

Identifying Cost-Effective Interventions

Capturing and Analyzing Costs of Interventions

Summary of Presentation

1

Why is Cost Analysis Important

2

What Should Cost Data Look Like

3

Capturing Costs

4

Analyzing Costs

5

Questions?

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Three Key Applications

1. Identifying Good Investments

2. Opportunities for Savings

3. Informing Scale-up

1. Identifying Good Investments

Example: Primary School Investments in Northern Brazil

Which investment would you implement???

Invest in general package of “Hardware”

Impact on Portuguese score = 8.97

Cost per student = \$16.06

Cost Effectiveness Ratio = $\$16.06/8.97 =$
\$1.79 to raise score 1pt per child

Investment in writing materials

Impact on Portuguese score = 4.70

Cost per student = \$1.76

Cost Effectiveness Ratio = $\$1.76/4.70 =$
\$0.37 to raise score 1pt per child

Lessons

- Impact alone is incomplete
- Cost metrics help with “preference setting”
- Policy makers will ask: “IS THIS A GOOD DEAL??”

Types of Analysis

- Cost-effectiveness Analysis (The Cost Per Outcome Measure)

Incremental Cost Effectiveness Ratio (CER) = C / E

ex. .17 sd change in test scores for \$2.33 cost per pupil.

-CER = \$2.33 / .17 / 10 = \$1.37 per .1 sd change per student

- Cost-Benefit Analysis (Total Benefits vs. Total Costs)

$$\text{NPV} = \sum_{t=0}^n \frac{B_t}{(1+r)^t} - \sum_{t=0}^n \frac{C_t}{(1+r)^t},$$

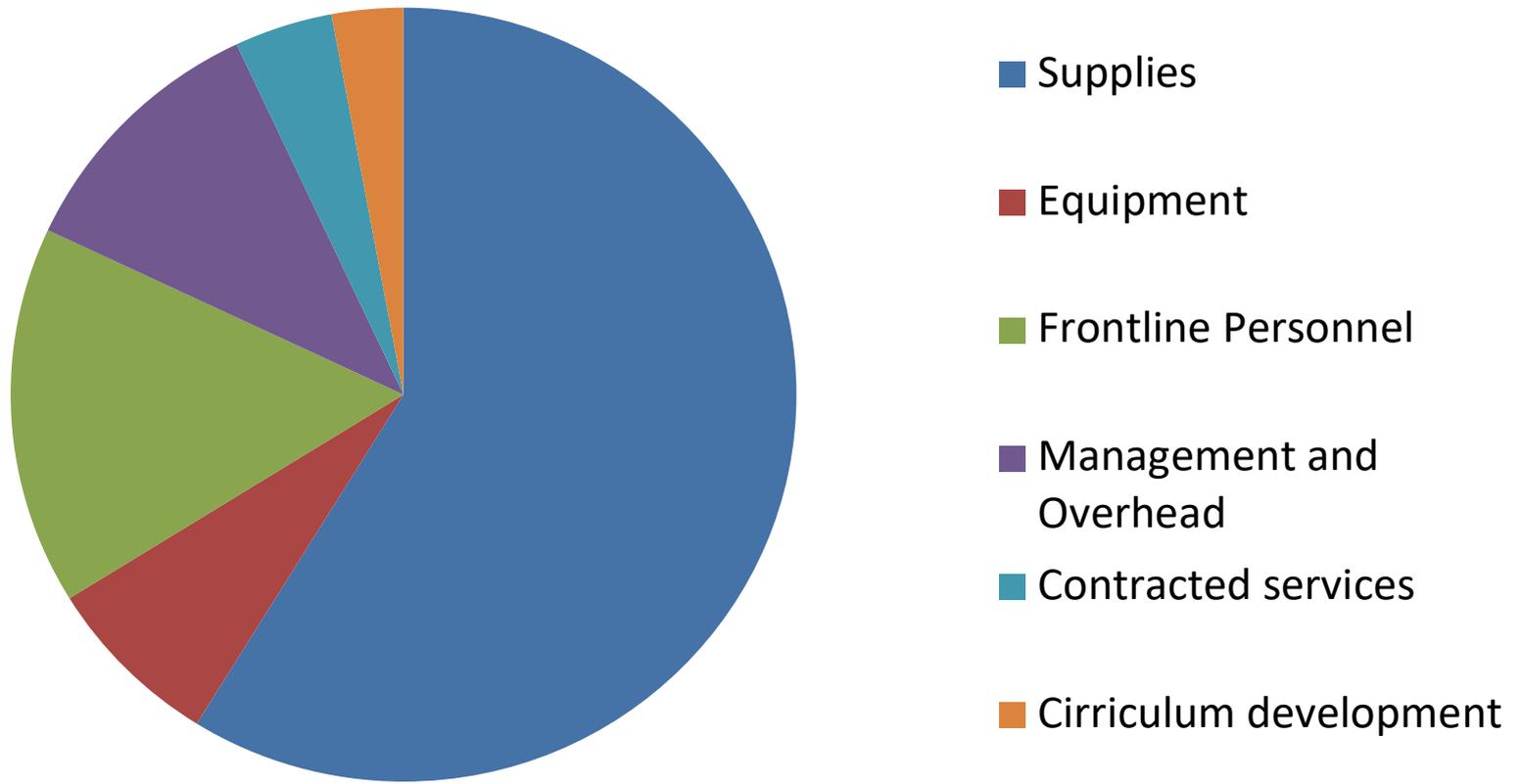
- Cost Utility Analysis (Cost Per Multiple Outcome Measures):
Cost / Quality Adjusted Life Years (QALY)

