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The Economic Benefits of Vaccines

Moving beyond traditional methods

Vaccinology 2018

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- Bill & Melinda Gates Foundation
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Background

- Routine immunization considered to be among the most cost-effective investments
    - According to former WHO Director General, Dr. Margaret Chan, “vaccines are among the most CE public health interventions and one of the best buys you can get for your bucks”
- Many new vaccines available now with many more in the pipeline
- These won’t cost the cents per dose the routine vaccines do
- Decision-makers require information regarding their value

Value for money: consumer decision example (car purchase)

Benefits
a) Why do I want a new car?
b) How will it improve my life?

What do I get? What do I give up?

Alternatives
a) Used car? Bicycle?
b) Public transport?
c) Ride sharing?

Costs
a) What expenses?
b) When paid?

Paying the costs
a) Savings?
b) Reduce spending on other items?
c) Work more?

Value for money: health sector example

Benefits
- Child
- Family
- Community
- Nation
- What metrics?

Alternatives
- Status quo (no new program)
- Polyvalent vaccine
- Treatment

Vaccine Program

https://www.health-e.org.za/2014/03/10/shots-dark-vaccines-south-africa/

Costs
- Vaccine
- Personnel
- Supply chain
- Cost to patient & family

Paying the costs
- Available funds
- Shift budget
- Fee for service
- New taxes
- NGO

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What is economic evaluation?

"Economic evaluation is the comparative analysis of alternative courses of action in terms of both their costs and their consequences."

(Drummond et al. 2005)

Cost A

Consequence A

Path A

Cost B

Consequence B

Path B

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Types of economic evaluations

Method	Costs	Outcomes	Efficiency	
			Technical (what HC to provide?)	Allocative (how to provide HC?)
CMA	Monetary terms ($,£,¥,..)	Outcomes are equivalent	Yes	No
CEA	Monetary terms ($,£,¥,..)	Natural units	Yes	No
CUA	Monetary terms ($,£,¥,..)	QALY, DALY*	Yes	Yes
CBA	Monetary terms ($,£,¥,..)	Monetary terms ($,£,¥,..)	Yes	Yes

CMA: cost minimization analysis; CEA: cost-effectiveness analysis; CUA: cost-utility analysis; CBA: cost-benefit analysis

* Reflects individual and societal preferences or utility

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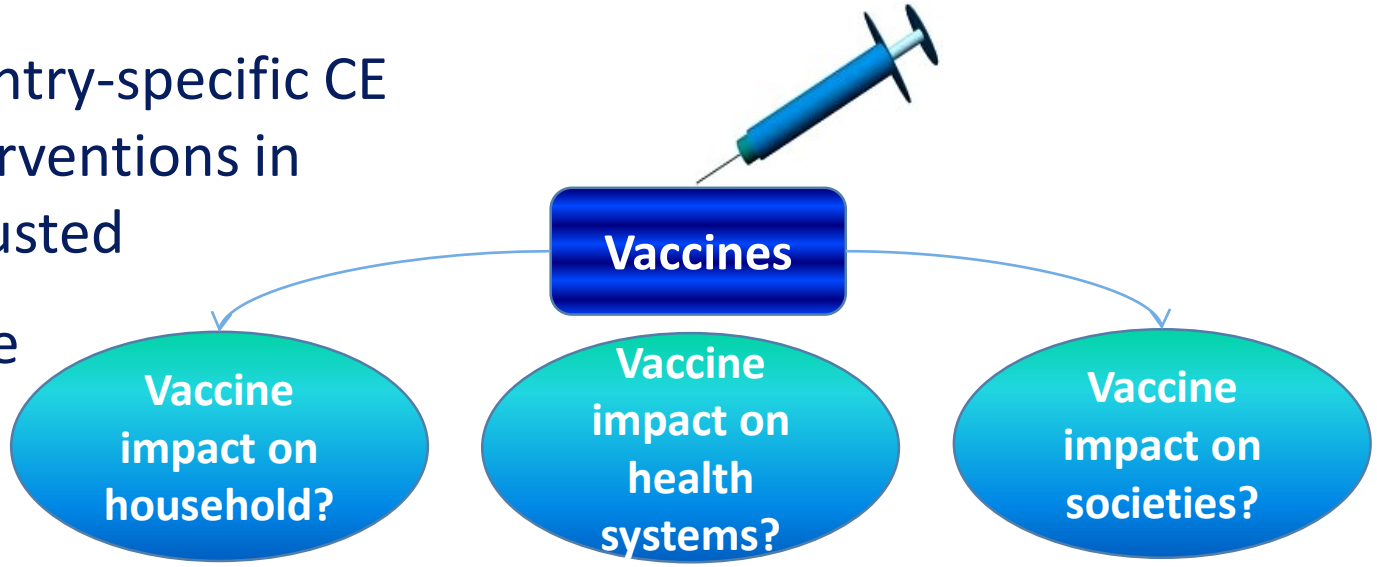
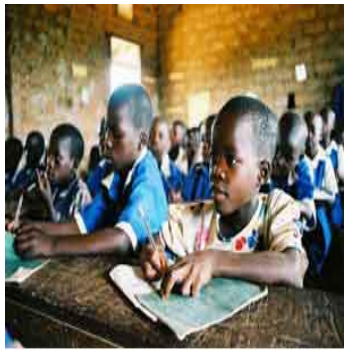
When is a vaccine cost-effective?

