ABDUL LATIF JAMEEL
Poverty Action Lab

TRANSLATING RESEARCH INTO ACTION

Cost-effectiveness analysis and Scaling up

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J-PAL

Course Overview

1. What is evaluation?
2. Measuring impacts
3. Why randomize?
4. How to randomize
5. Threats and analysis
6. Sampling and sample size
7. Randomized Evaluation: Start-to-finish
8. **Cost-effectiveness analysis and scaling up**

Outline

1. **Example: From impact to cost-effectiveness analysis**
2. What is CEA? (vs. CBA)
3. Common uses of CEA
4. Key challenges in doing CEA
5. Scale Ups

Evaluating Immunization Camps and Incentives in Udaipur, India – Supply Side

- Immunization is really low in Rajasthan (less than 5% in Udaipur)

- One possibility is that the supply channel is the problem:

    - Hilly, tribal region with low attendance by city based health staff to local health clinics (45% absenteeism)

    - Conducted monthly immunization camps in 60 villages: regular camps held rain or shine from 11a-2p (95% held)

    - Camera Monitoring

The Demand Side of Immunization

- Second possibility: There is a problem of demand:
  - People not interested in immunization, scared?
  - Opportunity cost of going for 5 rounds of vaccination
  - Can demand be affected?

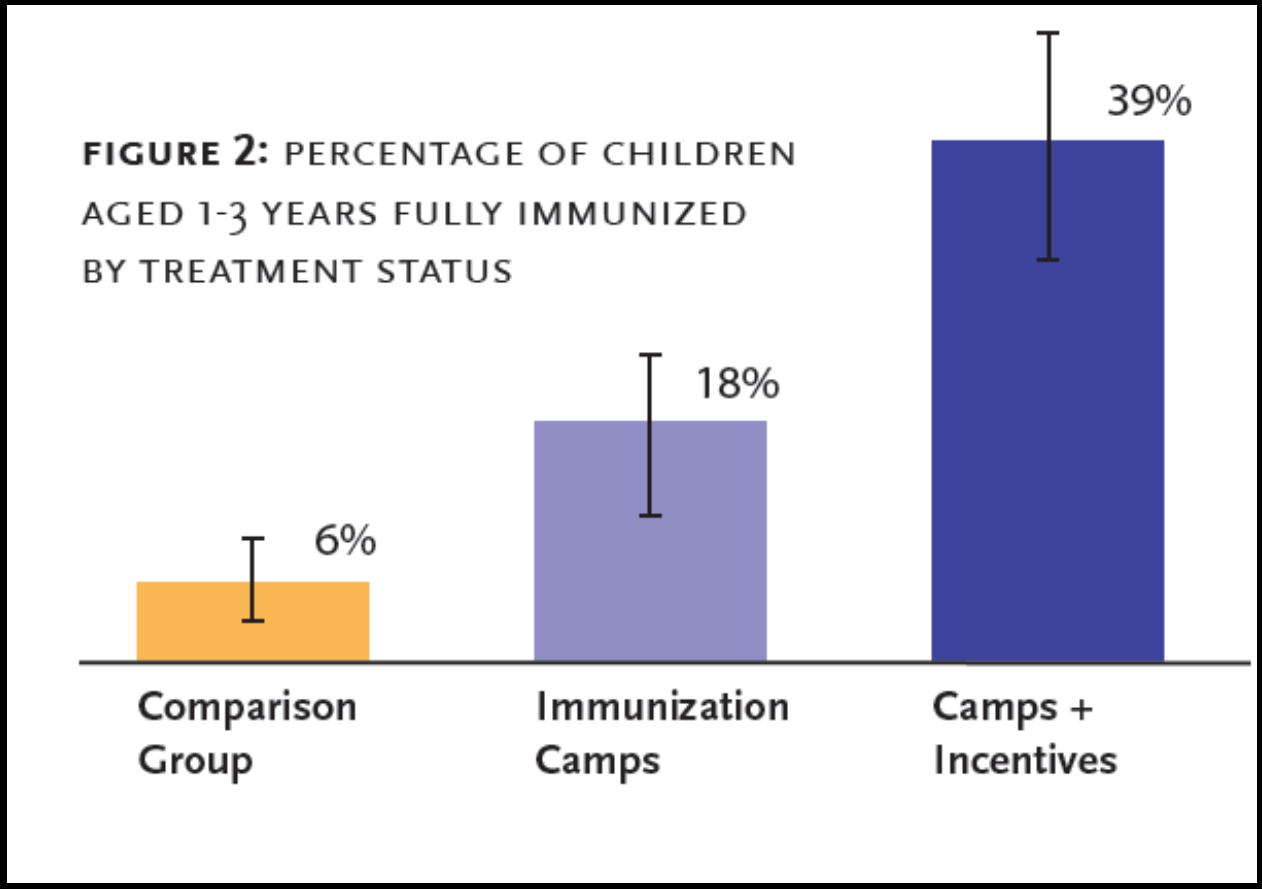
Incentivizing Demand

- Extra incentive: provided one kilogram of lentils for each immunization (Rs. 40 – one day's wage) plus thali set for full course

- Treatment 1: Reliable camps
  - 30 villages
- Treatment 2: Reliable camps + incentives
  - 30 villages
- Control group
  - 60 villages