2. Opportunities for Savings

Hypothetical Teacher Training Program

What's wrong here???

Cost Categories



Take a look at the expenditures

Which expenditure line is off???

Input	Billing Code	Ingredient	Nature of Unit	Units	Price	Expenditure USD
Printing Charges	GLC4912	Supplies	Pages	3225	\$0.45	\$1,451.25
Training booklets ordered	GLC2124	Supplies	Package	132	\$30.00	\$3,960.00
Lenovo T450 computers	GLC3321	Equipment	Purchases	15	\$600.00	\$9,000.00
Rental Space	GLC3256	Training	Days	40	\$500.00	\$20,000.00
Cookies for participants	GLC9421	Supplies	Cookies	63241	\$16.00	\$1,011,856.00
Trainer salaries	GLC2000	Frontline - Personnel	Trainer/days	750	\$150.00	\$112,500.00
Projectors purchases	GLC5999	Equipment	Purchases	4	\$300.00	\$1,200.00
Program Manager Salary	GLC2100	Management	Salary days	90	\$450.00	\$40,500.00
Procurement manager	GLC2300	Management	Salary days	10	\$250.00	\$2,500.00

Real Example - Possum Control in New Zealand



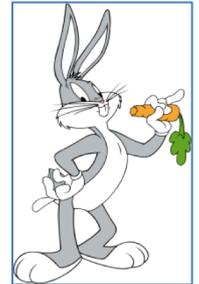
Problem: Bait contributing the largest proportion of cost.

- **Cost Saving Solution:** Use carrots (cheaper)

Waste!!!



