

# OPHI

OXFORD POVERTY & HUMAN DEVELOPMENT INITIATIVE

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UNIVERSITY OF  
OXFORD

# Summer School on Multidimensional Poverty Analysis

1–14 August 2016

Beijing, China

*Tabita, Kenya*



*Rabiya, India*



*Stephanie, Madagascar*



*Agatha, Madagascar*



*Dalma, Kenya*



*Ann-Saphia, Kenya*



*Valérie, Madagascar*



## Impact Evaluation using a Multidimensional Framework

Ana Vaz

OPHI

*Tabita, Kenya*



*Rabiya, India*



*Stephanie, Madagascar*



*Agatha, Madagascar*



*Dalma, Kenya*



*Ann-Saphia, Kenya*



*Valérie, Madagascar*



# Motivation

- Target 1.2 of SDG's:
  - “By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.”
- More and more poverty reduction programs are adopting multidimensional approaches. Examples:
  - Conditional Cash Transfers
  - Millennium Villages Project

# Motivation

- Impact/program evaluation became fundamental.
  - It generates evidence of what works;
  - It is a mechanism of accountability at the end of a project.
- So, what about using a multidimensional framework to assess the impact of multi-sectoral poverty reduction programs?

# Motivation

- Robano & Smith, 2014
  - BRAC's Targeting the Ultra-poor Program.
  - Difference-in-difference of multidimensional poverty measures as impact indicator.
- Loschmann, Parsons & Siegel, 2015
  - UNHCR post-return shelter assistance program in Afghanistan during 2009–11.
  - Multidimensional measure based on 3 dimensions: economic welfare, health and education, and basic services
  - Use propensity score matching techniques given the nonrandomness of the treatment group.

# Purpose

- Show how the Alkire Foster (AF) methodology can be used in impact evaluation
- Empirical application using the case of *Oportunidades* in rural areas

# Why use the AF methodology?

- More direct measure of the overall program's performance
- It allows us to monitor the impact of programs on the:
  - Incidence of deprivations, and
  - The joint distribution of deprivations.
- Communication of results: we can summarize impact at different levels into one number

# How to use the AF methodology?

- Suppose:
  - A poverty reduction program with  $D$  objectives;
  - Each objective can be defined in terms of minimum achievement thresholds,  $\mathbf{z}$ , for each target unit (person, household, community, etc.);
  - $w_d$  is the weight/importance of objective  $d$ ;
  - The overall goal of the program can be defined as reducing the weighted sum of the targets' missed objectives below a certain cutoff,  $k$ .
  - We have information for the beneficiaries of the program as well as for a comparable control group.



# How to use the AF methodology?

- In these circumstances, we can ‘translate’ the program’s overall goal into a M0 measure.
  - $D$  objectives  $\Rightarrow D$  or plus indicators
  - $z$  minimum achievement thresholds  $\Rightarrow z$  deprivation cut-offs
  - $k$  is the program cut-off

# How to use the AF methodology?

- Use  $M_0/H$  as the outcome of interest in the evaluation of the program's impact:
  - Compute the  $M_0/H$  for the treated and control groups;
  - Test whether the difference between the  $M_0/H$  of the two groups is statistically significant.
- Compare the distribution of the deprivation score across treatment and control groups.
- Test impact on the raw and censored headcounts.

# How to use the AF methodology?

- When we have data for multiple points in time, we can do additional analyses:
  - Assess groups' baseline comparability;
  - Impact on probabilities of transition;
  - Decompose change in  $M_0$  over time:
    - Between movements in-out of poverty and intensity of ongoing poor;
    - Across different population groups / geographical areas.

# Example

Matrices of achievements of treated individuals

	Baseline					Post-treatment				
	Income	Edu	BMI	Sanitation	Water	Income	Edu	BMI	Sanitation	Water
1	85	4	16	0	0	85	5	18	1	1
2	90	6	16	0	0	90	8	18	1	1
3	75	6	17	1	1	75	6	17	1	1
4	50	4	17	1	1	50	4	17	1	1
5	100	4	17	1	1	110	4	17	1	1
6	100	6	17	1	1	110	6	17	1	1
7	100	7	21	1	1	110	7	21	1	1
8	100	8	20.5	1	1	120	8	20.5	1	1
z	100	8	18.5	1	1	100	8	18.5	1	1

Program's average impact in each indicator

Average achievement at baseline	87.50	5.63	17.69	0.75	0.75
Average achievement at post-treatment	93.75	6.00	18.19	1.00	1.00
Program's average impact	6.25	0.38	0.50	0.25	0.25

# Example

## Deprivation matrices

	Baseline						Post-treatment					
	Income	Edu	BMI	Sanit	Water	No. depriv	Income	Edu	BMI	Sanit	Water	No. depriv
1	1	1	1	1	1	5	1	1	1	0	0	3
2	1	1	1	1	1	5	1	0	1	0	0	2
3	1	1	1	0	0	3	1	1	1	0	0	3
4	1	1	1	0	0	3	1	1	1	0	0	3
5	0	1	1	0	0	2	0	1	1	0	0	2
6	0	1	1	0	0	2	0	1	1	0	0	2
7	0	1	0	0	0	1	0	1	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0

### Program's average impact on raw headcounts

Raw headcount at baseline	0.50	0.88	0.75	0.25	0.25	2.63
Raw headcount at post-treatment	0.50	0.75	0.75	0.00	0.00	2.00
Program's average impact	0.00	-0.13	0.00	-0.25	-0.25	-0.63

# Example

Overall goal: no one misses... goals or more					
	k = 1	k = 2	k = 3	k = 4	k = 5
<b>Levels</b>					
Baseline					
Incidence	0.88	0.75	0.50	0.25	0.25
Intensity	0.60	0.67	0.80	1.00	1.00
Adjusted headcount	0.53	0.50	0.40	0.25	0.25
Post-treatment					
Incidence	0.88	0.75	0.38	0.00	0.00
Intensity	0.46	0.50	0.60	0.00	0.00
Adjusted headcount	0.40	0.38	0.23	0.00	0.00
<b>Program's impact</b>					
Incidence (change)	0.00	0.00	-0.13	-0.25	-0.25
Intensity (change)	-0.14	-0.17	-0.20	-1.00	-1.00
Adjusted headcount (change)	<b>-0.13</b>	<b>-0.13</b>	<b>-0.18</b>	<b>-0.25</b>	<b>-0.25</b>

# Empirical application

- Why *Oportunidades*?
  - Pioneer in Conditional Cash Transfer Programs.
  - Multi-sector program:
    - Education,
    - Health,
    - Nutrition.
  - Experimental design:
    - Randomization of localities into control and treatment groups;
    - Data collected before and after the start of the treatment.