- Collected data on immunization rates

Regular Supply Increased Immunization, Incentives Helped it Even More



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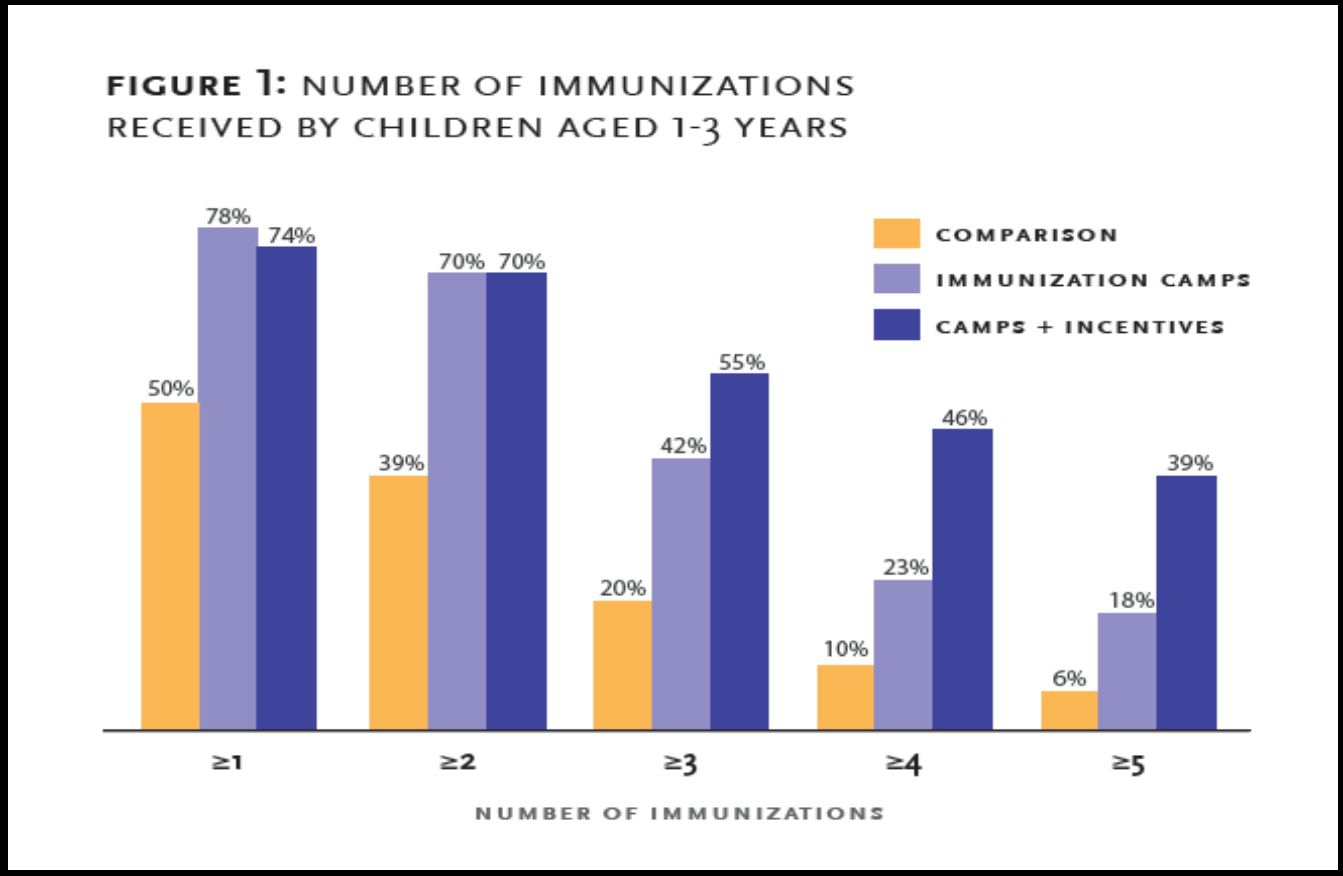
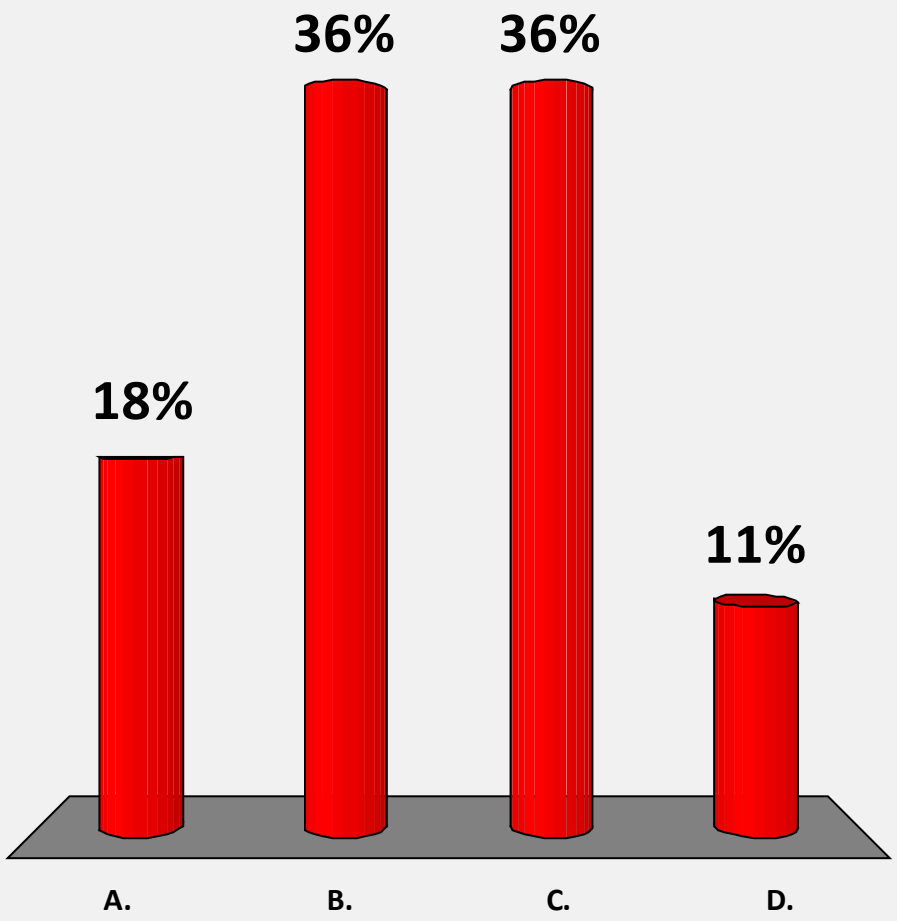
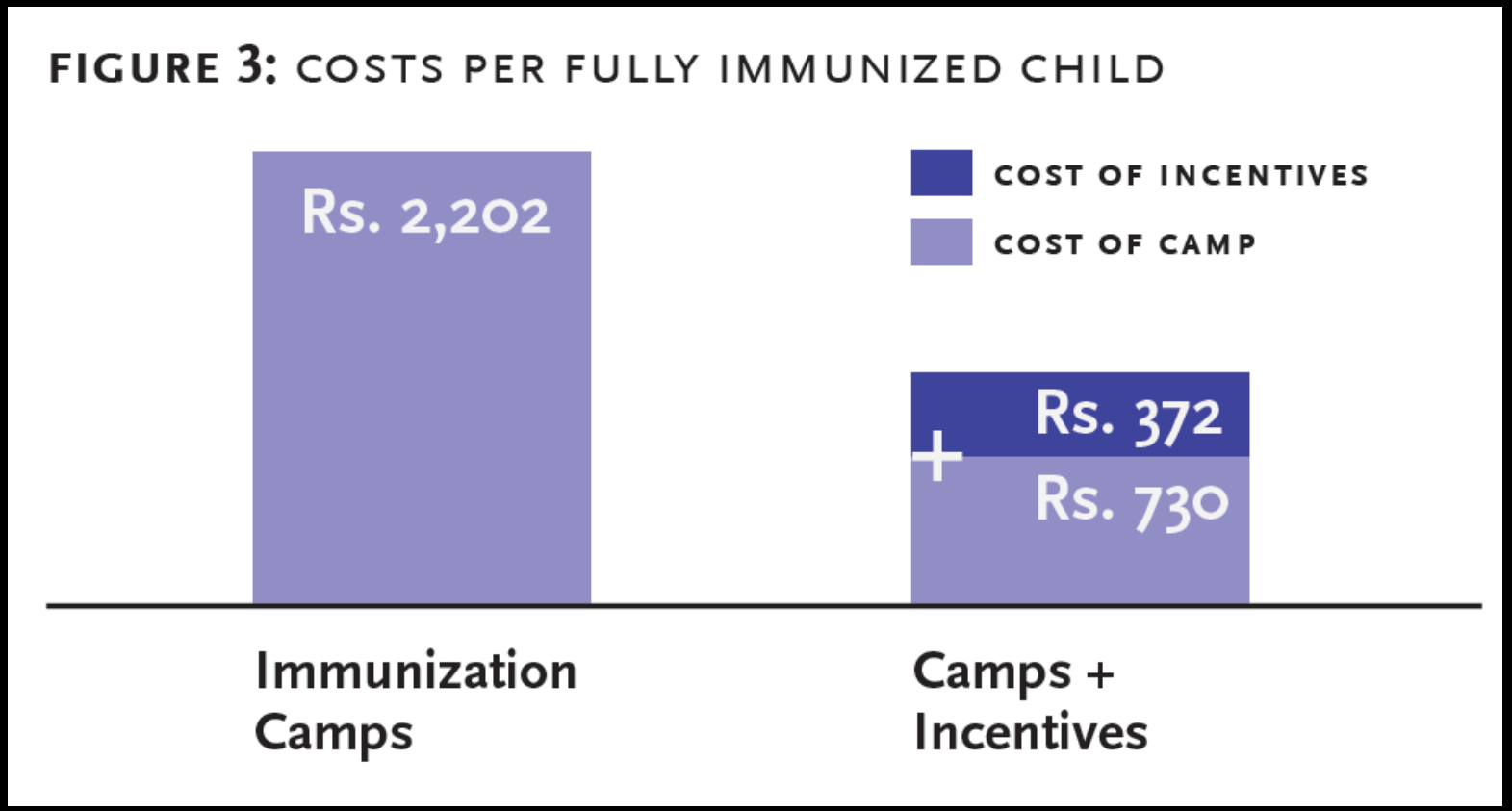


Which treatment was more cost effective?

A. Reliable Camps
B. Reliable Camps + Incentives
C. Could go either way
D. Don't know



Giving incentives was twice as cost-effective



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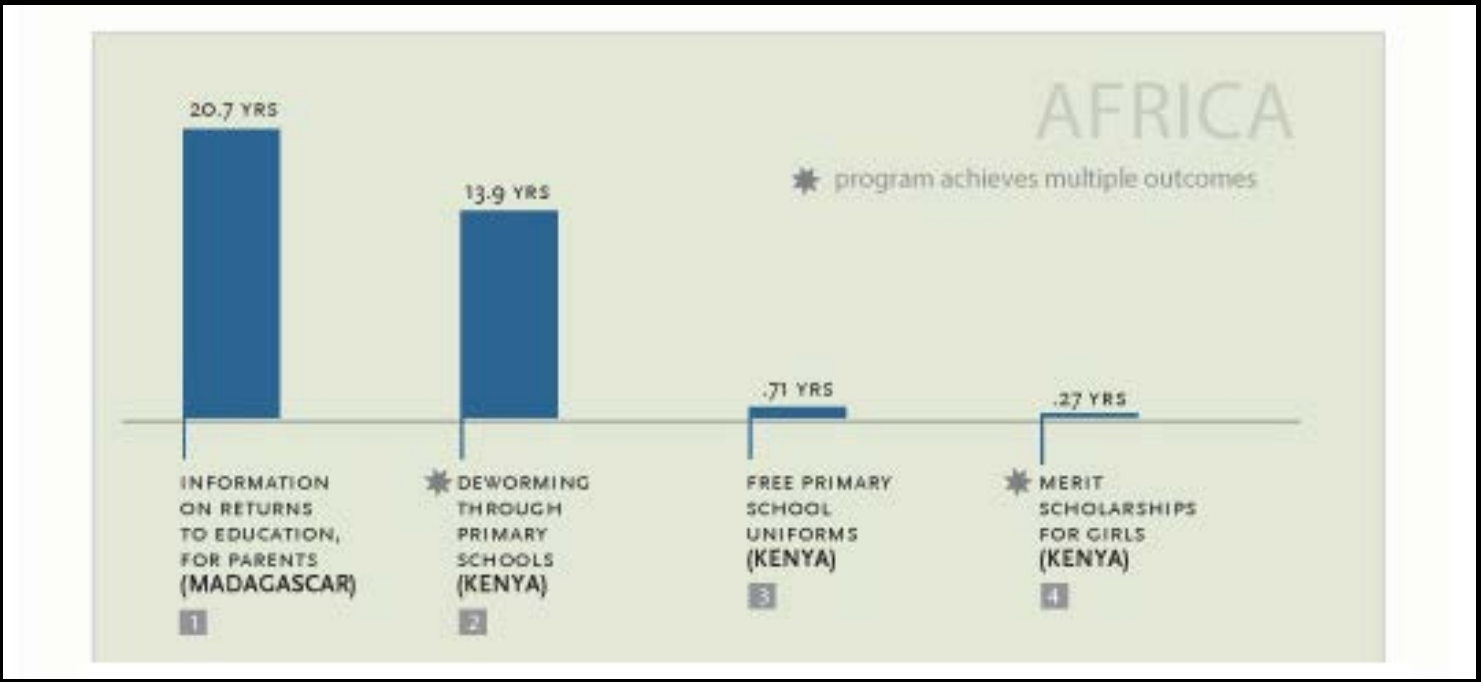
Cost-effectiveness Analysis (CEA) and Comparative CEA

- Cost-effectiveness analysis measures the ratio of the costs of a program to the effects it has on one outcome
  - Measure the cost for a given level of effectiveness: e.g. cost to increase school attendance by 1 year
  - Or, measure the level of effectiveness for a given cost: years of additional attendance induced by spending $100

Cost-effectiveness Analysis (CEA) and Comparative CEA

- *Comparative* cost-effectiveness then compares this cost-effectiveness ratio for multiple programs

Example: Years of schooling gained per $100 spent



Cost-effectiveness Analysis (CEA) and Comparative CEA

- *Comparative* cost-effectiveness then compares this cost-effectiveness ratio for multiple programs
  - Must compute costs and benefits using similar methodology for all programs

- Good way to help policymakers synthesize information from many evaluations
  - Provides a summary of a single program in terms of its costs and effects on one outcome
  - Can be used to compare many programs, find the most cost-effective option (comparative analysis)

Cost-Effectiveness (CEA) vs. Cost-Benefit Analysis (CBA)

- CEA: Ratio of costs to effect on **one** outcome
- CBA: Ratio of costs to **monetary value** of effects on **all** outcomes
  - Can deliver absolute judgment on whether a program is worth the investment.
  - But, also requires assumptions about the monetary value of all the different benefits. (cost of life, disability, lower crime among school kids)

- Advantage of CEA is its simplicity:
  - Allows user to choose an objective outcome measure (e.g. cost to induce an additional day of schooling) – no need for making judgments on monetary value of that schooling
  - Easier for policymakers to compare programs when they are primarily concerned about one outcome of interest (e.g. increasing school attendance, not child health)

When is cost-effectiveness analysis useful?