- **Theoretical approach**: compile country-specific CE league (ranking) table and fund interventions in order of CE until the budget is exhausted
  - reveals the maximum acceptable ICER, i.e. benchmark (also referred to as the ceiling ratio)
  - Is the vaccine among the interventions funded?
- **Pragmatic approach**: use an established benchmark





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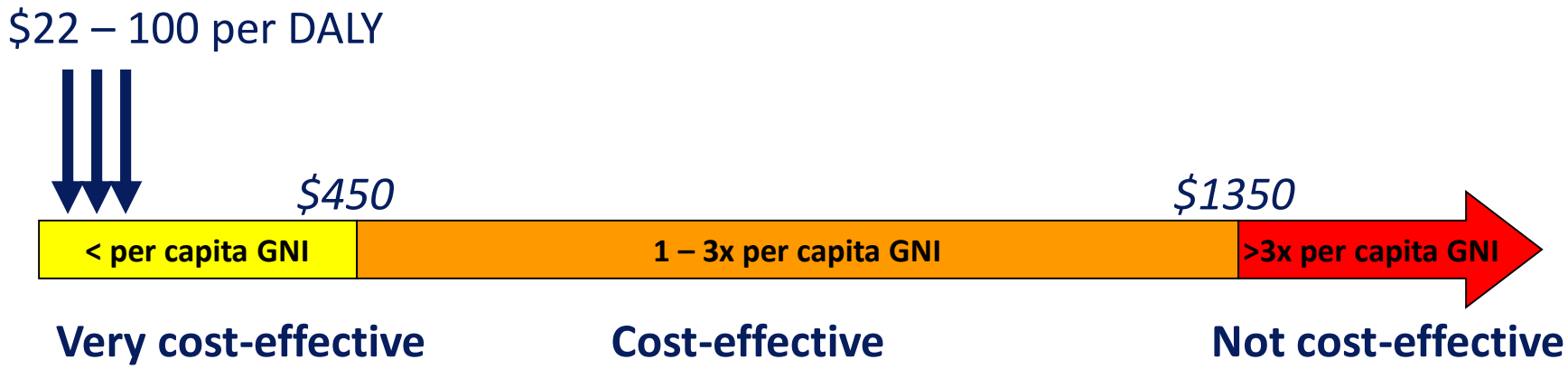
Established benchmark

- Following the recommendation of the Commission on Macroeconomics and Health, WHO uses the following categories:
  - $ per DALY averted < GNI per capita = highly CE
  - $ per DALY averted 1-3 * GNI per capita = CE
  - $ per DALY averted > 3 * GNI per capita = not CE



From wealth to health

The traditional story

- Income and health directly support better health because wealthier people can afford the resources that protect and improve health
  - Better nutrition
  - Better access to clean water
  - Better sanitation
  - Better psycho-social resources like community recreation facilities