Savings



Problem: Over-use of helicopters for sowing bait over small areas

- **Cost Saving Solution:** Use vans



Problem: Excessive Contactor costs. Some wasting 2 days on planning

- **Cost Saving Solution:** Get better contractors

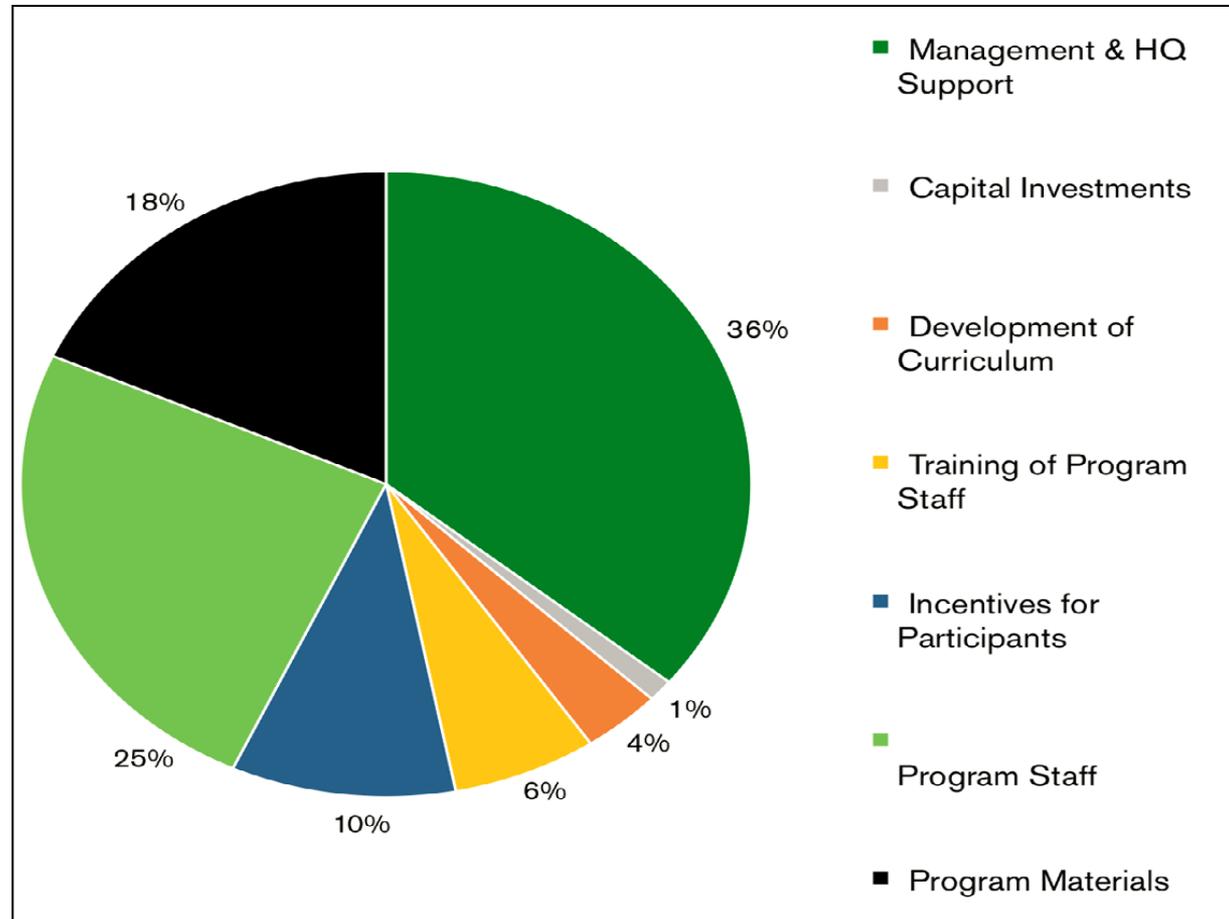


3. Inform Scale-up

How Could this Parent Education Program Be Improved During Future Implementation?

Insights:

- Increase Scale → increased program efficiency
- Cheap opportunities for quality improvements



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DISAGGREGATE!

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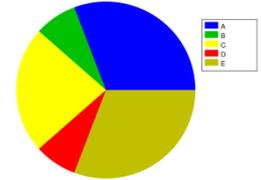
DISAGGREGATE!

A program's budget and financial information must be disaggregated using the **ingredients method** if you want to gain insights from cost analysis

*You can also think of it as an **investigation** into the cost details of an intervention*

What CAN'T we do with aggregate or only partially disaggregated data?

Cost different activities within the same program?



Differentiate marginal costs from total program costs



Achieve accuracy and precision



Show how costs evolve over time



Identify cost savings



Conduct sensitivity analysis or help scale program



Aggregate / Poorly Disaggregated Data

What is this data missing?

Item	Amount
1. Project Personnel	\$30,987
2. Travel	\$6,145
3. Software registration	\$5,500
4. In country staff	\$19,141
5. Overhead	\$21,776
6. Office Rent	\$11,458
7. Data Collection	\$450
8. Supplies	\$3,485
9. Other Direct Costs	\$9,529
Total Direct Costs	\$108,471
Overhead and Contingency	\$22,680
<i>Overhead - HQ</i>	<i>\$12,505</i>
<i>Overhead - Other Offices</i>	<i>\$10,175</i>
Total Costs	\$142,813

The Ingredients Method

An Investigation that uncovers, quantifies and values all resources and efforts required to make an intervention happen

(counterfactual: what ingredients would still exist without the intervention vs. with the intervention)

The Ingredients Method

List All Inputs to the Program (obtain from budgets, papers, interviews, expenditure reports, grant docs)

Tag inputs with ingredients: Personnel, Equipment/capital goods, supplies, admin and overhead, etc.

Valuing ingredients: quantities and prices, nature of unit cost.