- You have a specific outcome measure you want to affect
  - There are many possible interventions to address this goal, and you are unsure which will get the most impact at the least cost
- You want to convince a decision maker that a non-obvious program is a good idea
- You want to understand how the CE of a program could vary with contextual and implementation factors

What info is needed?

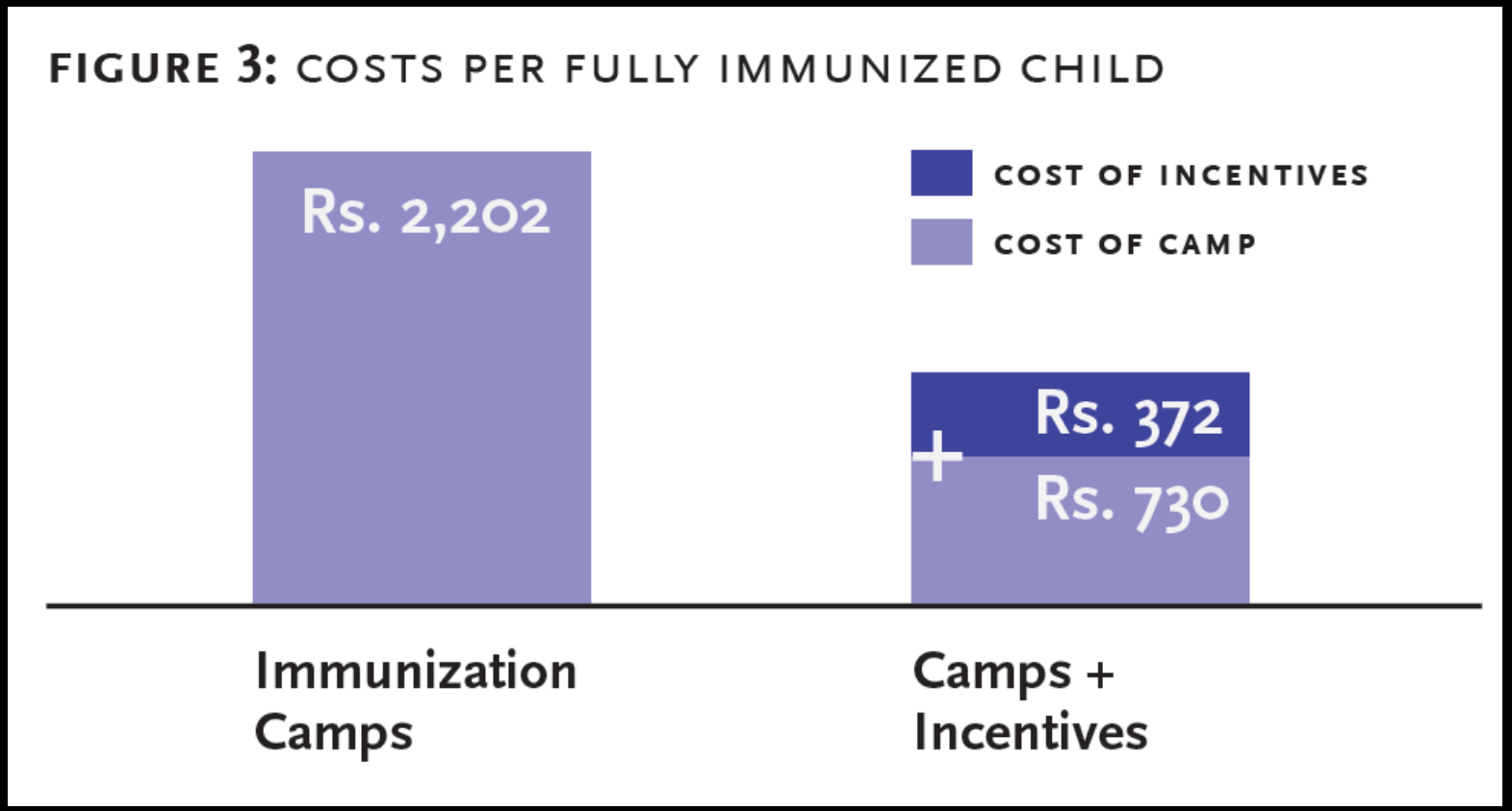
- Take impact measures from rigorous impact evaluations
  - Need some other info, like number of beneficiaries, when impacts were measured

- Take cost data from…?
  - Most projects don't record their implementation costs
  - Need fairly disaggregated specific data on exactly what items were purchased, how much staff time was spent (on what), transportation costs, etc.

Tally the full Costs of the Program – Ingredients Method

Cost Components	Details	Camps with Incentives	% of Total	Camps without Incentives	% of Total
Salary	Team of 4 GNMs and 4 GNM Assistants + Coordinators Salary	558,500	29%	558,500	46%
Travel	Staff and Incentive transport to camps	171,460	9%	63,460	5%
Honourarium	*USD 0.26 per child under 2 yrs per shot , given to village workers.*	*119,580*	*6%*	*62,370*	*5%*
Daily allowance	USD 1.10 for attending bi monthly meetings, given to village workers.	19,500	1%	19,500	2%
Consultancy fees	Paid for training of nurses and assistants.	2,200	0%	2,200	0%
Lodging & boarding	Expenses incurred during trainings.	7,333	0%	7,333	1%
Travel	For village worker's transport to trainings	4,645	0%	4,645	0%
Training Material	Office supplies disbursed during trainings.	1,500	0%	1,500	0%
Medicines	Includes paraceptemol, syringes and needles, needle cutters, blood pressure instruments, and stethoscopes.	43,925	2%	15,320	1%
Refrigerators	Four for vaccine storage.	25,178	1%	25,178	2%
Cost of Monitoring	Includes cameras, film, and manpower required for monitoring camps, entering, and analyzing data.	446,480	23%	446,480	37%
Incentive	*Utensils and lentils (includes storage boxes)*	*550,164*	*28%*	-	*0%*
Total		**1,950,465**	100%	**1,206,486**	100%

Giving incentives was twice as cost-effective



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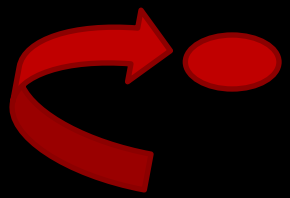
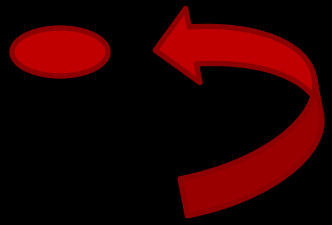
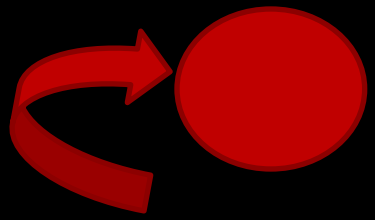
Common CEA Uses



- Prospective analysis of pilot programs
  - "Roughly how cost-effective could this proposed pilot be?"
  - "How big an impact must this achieve to meet our threshold?"

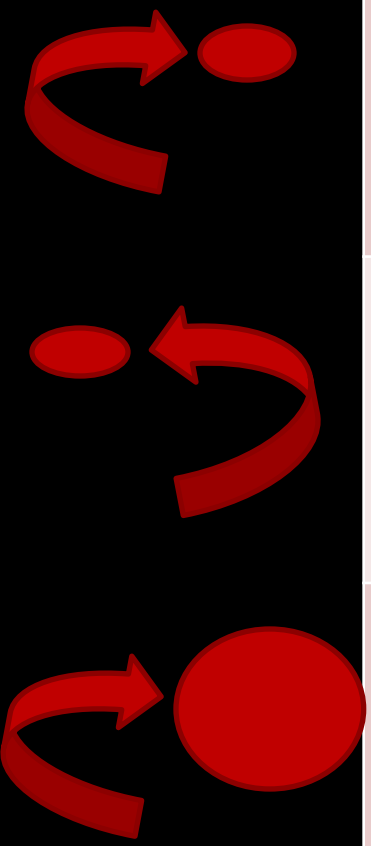


- Retrospective analysis of pilot programs
  - "Exactly how cost-effective was that pilot program?"



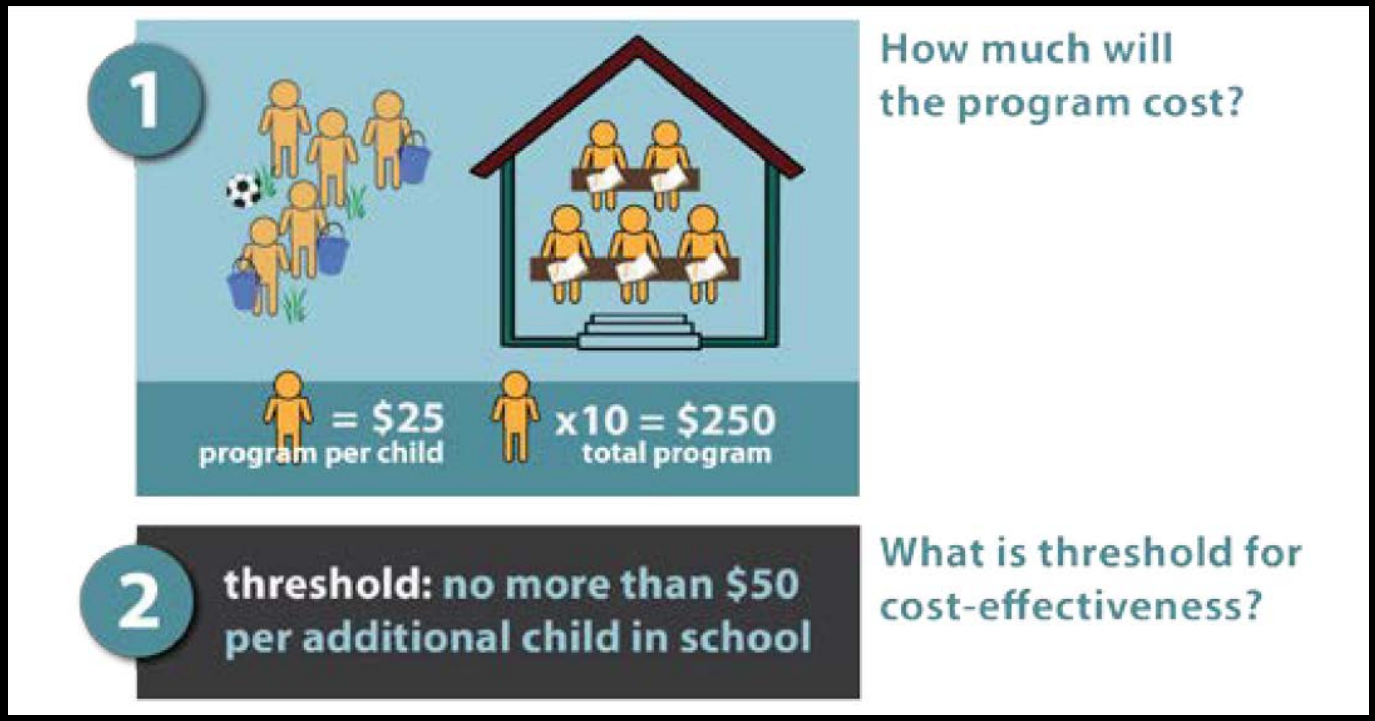
- Prospective analysis of programs at scale
  - "Roughly how cost-effective might this proposed national program be?"