Attributed to Jeffrey Sachs

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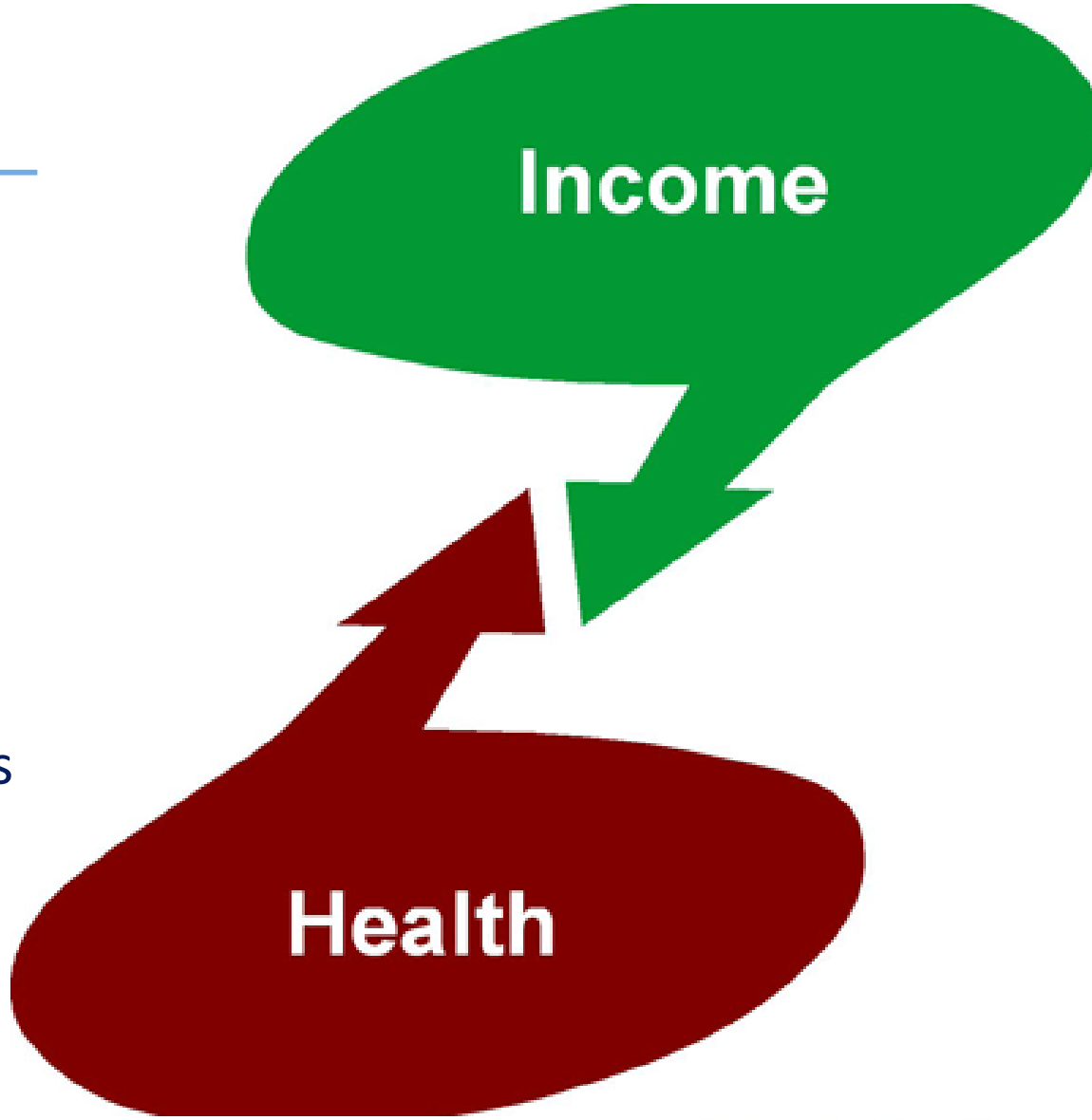
From health to wealth

The rest of the story

- Good health promotes savings and investment
- Live longer and more to save
- Improved productivity
- Greater returns from education
- A demographic dividend*

  Economic growth potential resulting from shifts in population's age structure (share of the working-age population is larger than the non-working-age share of the population)
- A demographic transition from large to small families



* United Nations Population Fund

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Valuing vaccines – old paradigm

Perspective		Type of benefit
	Narrow	Health gains: reduction in mortality through vaccination
		Health care cost savings: Savings of medical expenditures because vaccination prevents illness episodes
		Care-related productivity gains: Savings of parents' productive time because vaccination avoids the need for taking care of a sick child