Timeline

Allocation Percentage (obtain from interviews with project team, or regular reporting on time and effort data)

Input / Activity
Partial honorarium for 3-4 years intervention's teachers (Gross)

Item category
Personnel - frontline/direct delivery

Nature of unit cost	Number of units		Nominal unit price	
	2016	2017	2016	2017
Teacher months	1040	1240	1250	1250

Number of units		Nominal unit price		Allocation to Intervention		Nominal estimated cost	
2016	2017	2016	2017	2016	2017	2016	2017

Allocation to Intervention	
2016	2017
50%	50%

Costing Input / Activity	Nature of unit cost	Tracking necessary? (y/N)	Fixed / Lumpy / Variable	Data Source	Item category	Number of units		Nominal unit price		Allocation to Intervention		Nominal estimated cost	
						2016	2017	2016	2017	2016	2017	2016	2017
Partial honorarium for 3-4 years intervention's	Teacher months	Monthly	Variable	SCI ECCD	Personnel - frontline/direct	1040	1240	1250	1250	50%	50%	650,000	775,000

Information Used for Disaggregated Costs

1. Log-frames (list of activities, outputs, outcomes)
2. Quantity and price data
3. Time and effort data
4. Budget and actuals data
5. Interviews with project staff
6. Observational data

Hypothetical: Through an interview with a project lead, you discover that a number of **cars** are being used by intervention staff. What data do you need on this input??

- How many cars are used?
- Were the cars purchased? Contracted? Already owned?
- How much do the car's cost to maintain and use? Fuel?
- How much of the car's use is allocated to your project?
- What are they used for? Fixed or variable cost?
- Was the car used in for an impact evaluation?

Time and Effort Data

Reading Module for Children	Aggregate Salary (from budget)					
	Budget Line	Schools	Personnel Cost Per School	Spending		
	School Personnel	467	\$ 5,643.00	\$ 2,635,281.0		
	Salaries Disaggregated					
	Cost Ingredient	Price (Gross monthly Salary)	Quantity (number of personnel working on reading module)	Time (Months worked in which reading module implemented)	Effort (percent of hours spent on reading module during months implemented)	Total
	School Teacher	\$ 404.04	432	6.21	31%	\$ 336,017.12
	School Principals	\$ 943.00	41	5.23	15%	\$ 30,331.12
	TOTAL					\$ 366,348.24
	<i>How do we get the data on Time and Effort? The below template is distributed to all headmasters</i>					
	Time and Effort Collection Template (to be answered by school headmaster)					
	Question					Time/Effort Amount
	During how many months in the last quarter was the reading module implemented					
	During the months it was taught, how many days per week was the reading module conducted					
During the days it was taught, what percentage of work hours did teachers devote to the reading module						
How many months did you personally have to monitor and supervise the reading module intervention						
During the months that you monitored and supervised the reading module, what percentage of your time did you devote to the intervention						

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Four Steps

1. Take stock of budgets

- Ascertain all relevant budget and financial material and discuss data sources with program team



U.S. Agency or Department	FY 2009 actual	FY 2010 estimate	FY 2011 proposed	Percent change
Defense	81,171	81,090	77,548	-4.4
Natl and other HHS R&D	41,658	31,177	32,156	2.0
Energy	13,268	10,693	11,219	3.8
NASA	11,677	9,286	10,986	17.0
NSF	7,576	5,062	6,571	8.2
Agriculture	2,613	2,591	2,448	-6.5
Commerce	1,969	1,516	1,727	12.7
Homeland Security	1,096	1,150	1,046	-10.0
Interior	775	765	772	1.1
EPA	559	622	651	3.5
Other Agencies and Departments	3,159	3,381	3,672	4.5
TOTAL	165,471	147,353	147,696	-0.9

2. Ex-Ante Analysis

- Assess the state of all existing financial data about the project, and whether the structure of this data can answer all important questions about the cost structure of the program



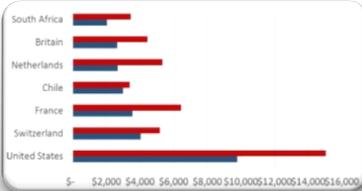
3. Data Collection Plan

- Determine what data needs to be collected in real-time to ensure accuracy of cost projection



4. Finalize Cost Estimate

- Fill in cost model with final actual expenditure data, as well as time, effort, quantity and price data; Generate final unit cost estimates



Steps 1-3 have to happen before the intervention even starts!