Common CEA Uses



	Necessary Data	Strengths	Weaknesses
Prospective Analysis of Pilot Programs	• Projected costs • Impact estimates from a similar program	Even rough calculations can help rule out programs that can't be cost-effective	Cost projections and impact estimates from similar programs may not be accurate
Retrospective Analysis of Pilot Programs	• Cost data from exact program that was evaluated • Rigorous impact estimates	Gives precise estimates of how cost-effective a program was in that context	Still suffers from external validity problem for cost and impact estimates
Prospective Analysis of Programs at Scale	• Projected cost data for program at scale • Rigorous impact estimates from pilot evaluation	Producing customized prospective estimates are a powerful tool when speaking with country governments	Impacts from small-scale pilots may not generalize to at-scale programs

Using thresholds to assess cost-effectiveness



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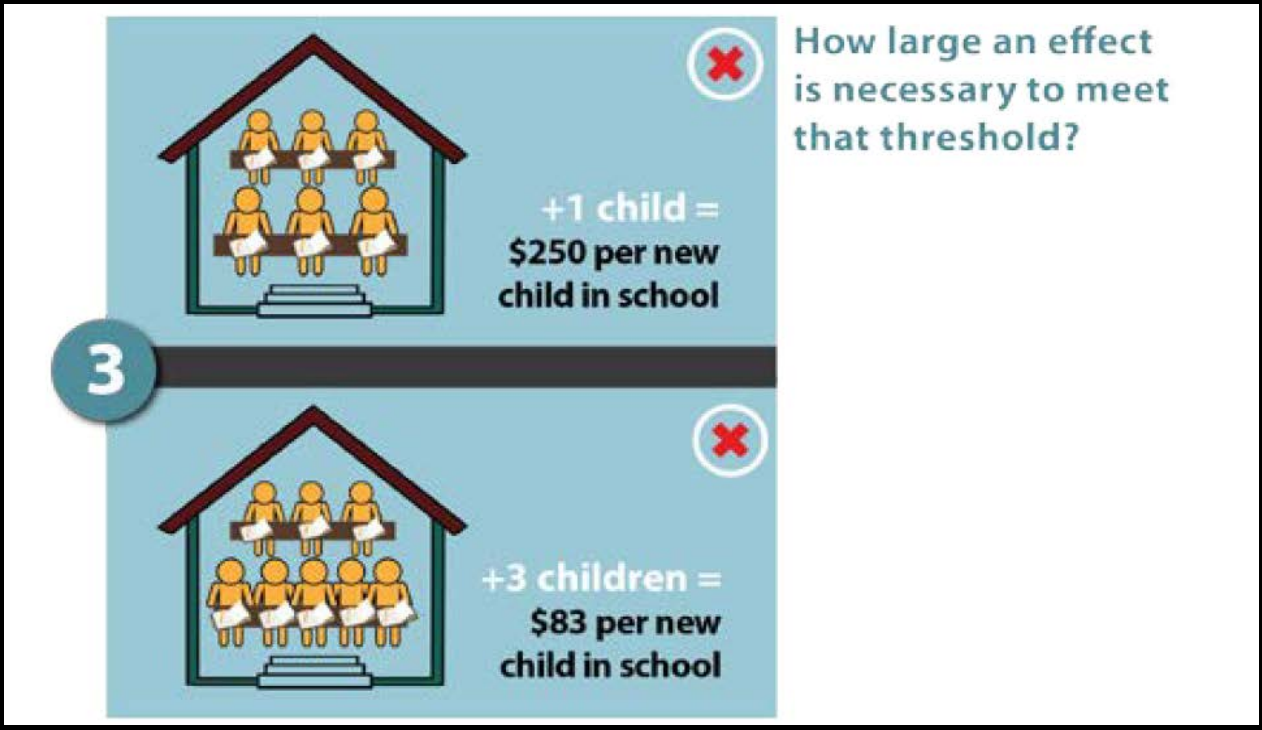

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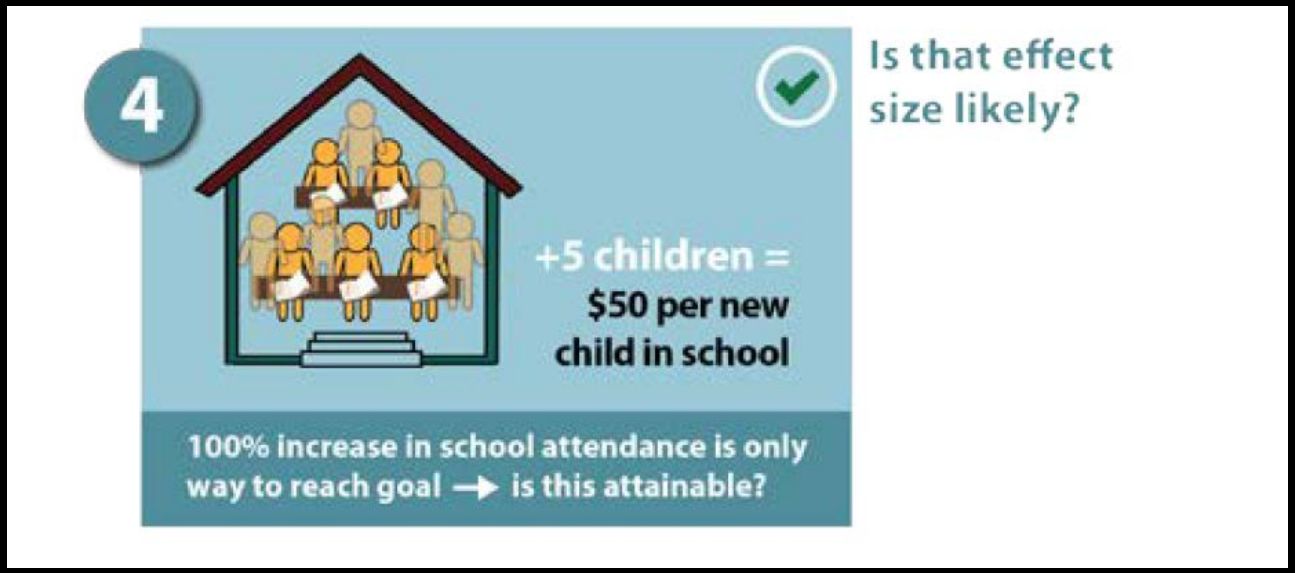

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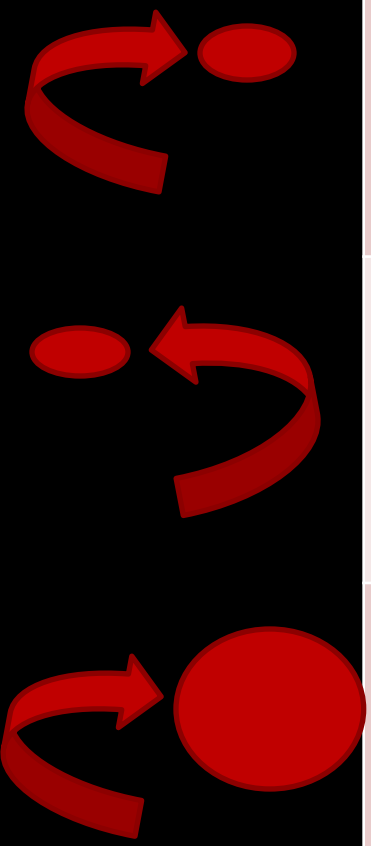

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Three Key Challenges in Doing CEAs

I. Absence of incentives to do CEA:

- What if the program was effective but not really cost-effective?
- No editorial requirement to show CEA in most social-science journals

II. Not straightforward:

- Number of assumptions are needed to complete the analysis (e.g. multiple outcomes, transfers, spillover effects, exchange rates, inflation etc.)
- No one "right" way, but consistency is important!

Three Key Challenges in Doing CEAs

I. Absence of incentives to do CEA

II. Not straightforward

- III. Costs are hard to gather:
  - Collecting cost data not seen as key part of evaluation unlike impact measures
  - Cost data is surprisingly hard to collect from implementers (budgets different from implementation costs; hard to divvy up overhead and existing costs to project)
  - Hard to get cost data from other authors for a *comparative* CEA
  - Impact measures and cost collection often not harmonized

Gathering Cost Data - Retrospectively

- Retrospectively:
  - J-PAL mostly uses "ingredients" method (Levin and McEwan 2001)

- Gather cost data from multiple sources:
  - Academic paper for description of program structure, ingredients and local conditions like wages
  - Interview researchers for additional ingredients, their costs, additional documents like budgets
  - Program staff and field research staff for unit cost data
  - Supplement with public sources (e.g. local wages, transportation costs etc.)