Source: Bärnighausen et al. 2010

Valuing vaccines – new paradigm

Perspective		Type of benefit
Broad	Narrow	Health gains: reduction in mortality through vaccination
		Health care cost savings: Savings of medical expenditures because vaccination prevents illness episodes
		Care-related productivity gains: Savings of parents' productive time because vaccination avoids the need for taking care of a sick child
		Outcome-related productivity gains: Increased productivity because vaccination improves cognition and physical strength and school enrolment, attendance and attainment
		Behavior-related productivity gains: Benefits accruing because vaccination improves child health and survival and thereby changes household choices (e.g., fertility, consumption choices)
		Community externalities: Benefits accruing because vaccination improves outcomes among unvaccinated community members

Source: Bärnighausen et al. 2010

Effect of childhood vaccination on scores of language, math and IQ test in Cebu, The Philippines

- Cebu Longitudinal Health & Nutrition Survey since 1983
- Filipina mothers and their children born in 1983-4 followed up
- Vaccination records and scores in language, math & IQ at age 10 years
- Large and significant effect of routine vaccination on test scores, raising them on average by about 0.5 standard deviations
- One standard deviation gain in cognitive test scores raises earnings by about 8%

Effect of childhood measles vaccination on school enrolment in Matlab, Bangladesh

- Intensive measles vaccination program introduced in two areas of Matlab in 1982 and 1985
- Children vaccinated against measles before one year of age are 9% more likely to attend school
- Each year vaccination is delayed decreases the probability of school enrollment by 2.4%
- Each year of schooling increases wages by 9.7%

Examples of the long-term impact of childhood health and nutrition and other interventions

Miguel and Kremer (2004) found that deworming in Kenya improved school attendance

Field et al. (2009) showed that iodine supplementation improved educational attainment in Tanzania

Lucas (2010) and Cutler et al. (2010) found that malaria interventions that protect young children can increase cognitive test scores and educational attainment

Guzman et al. (2010) in their INCAP longitudinal nutrition studies at the community level showed that protein-rich supplement given to preschool children improved growth and cognition and decreased morbidity and mortality

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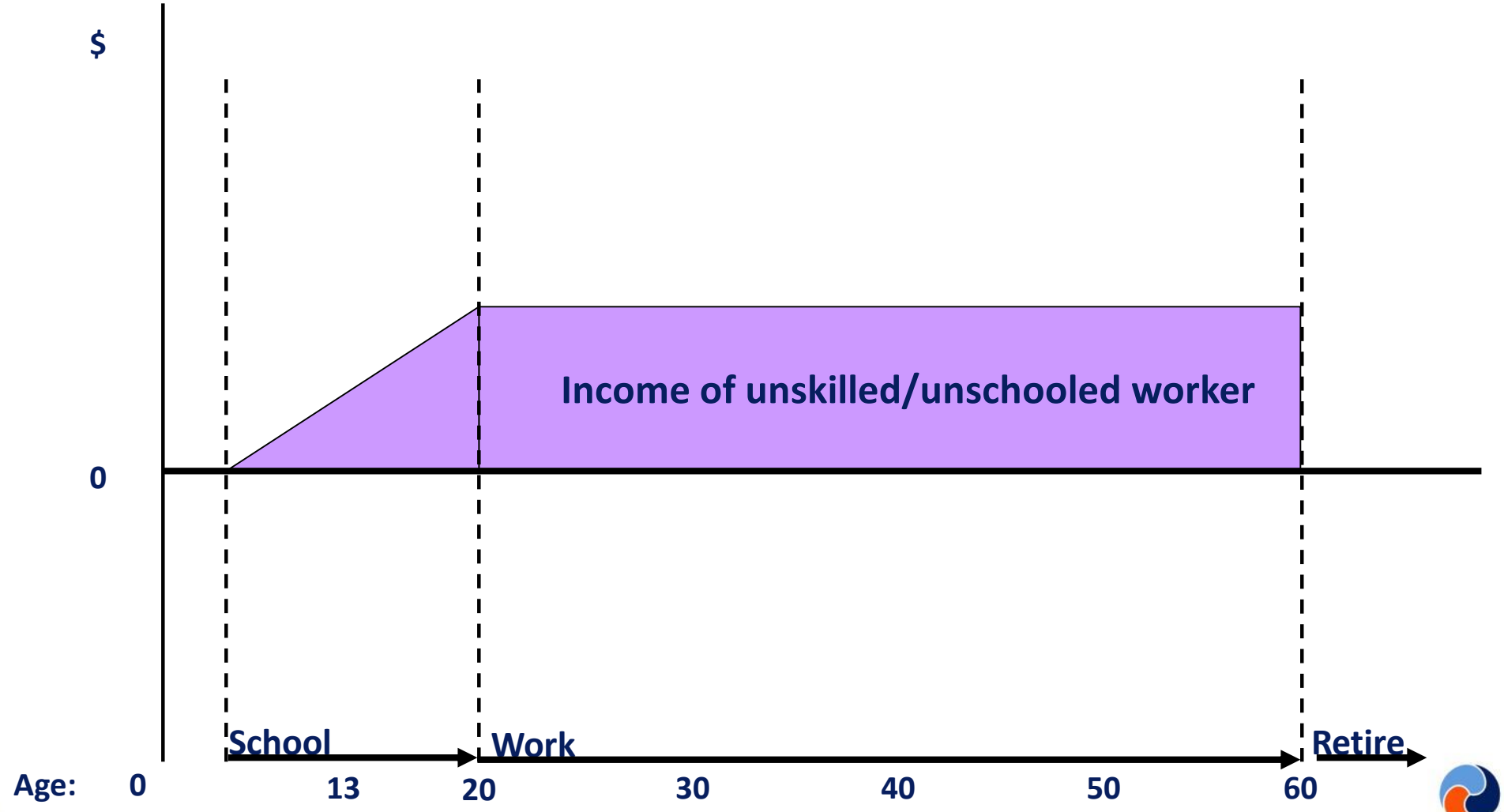
Lifetime earnings trajectory