1. Take Stock of Budgets

Getting Started

1. Get budget and logframe
2. Identify who to talk to about scope and use of each budget line
3. What activities = intervention

Some Questions to Ask the Project Team?

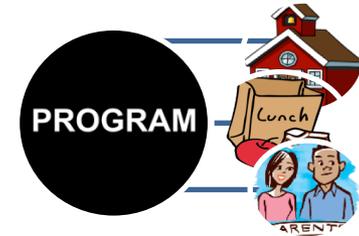


vs.



➤ Which orgs are funding and implementing?

➤ Evaluate program as a whole, or each component separately



➤ What sources of data are available, and how are these sources organized and updated



➤ Are there major funding sources or resources that do not need to be considered, such as construction costs



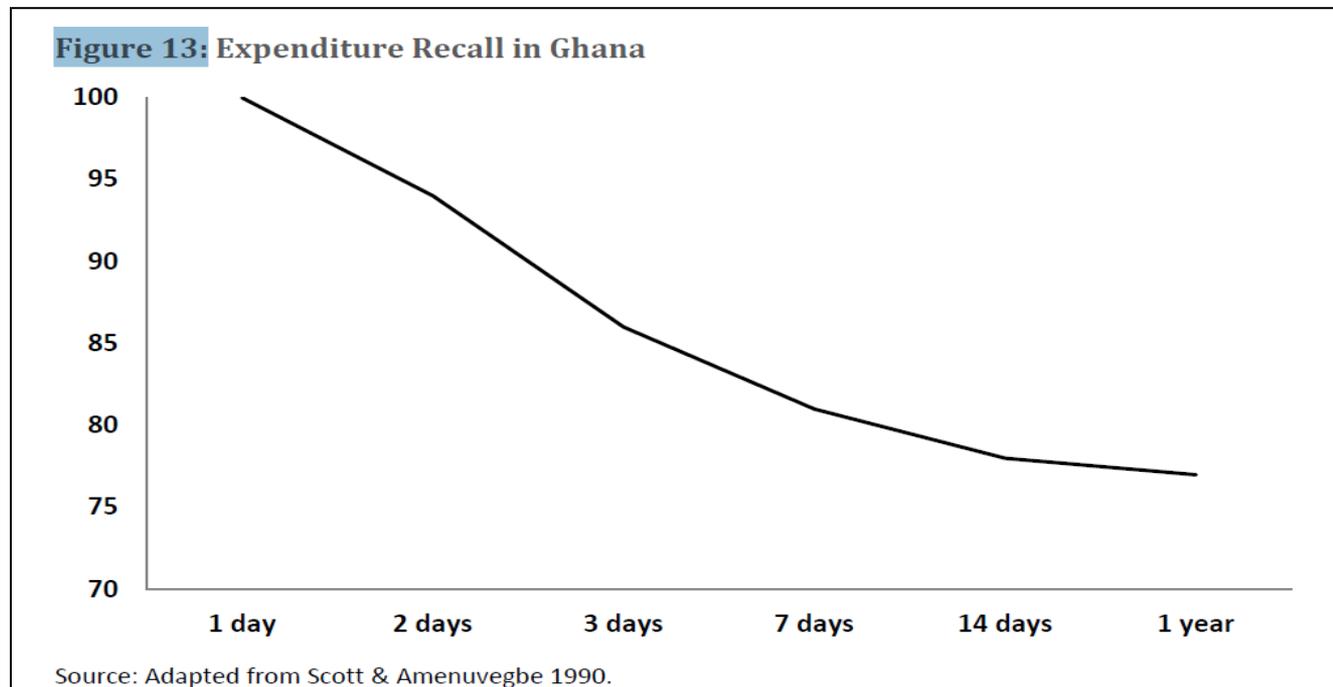
2. Ex-Ante Analysis

*Analytical investigation leading up to the ingredients method,
and all conducted BEFORE the intervention*

Why Ex-Ante?



- Most costing done after close of interventions (**retrospective / ex-post analysis**).
- Retrospective analysis is likely very inaccurate in many interventions. **Recall bias** + sources are hard to track down after intervention close.



What Are the Goals of Costing?



Let's take a hypothetical ECD program with four components:

1. Pre-primary centers
2. School lunches program
3. Parent education program
4. Technical assistance to MoE

Some Possible Goals Could Include:

1. Determine **marginal cost effectiveness** of adding **school lunches** vs. **parent education** to existing ECD centers?
2. Compare **cost-effectiveness** of the **full program** with a private school initiative
3. Determine how cost-effective the program would be **at scale**.
4. Be able to project cost of implementing program in a **different geographic location**
5. **Financial planning** on a 3-10 year time horizon for the MoE.