Retrospective vs. Prospective Cost Gathering

- Challenges with retrospective approach:
  - Data not originally collected by implementer or evaluator and key field staff are hard to locate or do not respond
  - Many important costs are forgotten, or hard to estimate after long lag
  - Program as implemented may be very different from how it was budgeted
  - Aggregate cost data is much less useful for sensitivity analysis or scale-up

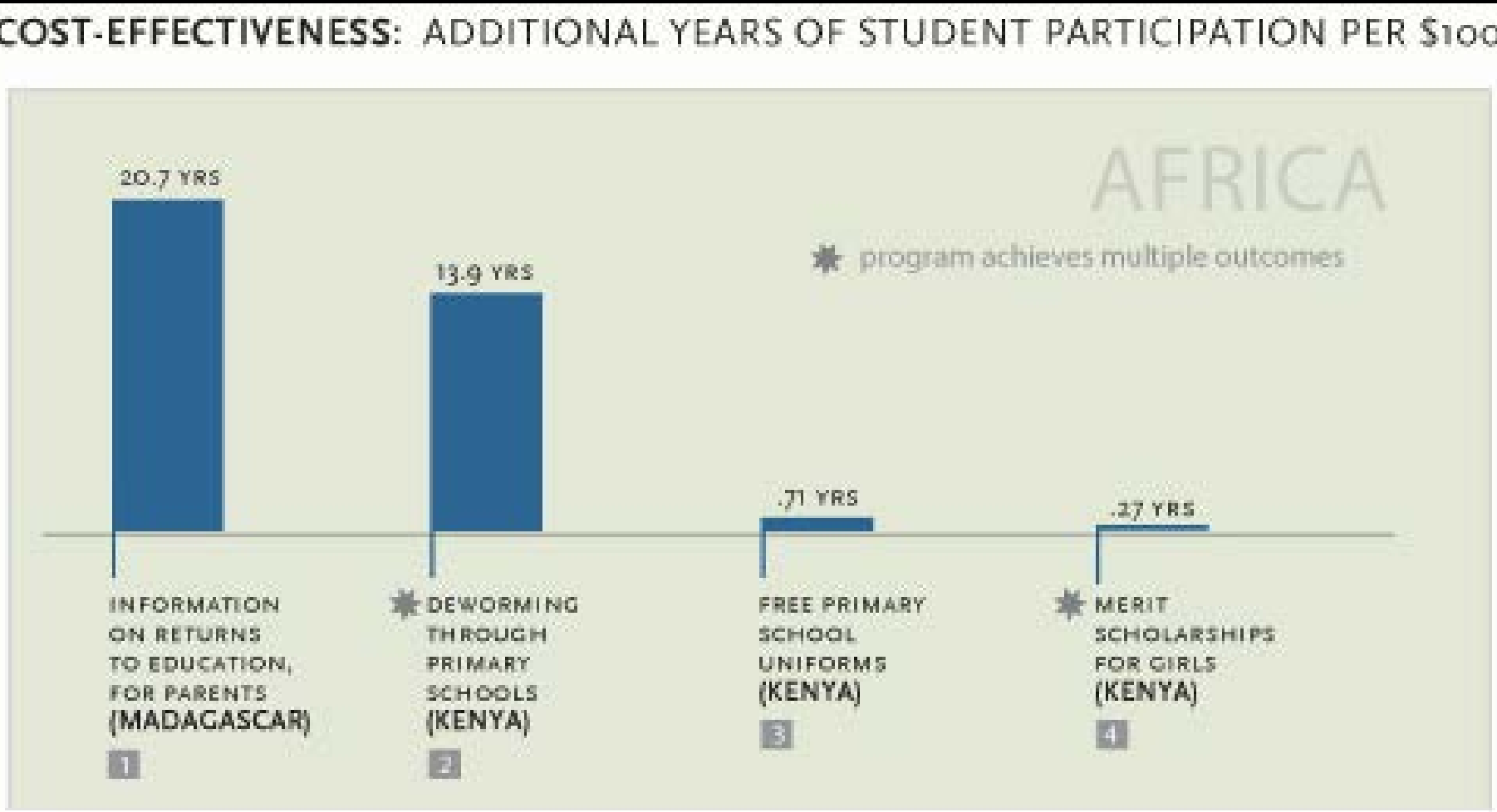
- Prospectively:
  - Overcomes challenges of retrospective cost gathering
  - J-PAL Initiatives provide standard templates to assist in data collection
  - Harmonization makes it easier to do *comparative* CEA

Assumptions for CEA

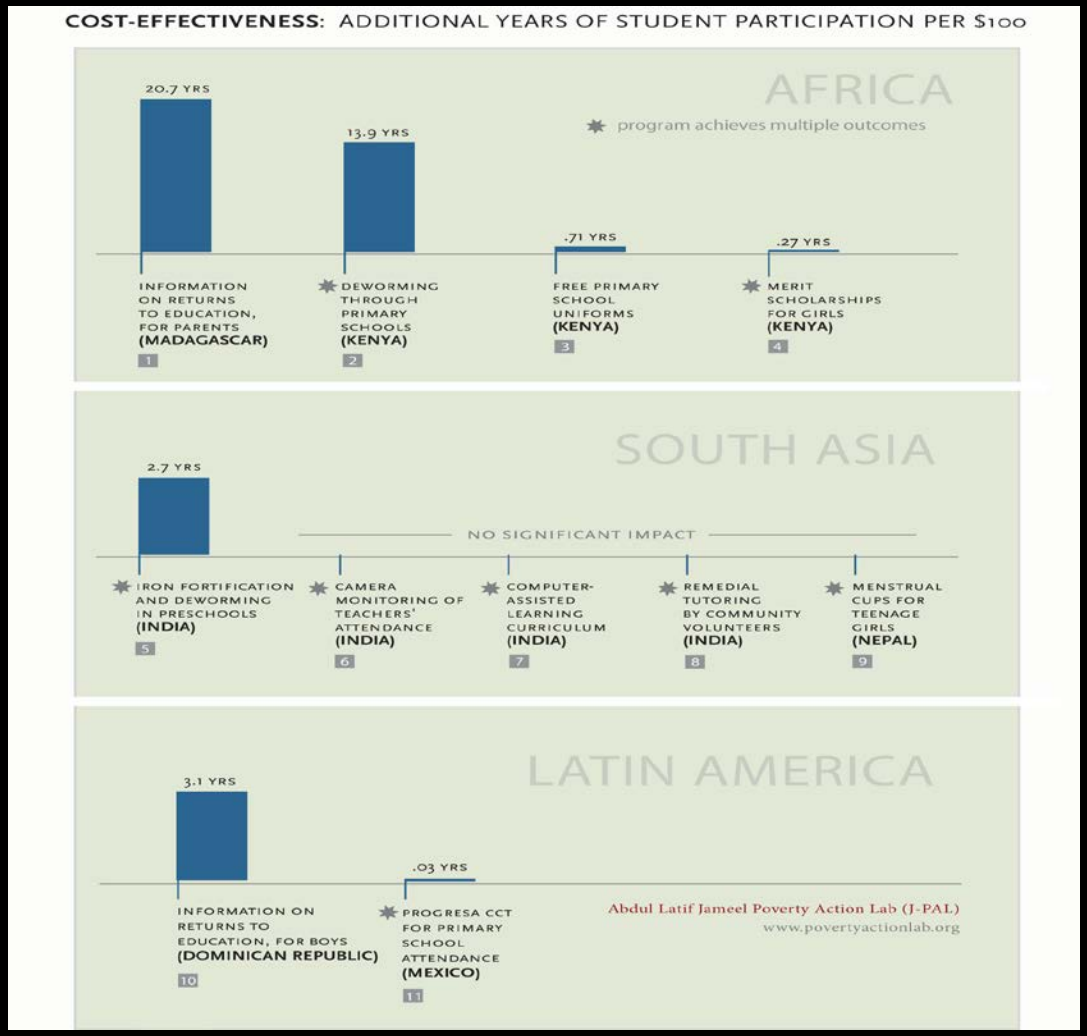
- What are you calculating the cost-effectiveness of?
  - The program, during pilot phase
  - The program, if it was scaled up
  - Some component of the program

- How will you deal with…
  - Exchange, inflation, discounting
  - Spillover effects
  - Multiple outcomes
  - Costs shared with a partner organization
  - Fuzzy costs: administration, overhead, and management