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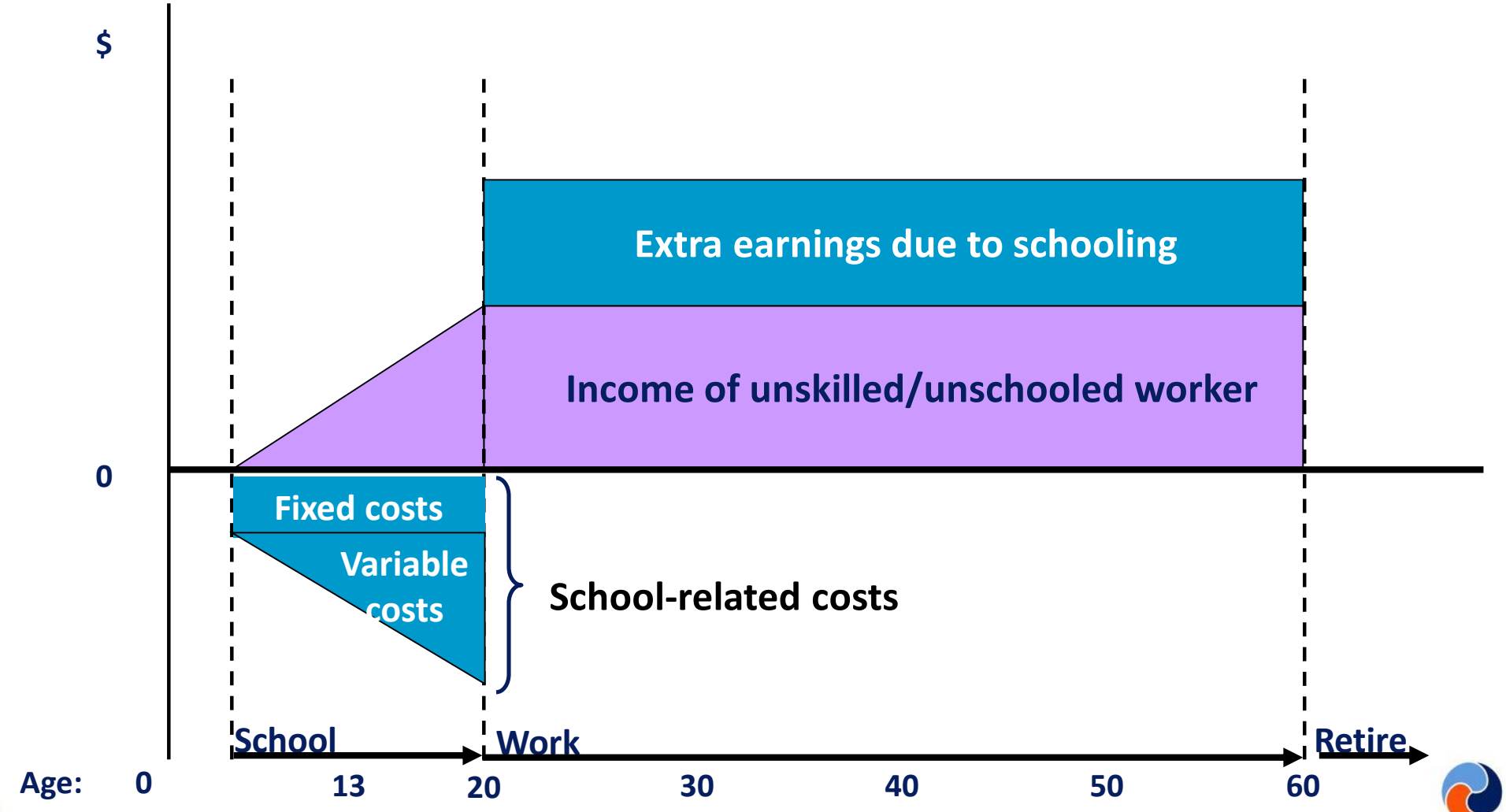
Lifetime earnings trajectory: with schooling