Social Perspective?



- Social perspectives are usually adopted for economic evaluations (especially cost-benefit analyses) but may also be necessary in a cost-effectiveness study.
- **“imputed,”** and **“averted”** costs are included in social costs
- Do you include:
 - a) Costs to beneficiary / opportunity costs of time contributions
 - b) Volunteer time or in-kind donations
 - c) Negative or positive externalities, spillover effects
 - d) Institutional or organizational opportunity costs (resources that were diverted away from other funding sources as a result of the intervention)
 - e) Transfer payments?

Calculating Yearly Societal Costs Example: CBA Analysis – Private School Voucher Lottery Program in Colombia

YEARLY COSTS PER BENEFICIARY (+)

- **Cost to beneficiary:** +\$52 extra school fees relative to non-lottery winner
- **Cost to beneficiary:** +\$41 reduced earnings due to extra time spent in school (.71 cents X 1.2 fewer hrs working X 48 weeks per year = \$41)
- **Cost to government:** +\$24 extra cost to government per beneficiary as relative to accommodating pupil in public school (due to voucher)



YEARLY COST SAVINGS PER BENEFICIARY (-)

- **Direct savings to beneficiary:** -\$74 per beneficiary is the average value of the vouchers received as compared with non-lottery winners



TOTAL YEARLY SOCIAL COST PER BENEFICIARY

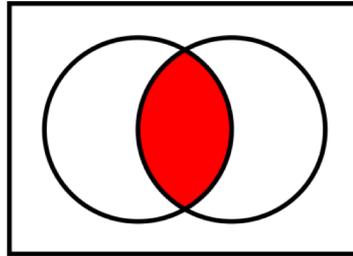
- \$52 (school fees) + \$41 (reduced earnings) + \$24 (gov. cost) – \$74 (vouchers) = **\$43 per beneficiary per year in societal costs.**

How does a program's marginal cost change when scaled?



- | | |
|--|-----------------------------------|
| <input type="checkbox"/> Curriculum development | <input type="checkbox"/> Fixed |
| <input type="checkbox"/> Textbooks for students | <input type="checkbox"/> Variable |
| <input type="checkbox"/> Software license | <input type="checkbox"/> Fixed |
| <input type="checkbox"/> Cash transfers to beneficiaries | <input type="checkbox"/> Variable |
| <input type="checkbox"/> Construction of new schools | <input type="checkbox"/> Lumpy |
| <input type="checkbox"/> Investments in municipal institutions | <input type="checkbox"/> Lumpy |

What is the Scope of Analysis?



Be careful when there is significant variation in:

1. Service Delivery (different type or intensity of services provided)
2. Geographic analysis (i.e. program implemented differently across locations)
3. Administrative Analysis (different models for management)

Consider choosing between **Activity Based** costing and **Variant (geographic/population) Based** costing

3. Data Collection Plan

A monthly or quarterly data collection plan may be required based on what you discover in your ex-ante analysis

Example time and effort data collection plan for teachers

Problem: unclear % of work hrs school staff put into a reading module being costed

Monthly Logs

- Teachers fill out monthly log estimating 1) number of days worked on reading module and 2) how many hours were typically spent on the reading module on days where it was taught.

School Report (Quarterly)

- Principals compile monthly logs in school-wide report
- Principals record percent of their own time spent on managing reading module over the quarter
- Principals record quarterly estimate of supplies and equipment used for reading module

HQ Report

- Finance staffer responsible for cost reporting compiles all principal reports into a master report on time and effort
- Allocation percentages generated for the cost model based on master report

Regularly reporting data can allow cost experts, finance personnel, or research teams to generate **expenditure analyses in real-time!**

This can help project teams realize savings and make mid-intervention adjustments.

4. Finalize Cost Estimate

Finalize Cost Estimate

- Replicate the steps taken in the ex-ante analysis with the finalized actual expenditure data.
- Determine total cost for each relevant Intervention or Variant you are costing.
- Develop a final model that analyzes costs and breaks them down into categories.
- PUBLISH findings of cost-effectiveness.

When a project closes, you should already be able to estimate cost!