# Empirical application

- Impact of *Oportunidades* in single indicators documented:
  - Positive impact on enrolment (Schultz, 2000)
  - No impact on school attendance (Schultz, 2000)
  - Significant reduction in school grade gaps (Behram, Sengupta & Todd, 2000, 2005)
  - Positive impact on the number of grades completed (Behram, Parker & Todd, 2005)
  - Increase in number of visits to public health centres (Gertler, 2000)
  - Negative impact on probability of illness of children under 5 (Gertler, 2000)
  - Negative impact on children's labor (Parker & Todd, 2000)
  - Increase in food expenditure (Hoddinott & Skoufias, 2004)



# Empirical application

- Select indicators that:
  - Reflect the program's minimum goals;
  - Based on previous evaluation literature;
  - For which we have data for all time periods.
  
- Select weights

# Empirical application

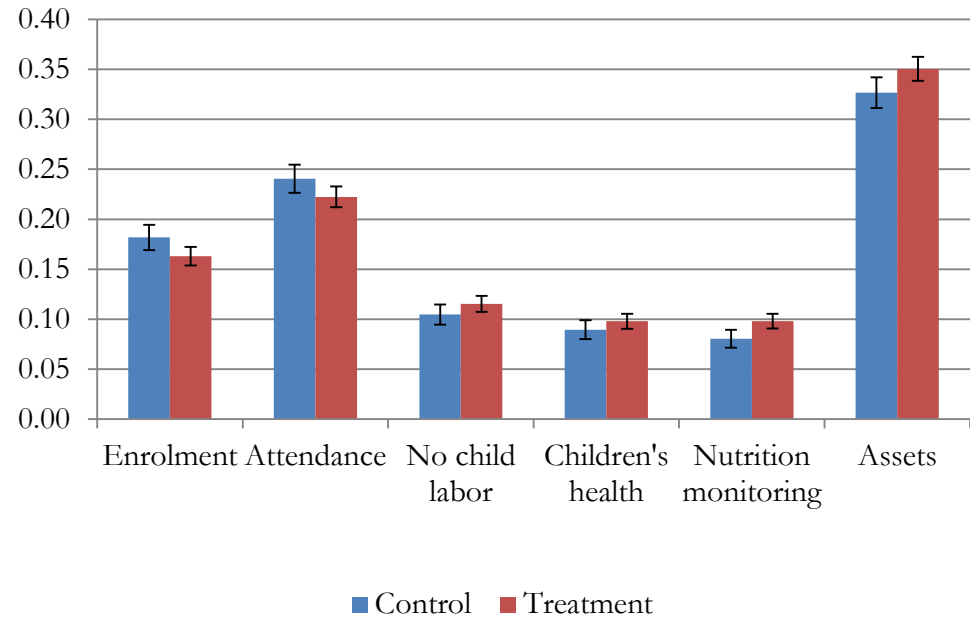
Indicator	Deprived if:	Weight
Enrolment	at least one member aged 6-14 not attending school (secondary school)	0.1
School attendance	at least one member aged 6-14 attended less than 90% of the school days (past month) OR is not enrolled	0.1
No child labor	at least one member aged 8-14 had a job or worked during last week (even if unpaid)	0.2
Children's health	at least one member aged 0-2 was ill in the past 4 weeks for more than 5 days	0.2
Health visits for nutrition monitoring	at least one member aged 0-2 has not made any visit in the past 6 months <sup>(1)</sup>	0.2
Assets	at least one of the following assets: refrigerator, television or radio	0.2

- **Problem:** Most indicators are defined with reference to children, the poverty status of the household is highly dependent on its the demographic structure.