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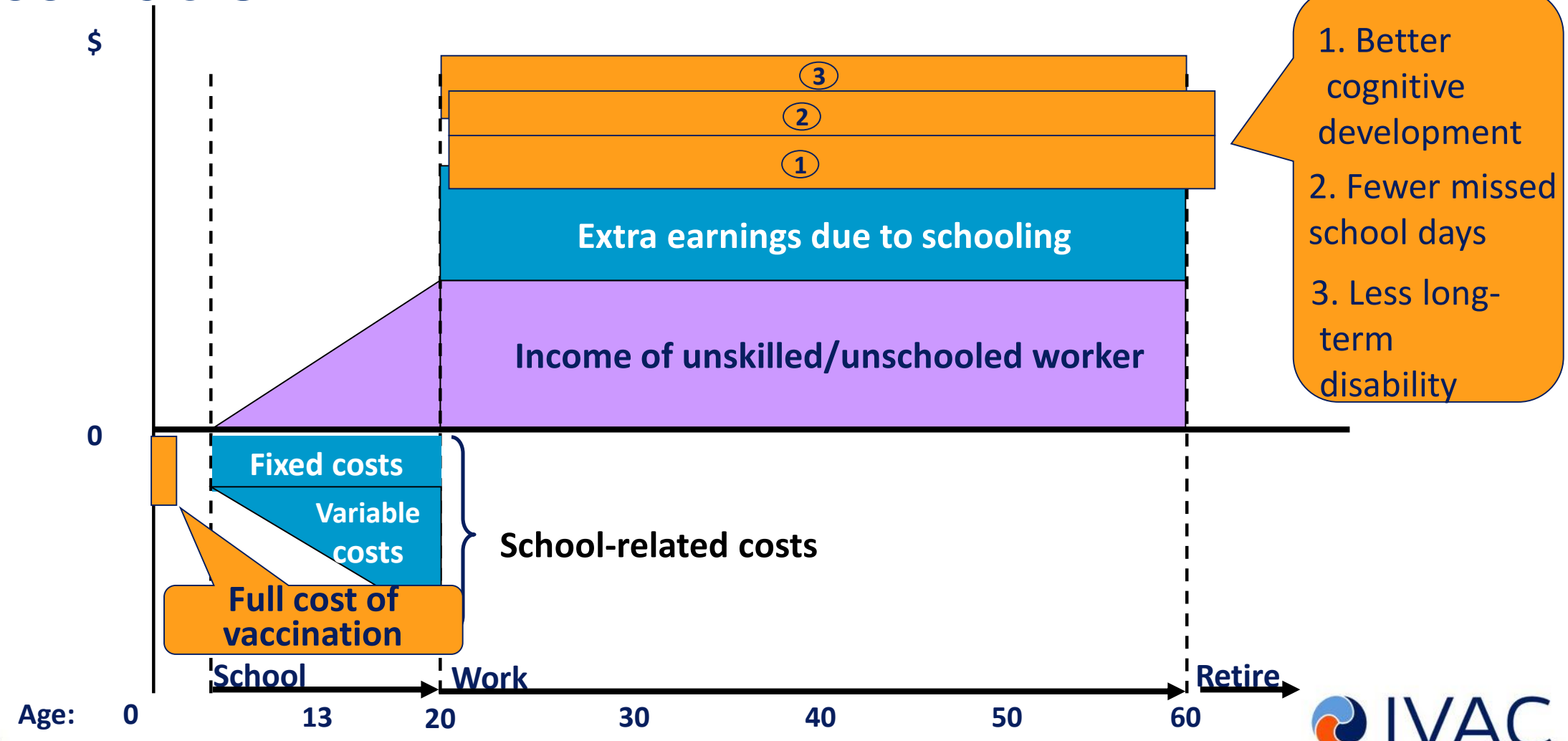
Lifetime earnings trajectory: with childhood vaccination



