4.9
Average	**$2.4**	**$0.5**	**$6.2**

Baseline: 3% discount rate; VSLY is equal to three times GDP per capita
Least favorable: 5% discount rate; VSLY is equal to GDP per capita
Most favorable: 1% discount rate; VSLY is equal to five times GDP per capita

Conclusions

- Preliminary estimates point to large full societal value of prospective Strep A vaccines.

- Refinements:
  - Different DALYs may have different value depending on their socioeconomic implications.
    - Use of life-cycle economic models to simulate the value of preventing a DALY across different individuals.
  - Equity-weighted benefit-cost analysis to account for distributional considerations within/between countries.
  - Willingness to pay estimates and behavioral constraints.

HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH
Department of Global Health and Population

Thank you!

Comments or questions?

Please contact mferranna@hsph.harvard.edu