# Differences at baseline?

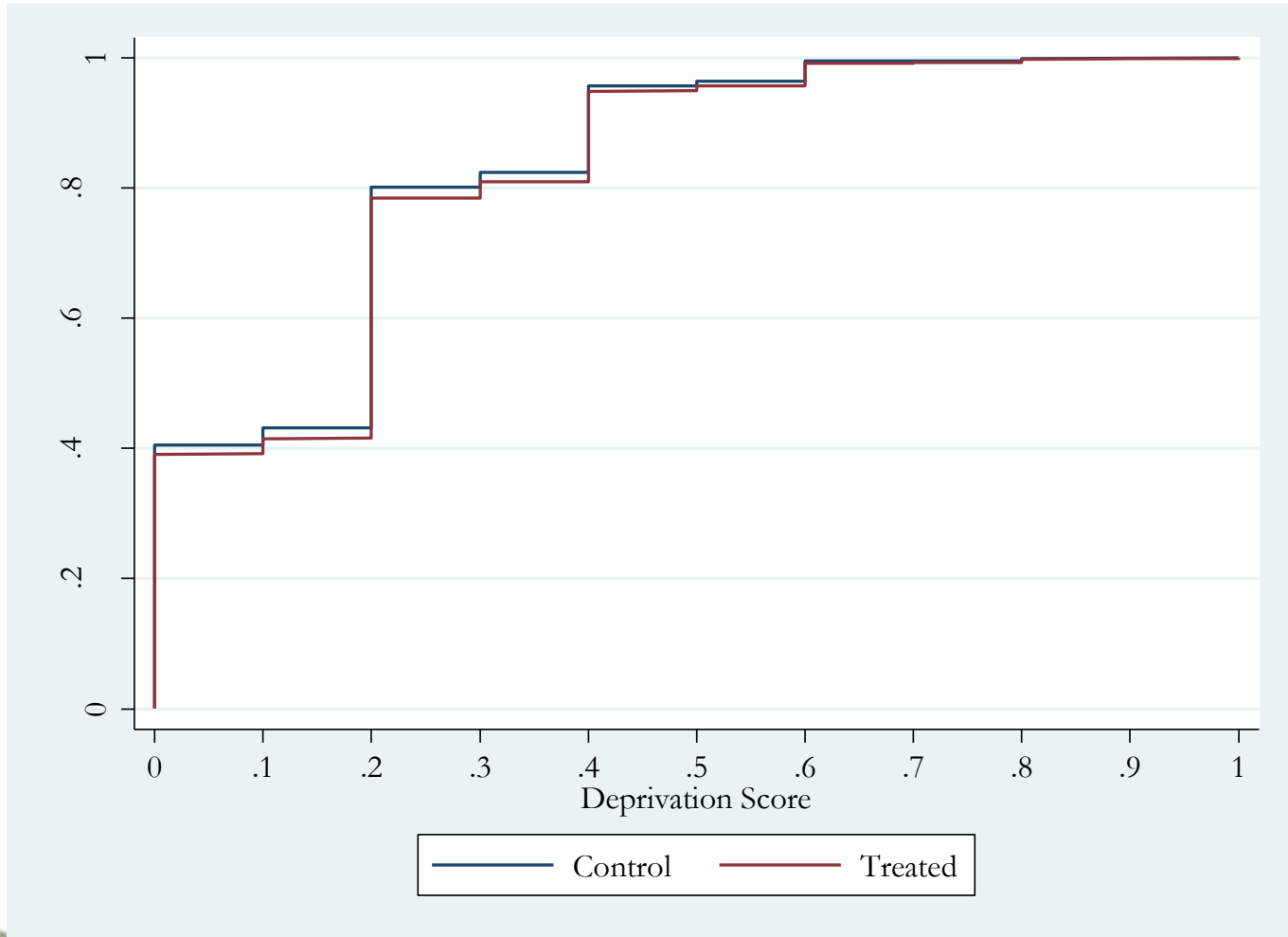
## Raw Headcount Ratios

	<b>Control</b>	<b>Treatment</b>
Enrolment	0.182	-0.019 (0.014)
Attendance	0.241	-0.018 (0.016)
No child labor	0.105	0.011 (0.012)
Children's health	0.090	0.008 (0.009)
Nutrition monitoring	0.080	0.018 (0.012)
Assets	0.327	0.024 (0.024)