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Bloom et al. 2005

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Usefulness of economic evaluations

- Economic evaluation has been neither necessary nor sufficient to a decision to introduce vaccines
  - CBA of Hib vaccination in Israel was able to influence decision-making only after “luck” brought it to attention of treasury personnel
  - ROI Health Affairs paper (2016) have been cited consistently by the Ministerial Conference on Immunization in Africa and others, which has helped to redouble efforts and commitment of strong, sustainable and inclusive immunization programs
- Why has formal use of economic evaluations in vaccine decision-making been limited?

Projected immunizations (10 antigens) yield a net return about 16 times greater than costs over the decade (2011-20)

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Understanding resistance to economic evaluation

Decision-makers do not understand the approach?

Decision-makers do not trust the approach?

Decision-makers perceive the approach to lack relevance?

Decision-makers do not trust the motives of economic evaluations?

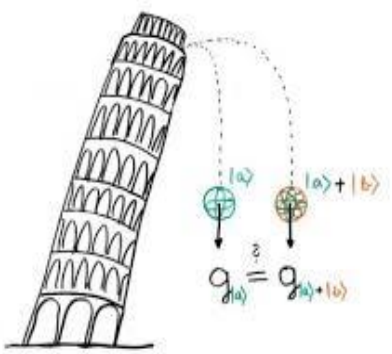
Decision-makers recognize that the approach tends to create winners and losers

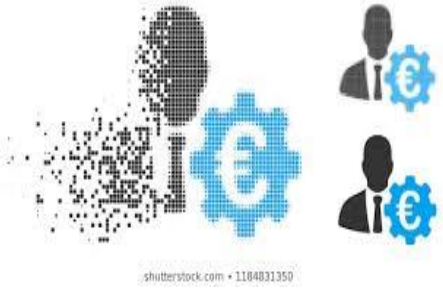
What do you think?

Too reliant on assumptions?

- A physicist, a chemist and an economist are stranded on an island with nothing to eat. A can of soup washes ashore. The physicist says, “Let’s smash the can open with a rock.” The chemist says, “Let’s build a fire and heat the can first.” The economist says …
  - … “Let’s assume we have a can-opener.”

Attributed to Paul Samuelson





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Potential solutions to sub-optimal use of economic data