Reading Cost-Effectiveness Results



CEA as a starting point for discussions on evidence based policy



CEA graph is just the start – it is supplemented by many more details

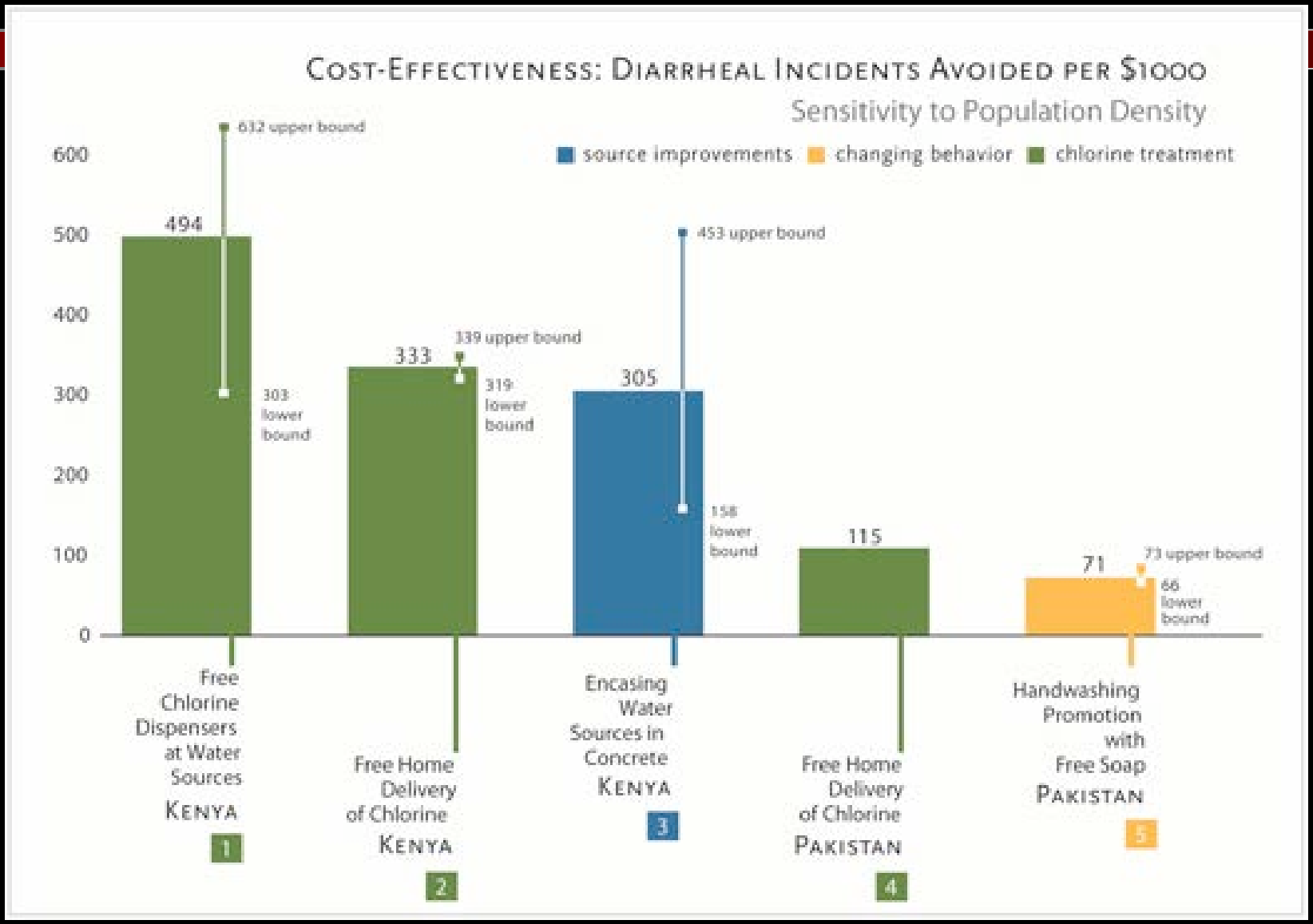
CONFIDENCE INTERVALS OF COST-EFFECTIVENESS: ADDITIONAL YEARS OF EDUCATION PER $100 SPENT

RANGES BASED ON 90% CONFIDENCE INTERVAL OF PROGRAM IMPACT

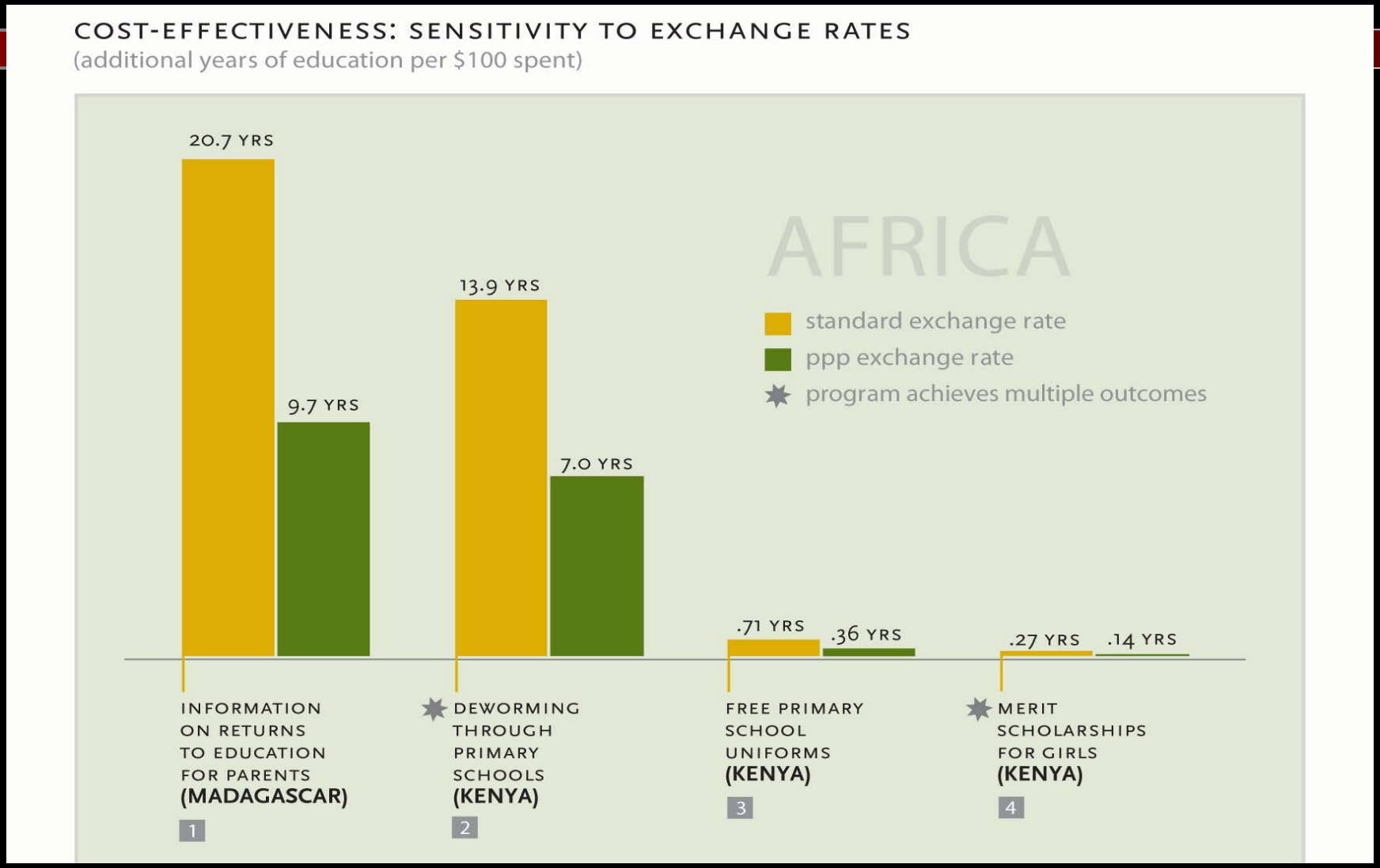
Abdul Latif Jameel Poverty Action Lab (J-PAL)
www.povertyactionlab.org

	PROGRAM	COUNTRY	TIME FRAME	LOWER BOUND	PT. ESTIMATE	UPPER BOUND
1	Information Session on Returns to Education, for Parents	Madagascar	1 year	1.1	20.7	40.3
2	Deworming Through Primary Schools	Kenya	1 year	5.7	13.9	22.1
3	Free Primary School Uniforms	Kenya	1 year	0.33	0.71	1.10
4	Merit Scholarships for Girls	Kenya	3 years	0.02	0.27	0.52
5	Iron Fortification and Deworming in Preschools	India	1 year	0.10	2.7	5.3
6	Camera Monitoring of Teachers' Attendance	India	–	NO SIGNIFICANT IMPACT		
7	Computer-Assisted Learning Curriculum	India	–	NO SIGNIFICANT IMPACT		
8	Remedial Tutoring by Community Volunteers	India	–	NO SIGNIFICANT IMPACT		
9	Menstrual Cups for Teenage Girls	Nepal	–	NO SIGNIFICANT IMPACT		
10	Information Session on Returns to Education, for Boys	Dominican Republic	4 years	1.0	3.1	5.2
11	PROGRESA CCT for Primary School Attendance	Mexico	4 years	0.02	0.03	0.04

Sensitivity to Contextual Factors



Sensitivity to Assumptions



Issues to Consider in Cost Effectiveness Analysis – *there is no one right way*

- *Present Value*: Real discount rate of 10% is used to discount costs and benefits to control for time value of money

- *Inflation*: Adjust costs to today's prices

- *Across Countries*: Standard exchange rates are used to adjust to US$

- *Multiple Outcome:* Can only examine one type of benefit at a time, which is how many policies are framed anyway

Issues to Consider in Cost Effectiveness Analysis – *there is no one right way*

- *Total vs. Sunk Costs*: Only consider incremental cost to the existing infrastructure (material, personnel, oversight)

- *Proximal Success vs. Final Impact of Programs:* Use global measures to translate proximal outcomes into final outcomes

There is no <u>one</u> right way of doing a CEA. But we need to make choices (be transparent about assumptions) and apply the same standard across all studies in an analysis.

Some Resources for CEA

- J-PAL paper on CE methodology:
  - Why CEA is valuable
  - What assumptions are necessary to perform CEA
  - Common problems or mistakes in calculating CEA

www.povertyactionlab.org/publication/cost-effectiveness

- Also includes some very basic templates for cost-gathering and doing CEA

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There are Different Paths from Impact Evaluations to Scale-Ups

1. Governments evaluate their pilot programs to demonstrate usefulness to public, gather support for their expansion and learn lessons to make it more effective (e.g. Progresa)