# Differences at baseline?

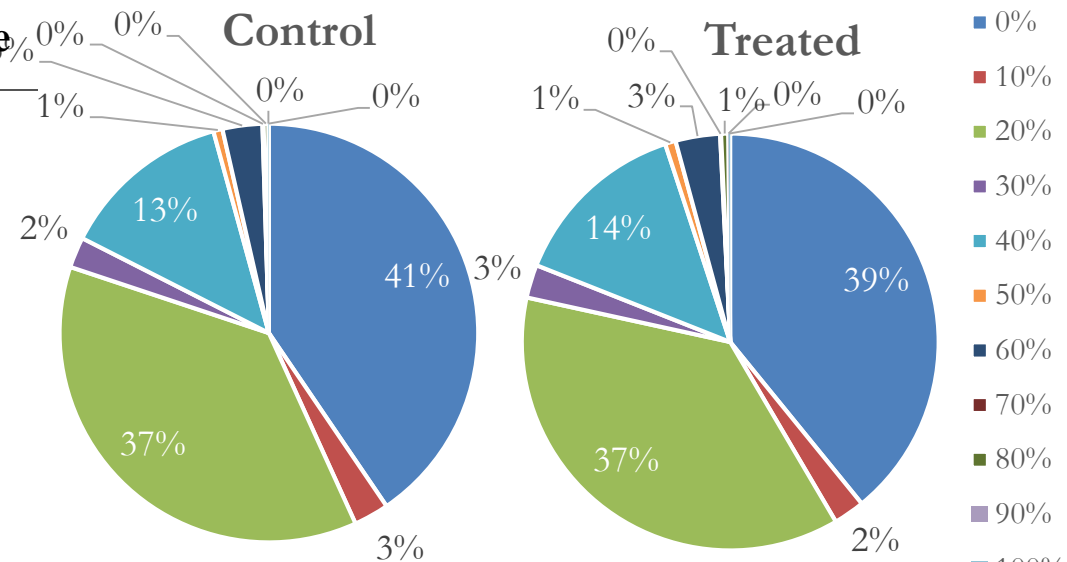
## Weighted Deprivation Score



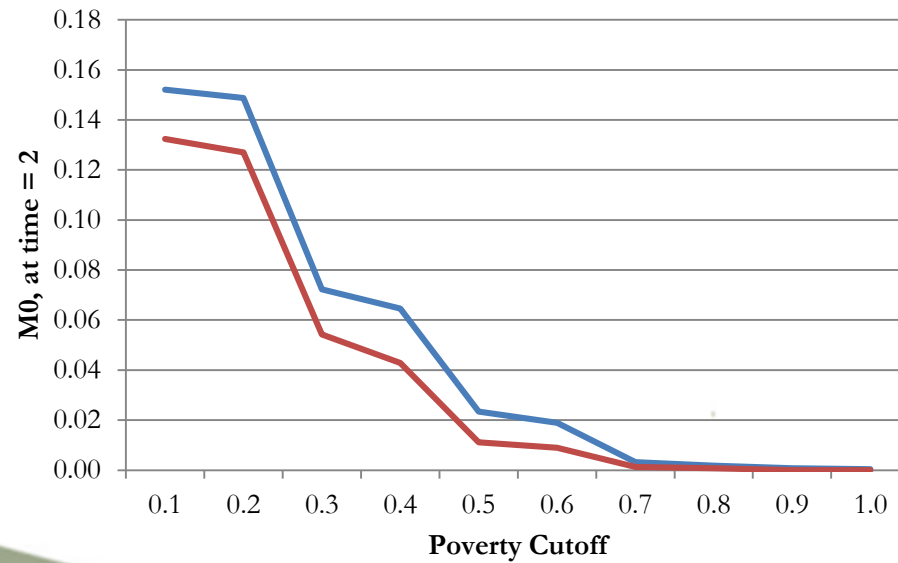
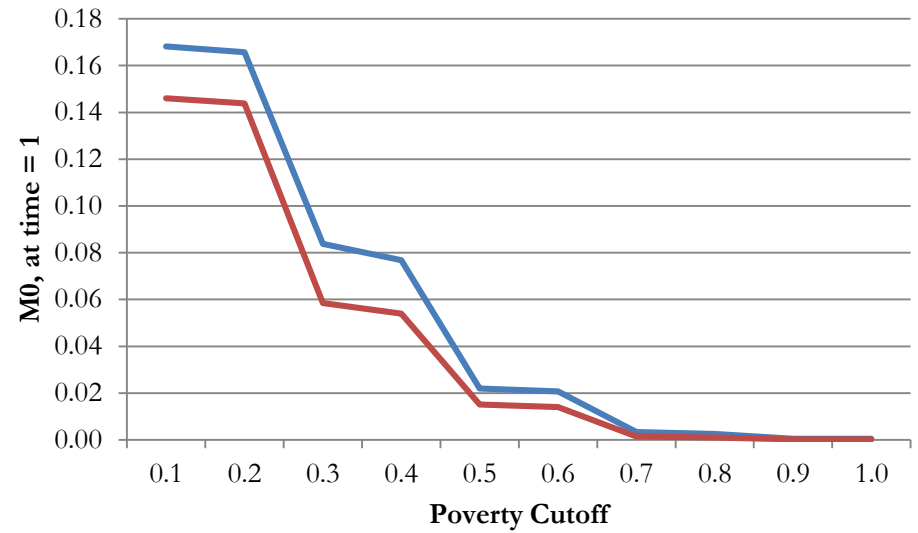
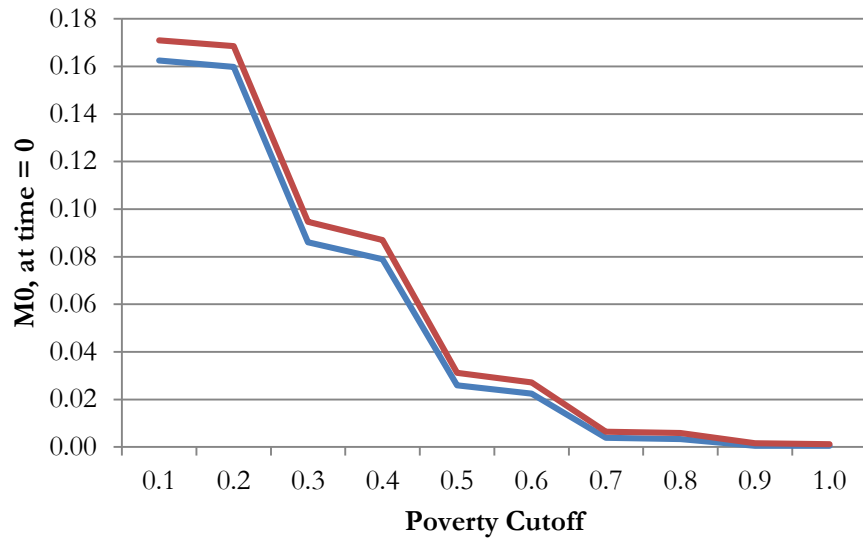
# Differences at baseline?

## Weighted Deprivation Score

Deprivation share	% of People		Test P-value
	Control	Treatment	
0%	40.5%	39.1%	0.506
10%	2.7%	2.4%	0.504
20%	36.9%	36.9%	0.991
30%	2.4%	2.6%	0.662
40%	13.2%	13.9%	0.519
50%	0.7%	0.8%	0.627
60%	3.1%	3.5%	0.495
70%	0.1%	0.1%	0.820
80%	0.4%	0.5%	0.303
90%	0.0%	0.0%	0.318
100%	0.0%	0.1%	0.337