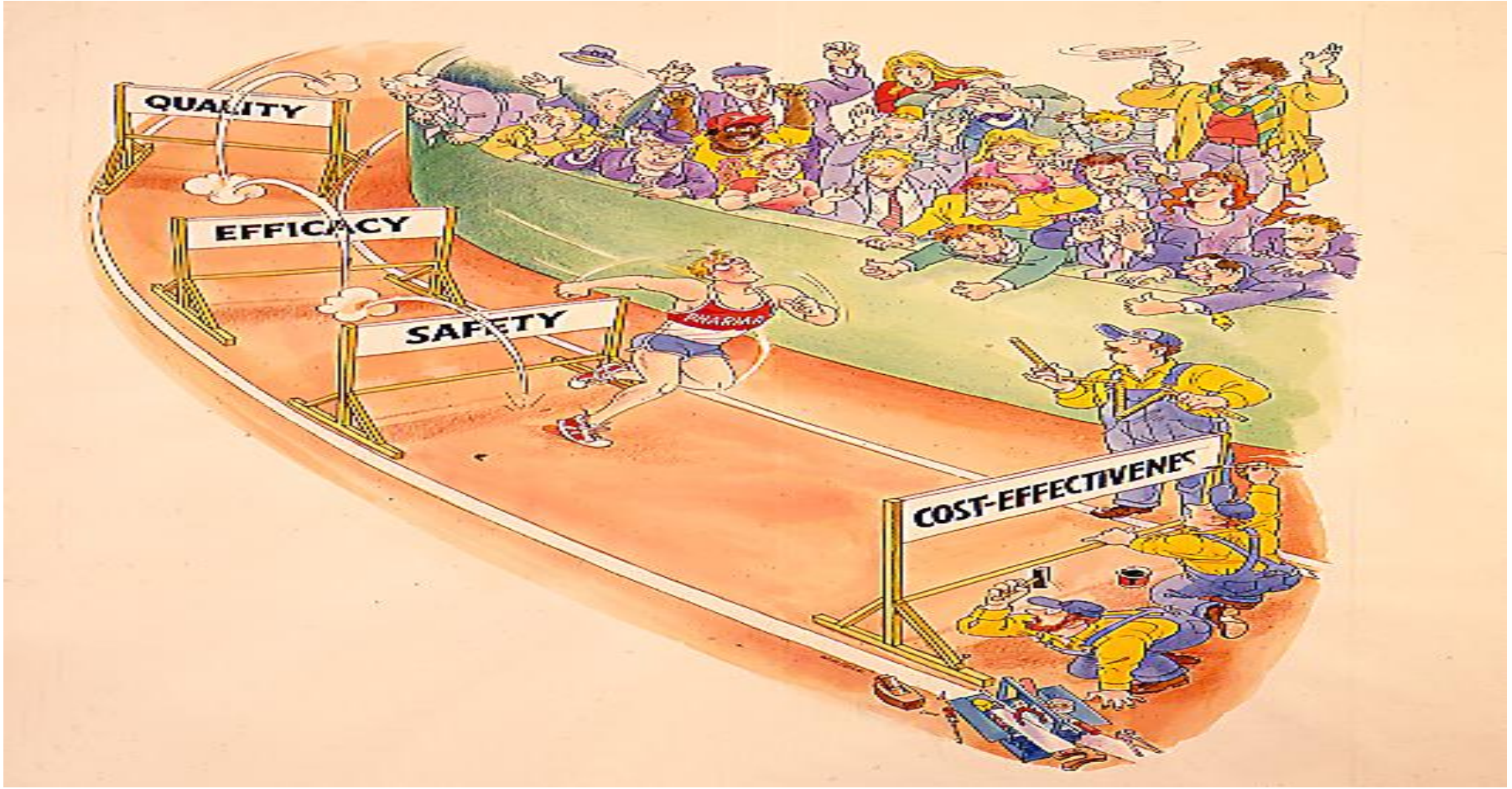
- Train and support decision-makers in use of methods and models
  - BMGF grant to PAHO to generate CE data (http://new.paho.org/provac/)
  - BMGF grant to AMP and IVI to establish or strengthen National Immunization Technical Advisory Groups (http://www.sivacinitiative.org/)
  - BMGF grant to JH ; material in vaccine economics, costin n policy makers in GAVI-eligible countries .org/courses/)
- Adopt methodologies and presentation formats that decision-makers understand
- Develop demand for training
- Sustain a community of alumni, students and teachers everywhere there is need

TVEE
TEACHING VACCINE ECONOMICS EVERYWHERE

Summary

- As more vaccines become available decision-makers will require economic data
- Economic evaluation is not an exact science although adherence to guidelines would improve comparability
- In today's economic climate, we should consider adopting a broader perspective to fully capture the value of vaccines
- But we need to improve the use and usefulness of economic evaluations

The fourth hurdle requires real world evidence



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Thank you

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