2. Leveraging evidence by implementing organization to expand existing programs and get more funding (e.g. Pratham)

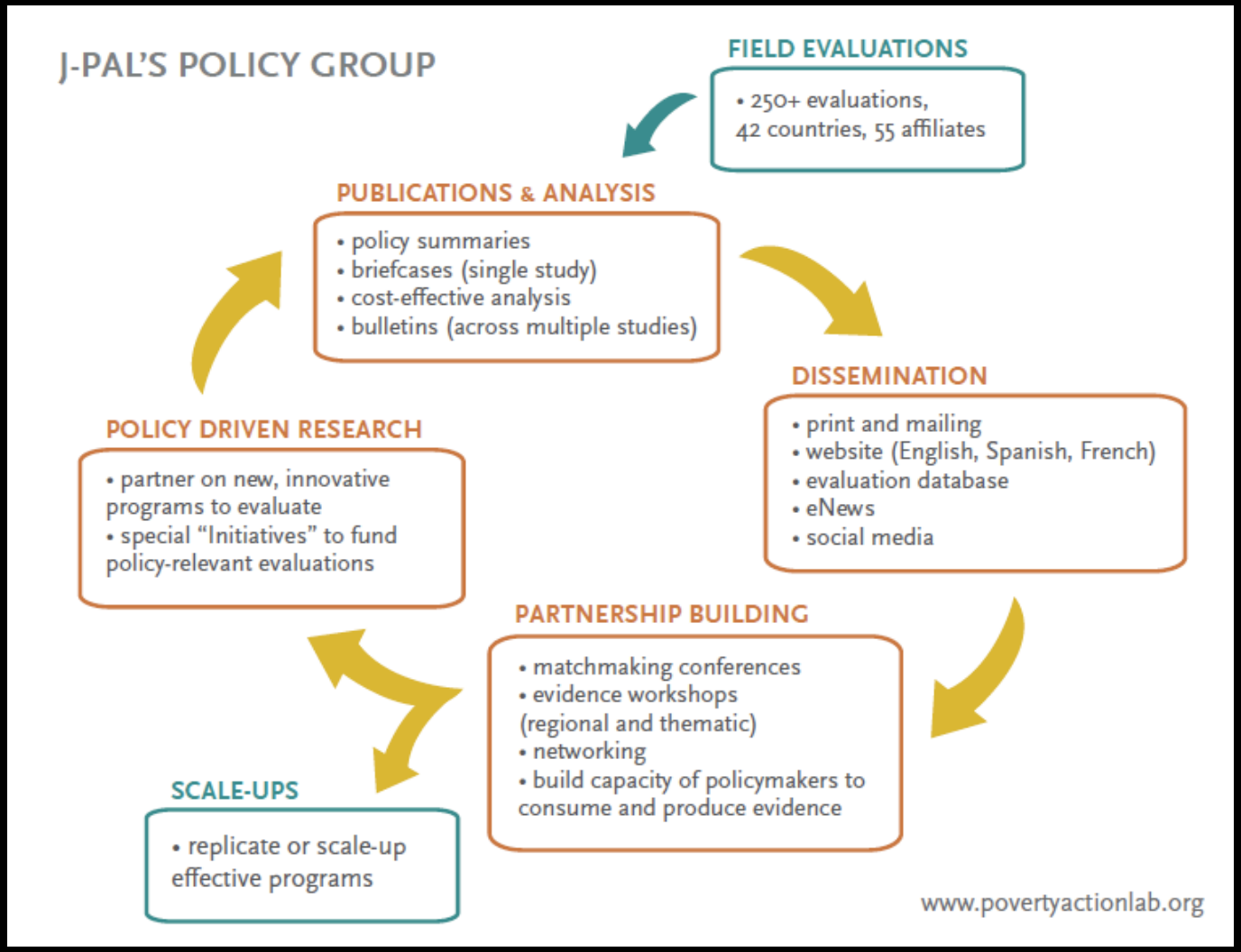
3. Independent organizations can use evidence to replicate or scale-up programs found to be highly cost-effective, and/or simple to implement (e.g. Deworm the World)

There are Different Paths from Impact Evaluations to Scale-Ups

4. If an evaluation helps provide evidence on a very policy relevant and salient topic, it gets a huge amount of traction very easily (e.g. Pricing)

5. Careful study of the new context, collaboration with original evaluator and implementer and a pilot replication (e.g. TCAI: remedial education in India and Ghana)

There are Different Paths from Impact Evaluations to Scale-Ups – Here is One



Final Issues to Consider in Scale Ups – *there are no easy answers*

- *Spillover Effects:* Spillovers may be different in a pilot vs. scaled program.

- *Partial vs. General Equilibrium:* Very hard to measure precise nature or direction of such effects

- *Experimental vs. Scalable Mode:* Costs of inputs may become endogenous to the scale up

- *Hard to Control Contextual Differences:* Quality of infrastructure, motivation of local partners and beneficiaries, price differences, cultural differences, local parameters

Conclusion

- CEA is a useful first step in comparing alternate programs that are aimed at the same outcome
- Simplicity allows for greater use of evidence in policymaking but need to make user aware of assumptions
- Sensitivity Analysis around CEAs allow policy makers to see the effect of modifying assumptions and local conditions
- Cost Collection process is far more accurate and easier when done prospectively rather than retrospectively
- The journey from impact evaluation to scale-ups is neither automatic, nor easy
- But we are learning more about the process and there are more and more success stories

Demand Incentives Most Effective For Later Rounds of Immunizations

Figure 3: Number of immunizations received by children 1-3 years

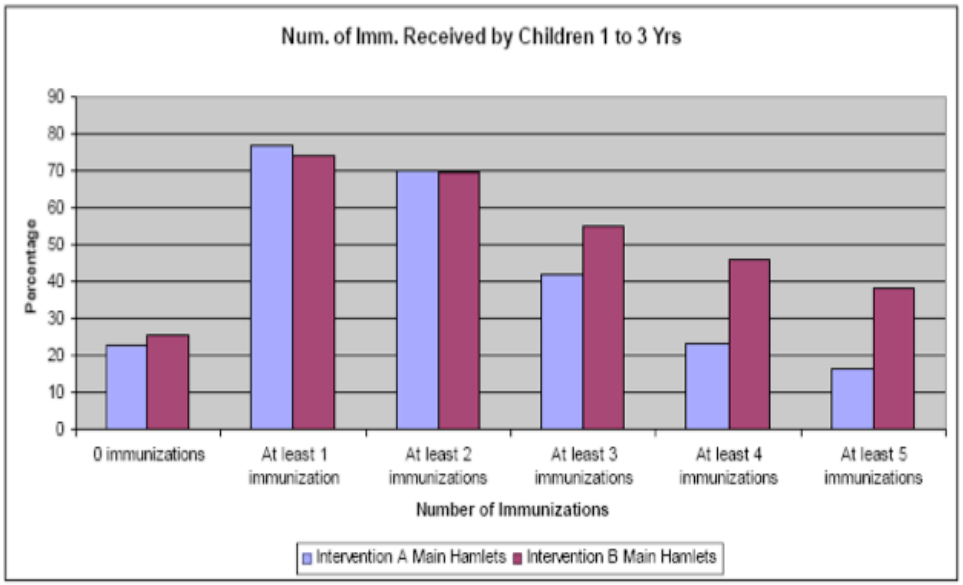
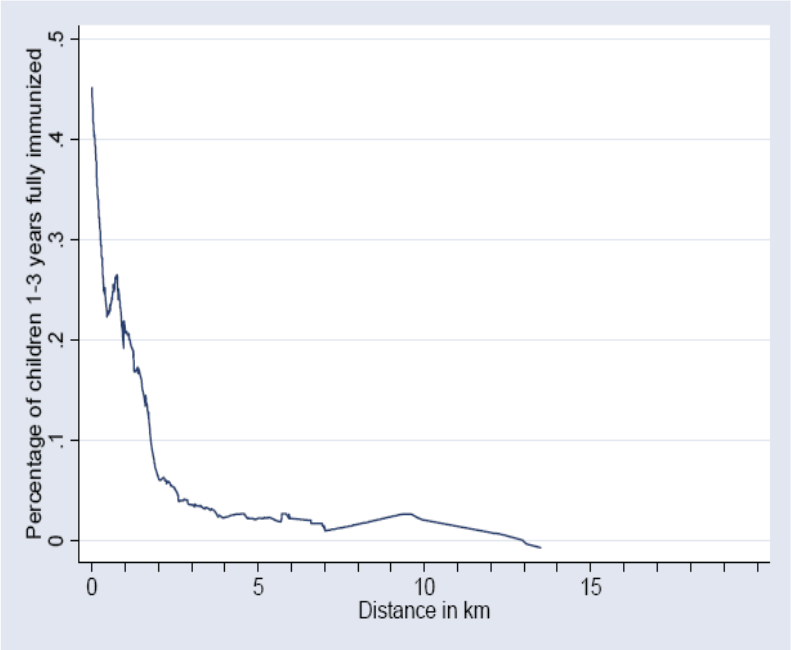
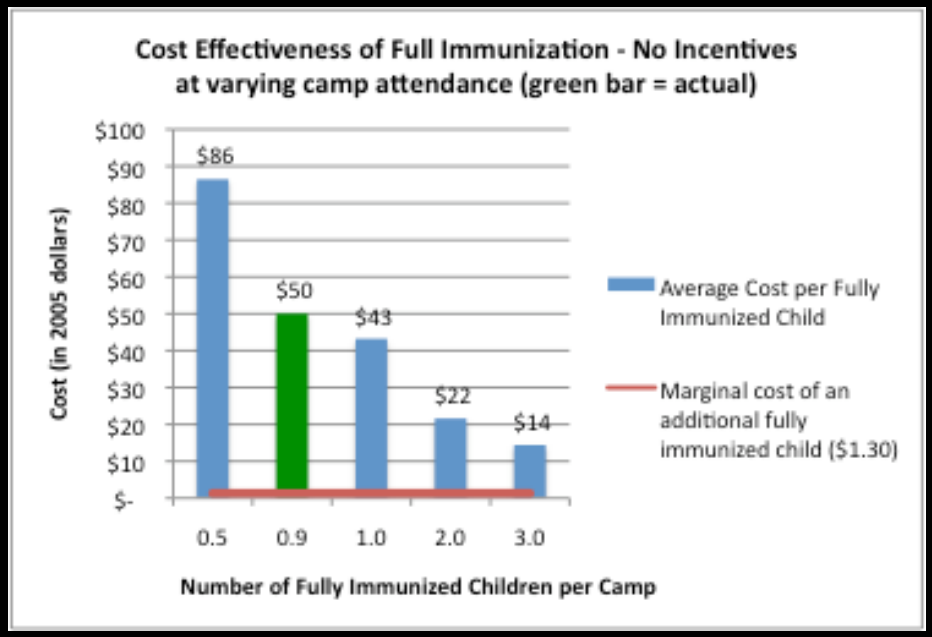
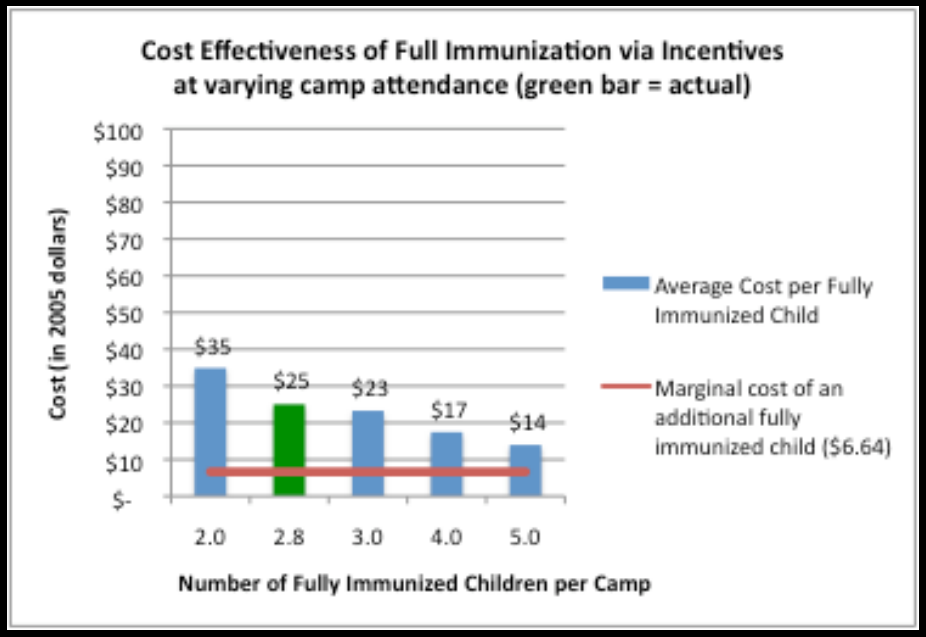