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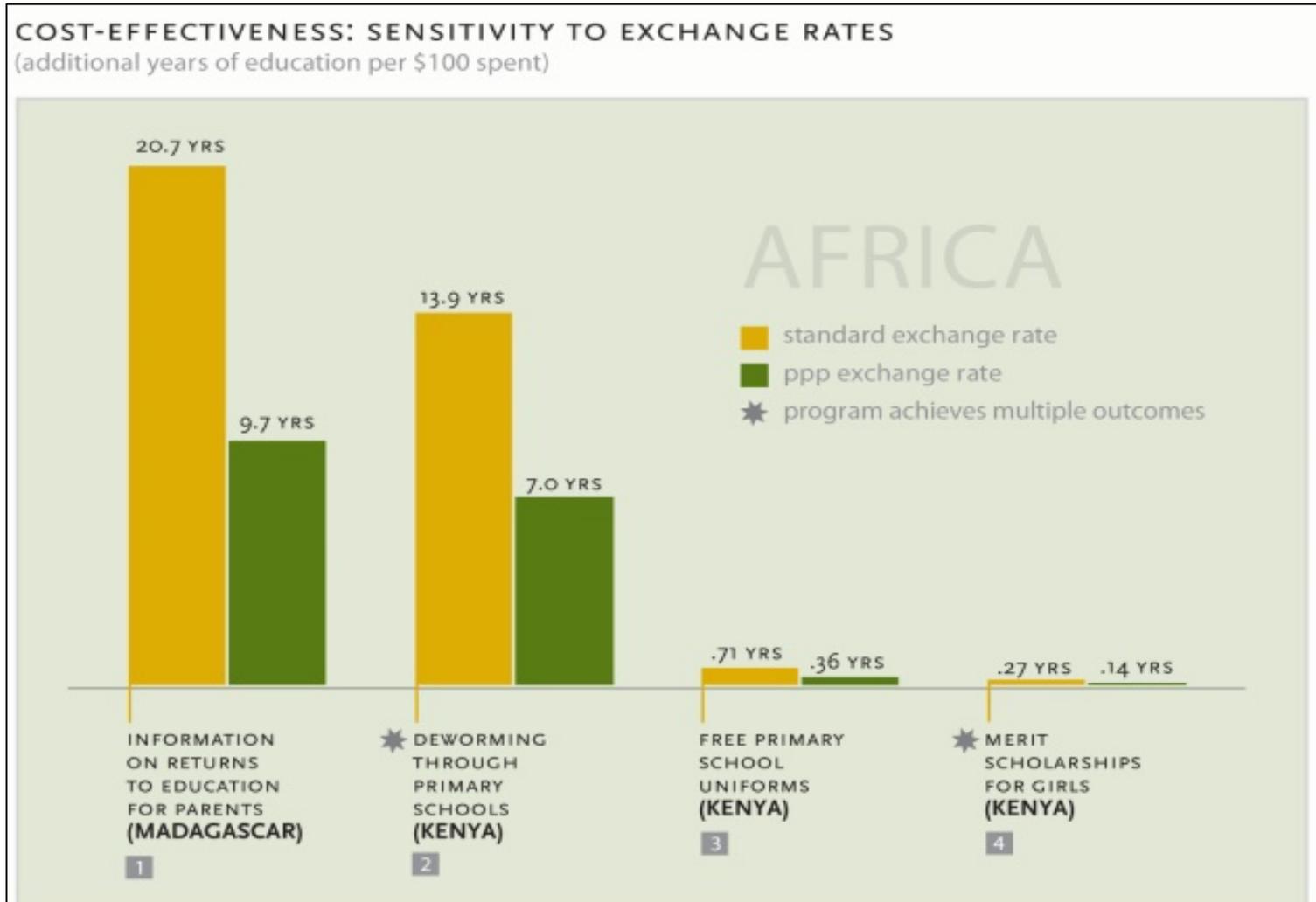
Questions?

Cost Sensitivities: Getting to a Transparent and Usable Analytical Model

- Discount rates
- Price fluctuations (or price differences across locations)
- Pilot and startup bias?
- Changing costs over time
- Does the “margin” change when the program is scaled
- Currency
 - PPP exchange rates vs. nominal exchange rates

Is the model detailed enough?!

Sensitivity Analysis Example



Source: Dhaliwal, JPAL Presentation

References

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Questions



THE WORLD BANK



Strategic Impact
Evaluation Fund

www.worldbank.org/sief