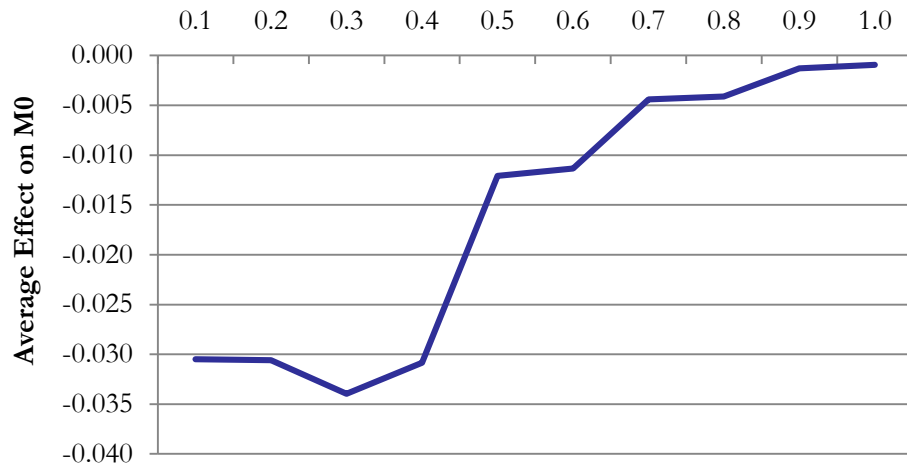
# Impact on Aggregated Measures



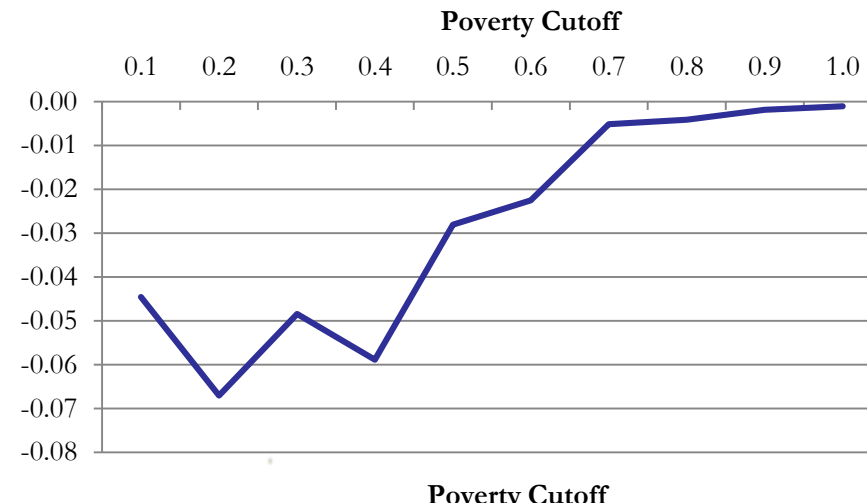
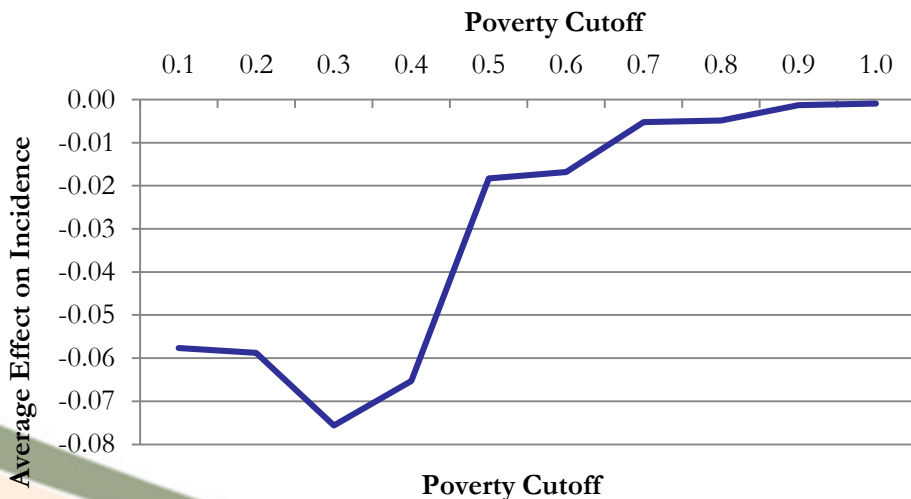
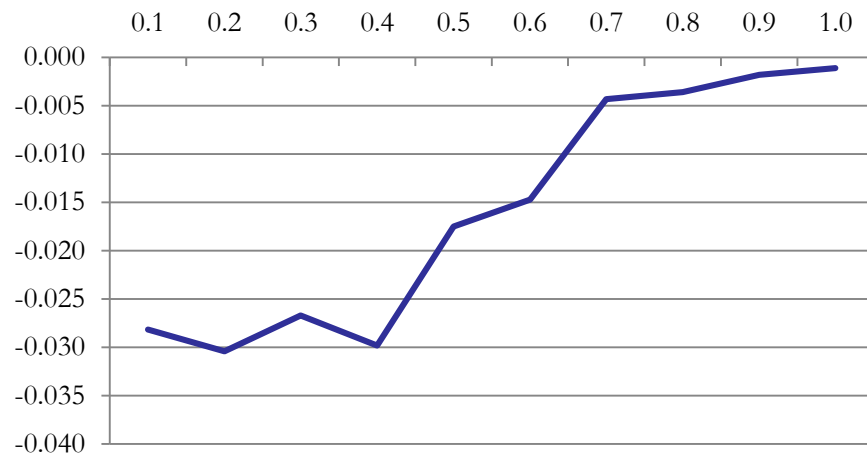
— Control — Treated

# Impact on Aggregated Measures

After 1 period:



After 2 period:



Poverty Cutoff  
— Dif-in-Dif

Poverty Cutoff  
— Dif-in-Dif

# Impact on Raw and Censored Headcounts

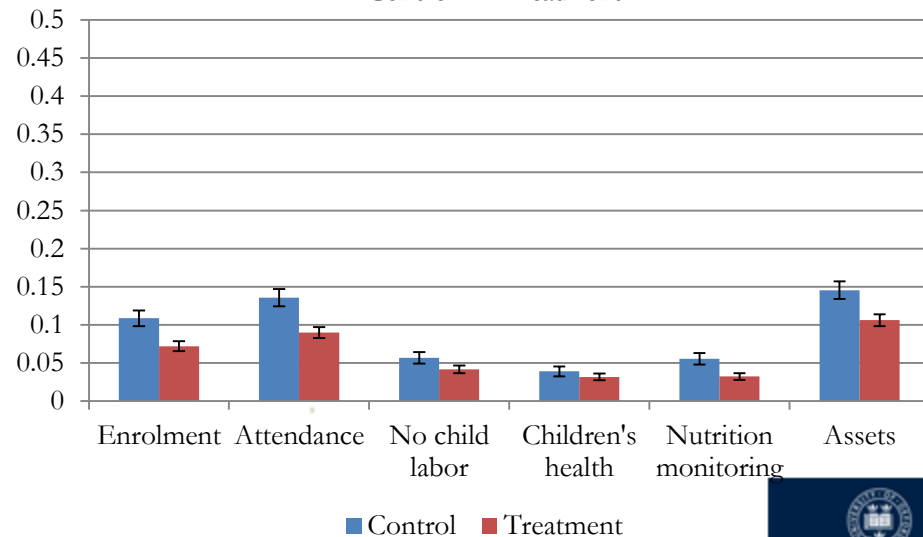
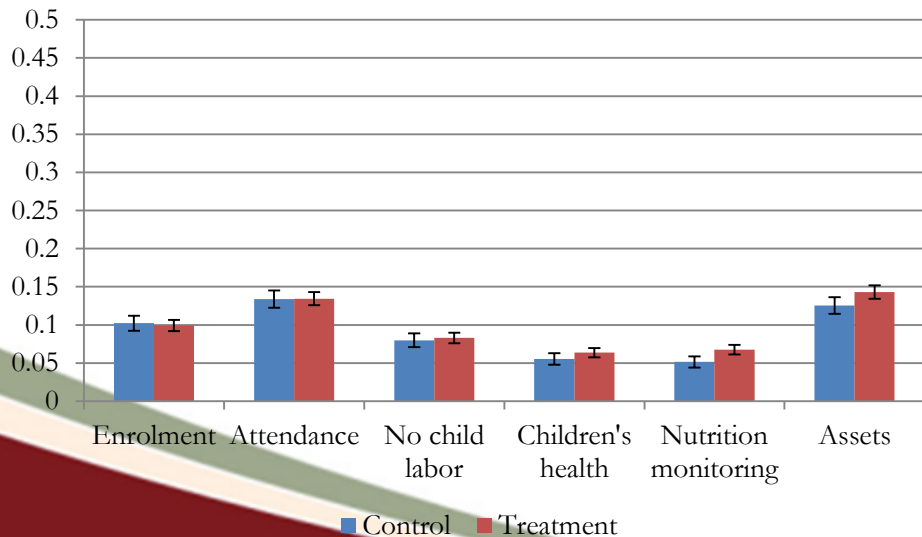
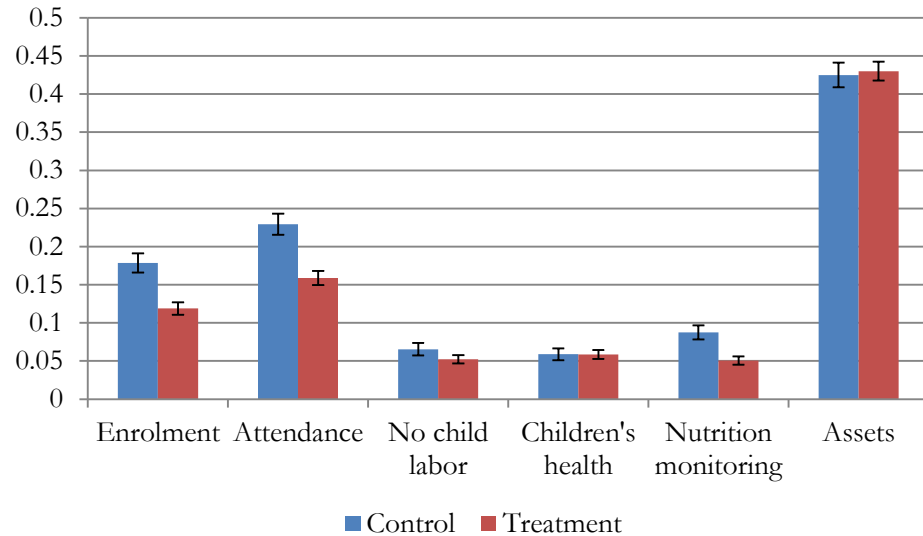
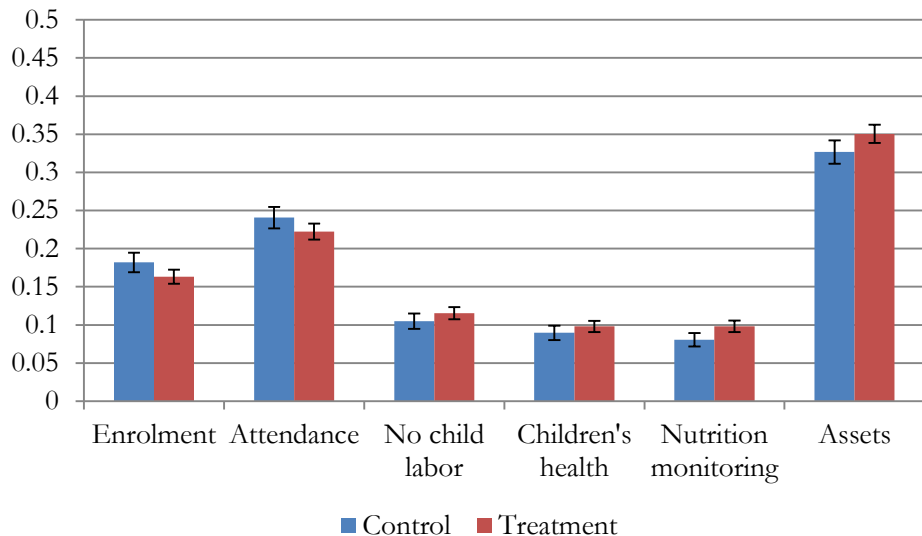
Time	Indicator	% Pop. Deprived in...			% Pop Poor & Deprived in...		
		Control	Treatment	Dif-in-Dif	Control	Treatment	Dif-in-Dif
0	Enrolment	18.2%	16.3%		10.2%	9.9%	
0	Attendance	24.1%	22.2%		13.4%	13.4%	
0	No child labor	10.5%	11.5%		8.0%	8.3%	
0	Children's health	9.0%	9.8%		5.5%	6.4%	
0	Nutrition monitoring	8.0%	9.8%		5.1%	6.8%	
0	Assets	32.7%	35.0%		12.6%	14.3%	
1	Enrolment	17.9%	11.9%	-0.041***	10.9%	7.2%	-0.034***
1	Attendance	23.0%	15.9%	-0.052***	13.6%	9.0%	-0.046***
1	No child labor	6.5%	5.2%	-0.024**	5.7%	4.2%	-0.018*
1	Children's health	5.9%	5.9%	-0.009	3.9%	3.2%	-0.016*
1	Nutrition monitoring	8.8%	5.1%	-0.054***	5.6%	3.2%	-0.039***
1	Assets	42.5%	43.0%	-0.019	14.5%	10.6%	-0.057***
2	Enrolment	17.7%	12.2%	-0.037***	9.6%	6.7%	-0.026***
2	Attendance	24.7%	21.8%	-0.011	13.3%	11.0%	-0.023
2	No child labor	6.3%	5.3%	-0.021*	5.6%	3.9%	-0.020*
2	Children's health	5.6%	4.4%	-0.020*	3.4%	2.5%	-0.017**
2	Nutrition monitoring	5.5%	2.3%	-0.049***	3.7%	1.5%	-0.038***
2	Assets	37.5%	37.2%	-0.026	12.0%	10.3%	-0.034***