Figure 4: Immunization status as a function of distance from Intervention B camps



Divide the Costs by the Number of Fully Immunized Children to get the Cost Effectiveness of Camps and Incentives





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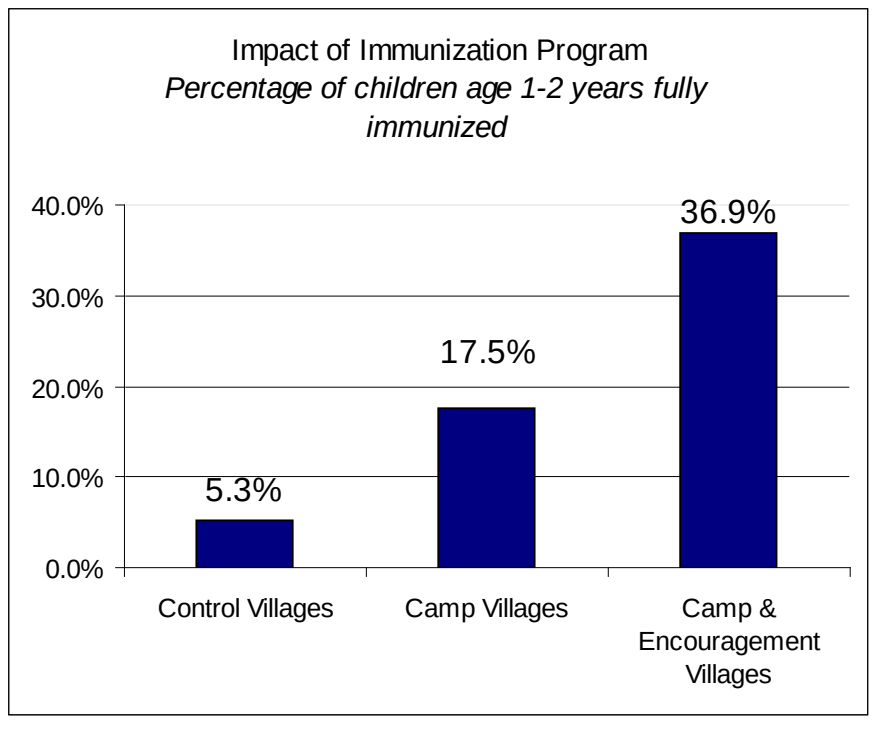
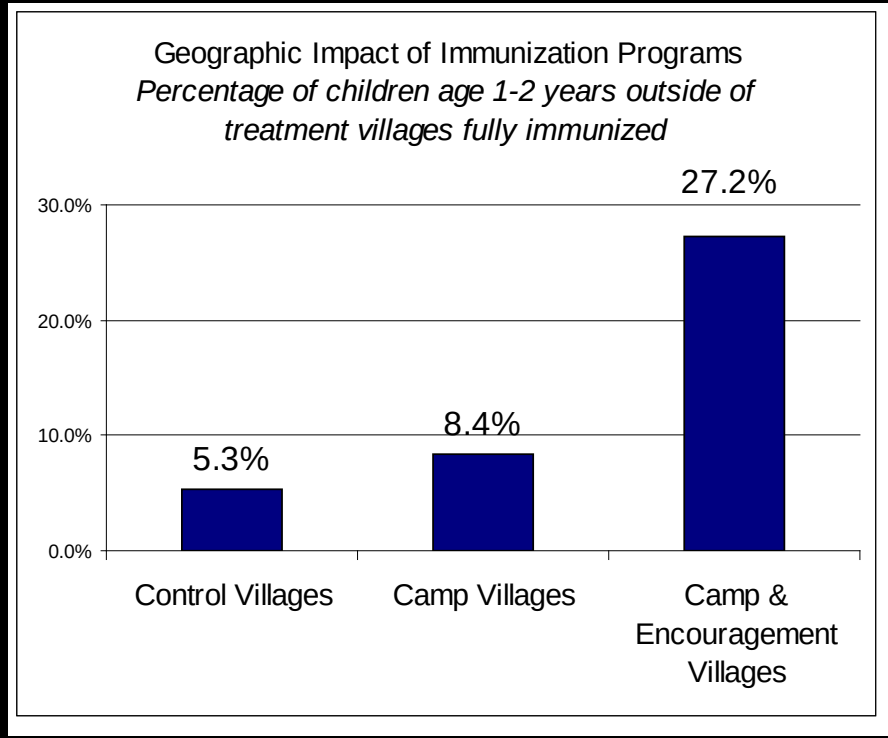


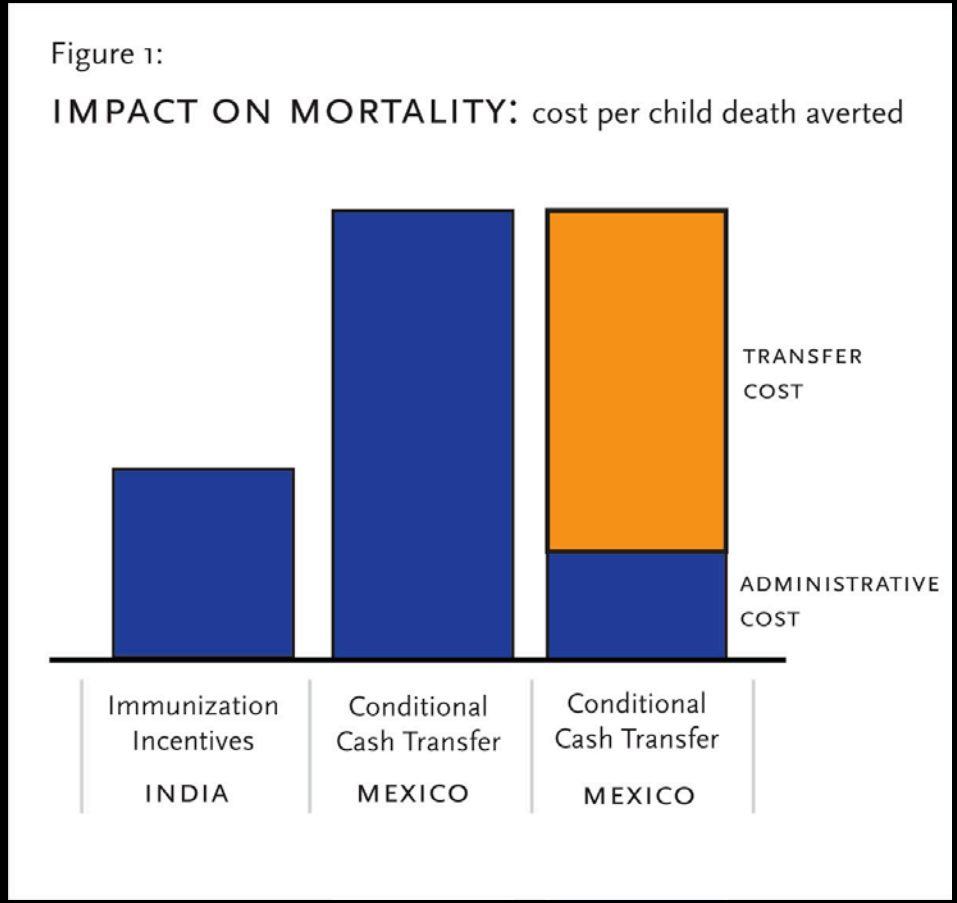


Prospective CEA - Harmonization

- Outcome Harmonization:
  - Student Attendance: Attendance (random head count) vs. increased enrollment; or Participation (both attendance and enrollment)
  - Learning outcomes: Standardized tests (e.g. PISA or Pratham's rapid assessment) vs. standard deviation of scores
  - Duration of intervention (measuring impact after a few months or a few years)
  - Prevalence vs. Incidence (health)
- Cost Harmonization:
  - Which costs to gather and include (e.g. existing infrastructure, high level overhead, user fees etc.)
  - Ensure both costs and impacts are over entire program duration
- CEA Methodology Harmonization
  - Not on today's agenda!

Issues to Consider in Cost Effectiveness Analysis – *there is no one right way*

- *Transfers*: Not a cost to the society but are they a part of the program cost?
  - International Donors vs. Local Governments
  - Additional Problems of Non-Cash Transfers



Issues to Consider in Cost Effectiveness Analysis – *there is no one right way*

- *Significance of Effects*: Only report results at 10% level of significance and show confidence intervals

- *Point Estimates vs. Range*: Show range around point estimates to make distinction between a set of cost effective programs vs. a set of not so cost efficient programs

- *Context*: If costs depend a lot on specific contexts (e.g. population density) provide ranges of cost effectiveness based on these parameters