# Impact on Raw and Censored Headcounts

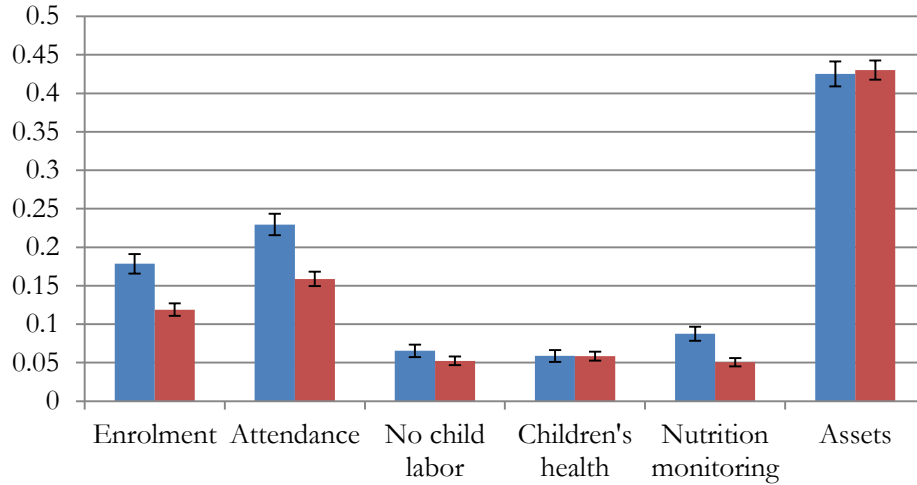
Baseline

After 1 period

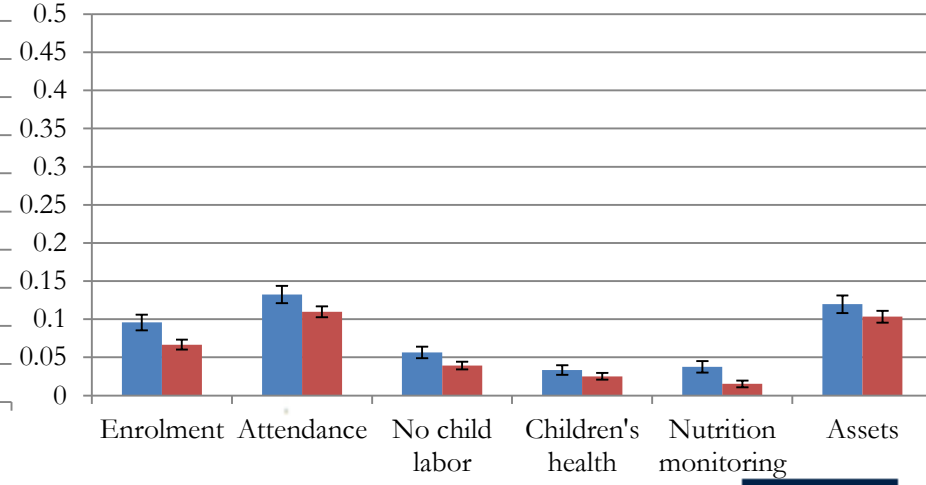
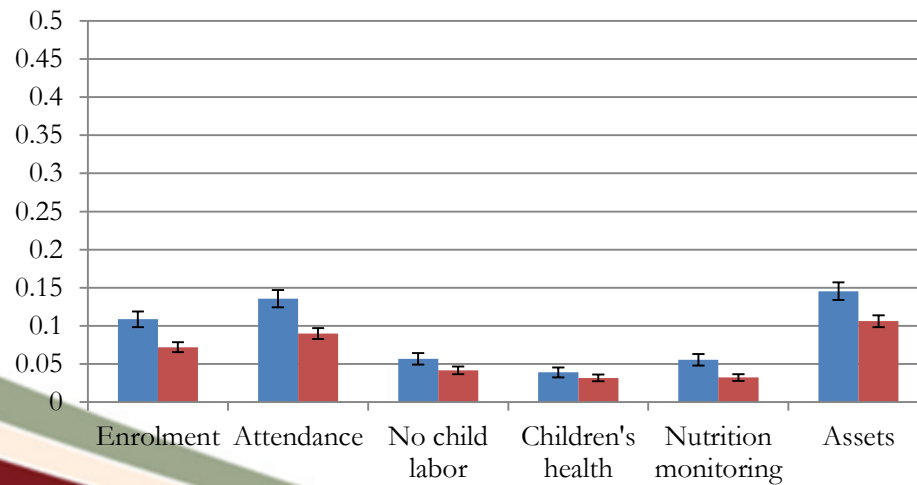
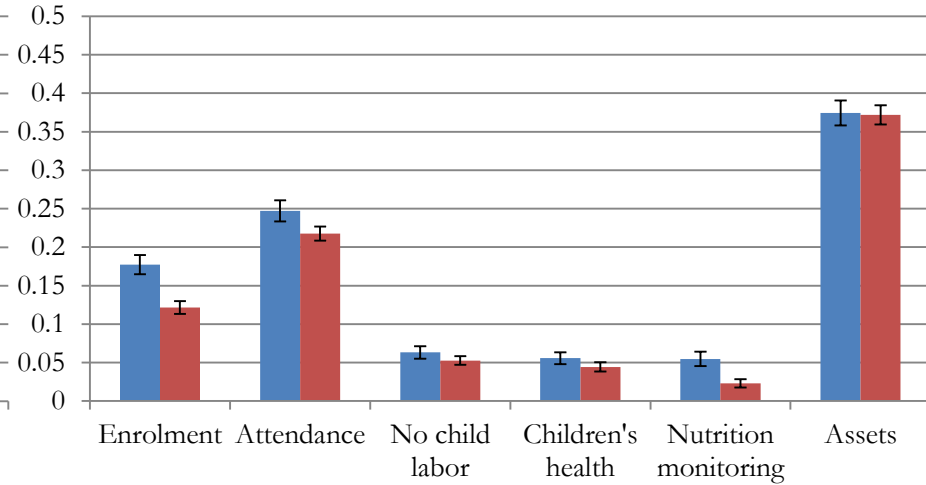


# Impact on Raw and Censored Headcounts

After 1 period



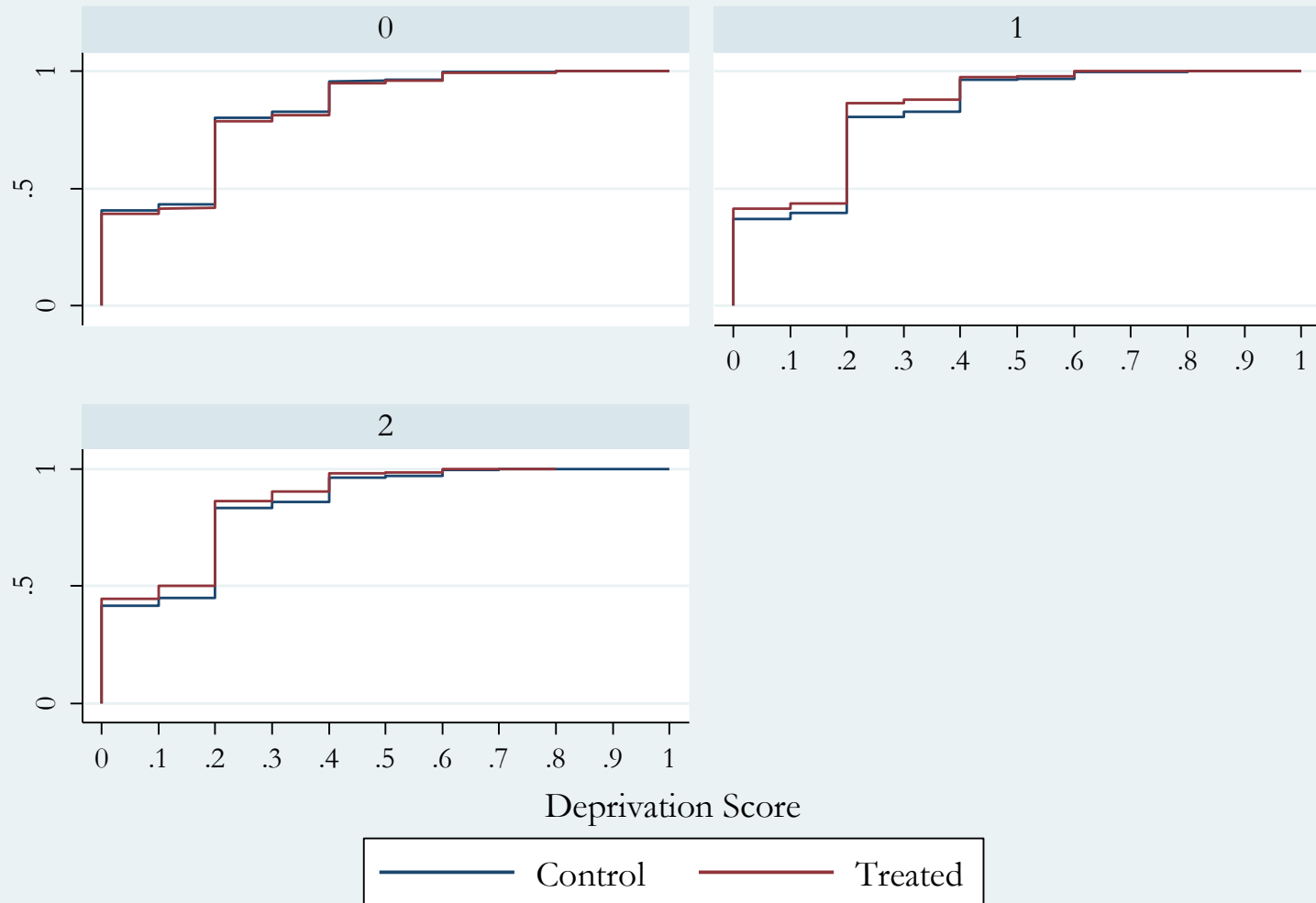
After 2 periods



■ Control ■ Treatment

■ Control ■ Treatment

# Impact – Deprivation Score



Graphs by time

# Impact –Deprivation Score

$$C_{i,t} = \alpha + \beta_1 T_i + \beta_2 P1_i + \beta_3 P2_i + \beta_4 T_i P1_i + \beta_5 T_i P2_i + \varepsilon_i$$

	Deprivations count
Treatment	0.008 (0.008)
Period 1	0.006 (0.005)
Period 2	-0.010** (0.005)
Treatment x Period 1	<b>-0.030***</b> (0.006)
Treatment x Period 2	<b>-0.028***</b> (0.007)
Constant	0.163*** (0.006)
Observations	28,932
F-statistic	24.39***
R-Squared	0.0081

# Impact – Other analysis

- Estimate the DID including baseline controls
- Decomposition of program's impact by sub-groups:
  - Gender of household head
  - ...
- Ranking regions by program's performance

# References

Robano, V. and Smith, S. C. (2014). “Multidimensional targeting and evaluation: A General Framework with an Application to a Poverty Program in Bangladesh”. *OPHI Working Paper* 65.

Loschmann C., C. R. Parsons and M. Siegel (2015). “Does Shelter Assistance Reduce Poverty in Afghanistan?” *World Development*, 74, 305-322.

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*Thank you!*