Ninth Campbell Collaboration Colloquium

Impact Evaluation of Interventions on Child Health in Nepal

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Diarrhea Prevalence in Nepal

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Table: **2001 Child Diarrhea Prevalence**

Response	Number	(%)
None	5,086	79
Yes	1,285	***20***
Total	6,415	100

Source: DHS 2001

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Table: **2006 Child Diarrhea Prevalence**

Respone	Number	(%)
None	4,757	87
Yes	659	***12***
Total	5,457	100

Source: DHS 2006

Access to Drinking Water

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Table: **2001 Water Source**

Source	Number	(%)
Piped Water	485	7
Public tap	1,825	26
Pvt. Well	135	2
Public Well	133	2
Tubewell	1,288	19
Public tubewell	1,177	17
Sprong/kuwa	1,267	18
River/lake/pond	166	2
Stone tap/dhara	58	1
Not resident	393	6
Total	6,929	100

Source: DHS 2001

2

Table: **2006 Water Source**

Source	Number	(%)
Piped Water	513	9
Public tap	1,361	24
Pvt. well	25	0
Public well	140	2
Tubewell	2,044	35
Protected spring	144	2
Unprotected spring	640	11
River/dam/pond	376	7
Stone tap/dhara	205	4
Not dejure resident	318	5
Total	5,783	100

Source: DHS 2006

Access to Sanitation

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Table: **2001 Toilet Facility**

Type	Number	(%)
Flush Toilet	511	**7**
Trad. Pit Toilet	971	14
Vent. Pit latrine	116	2
No facility	4,940	71
Not resident	393	6
Total	6,931	100

Source: DHS 2001

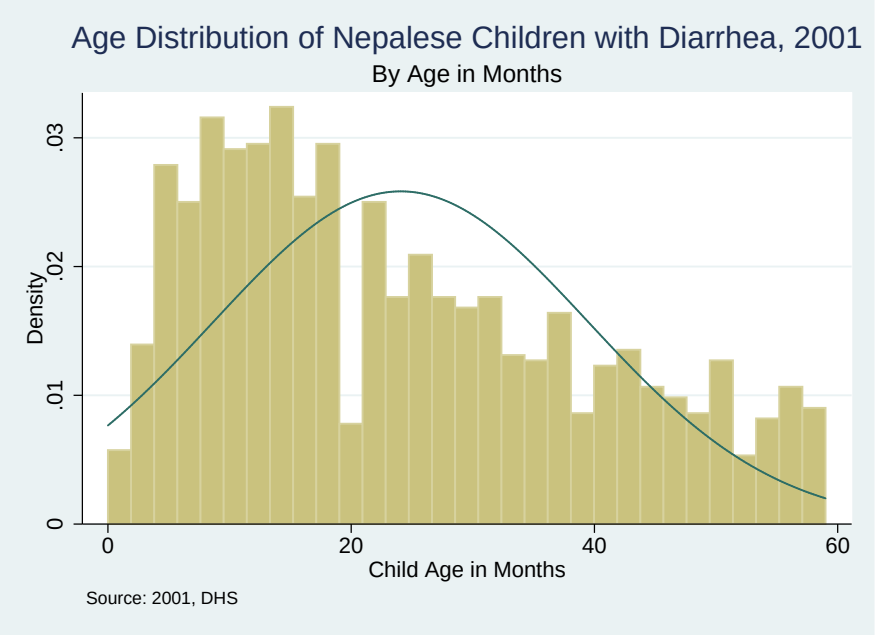
2

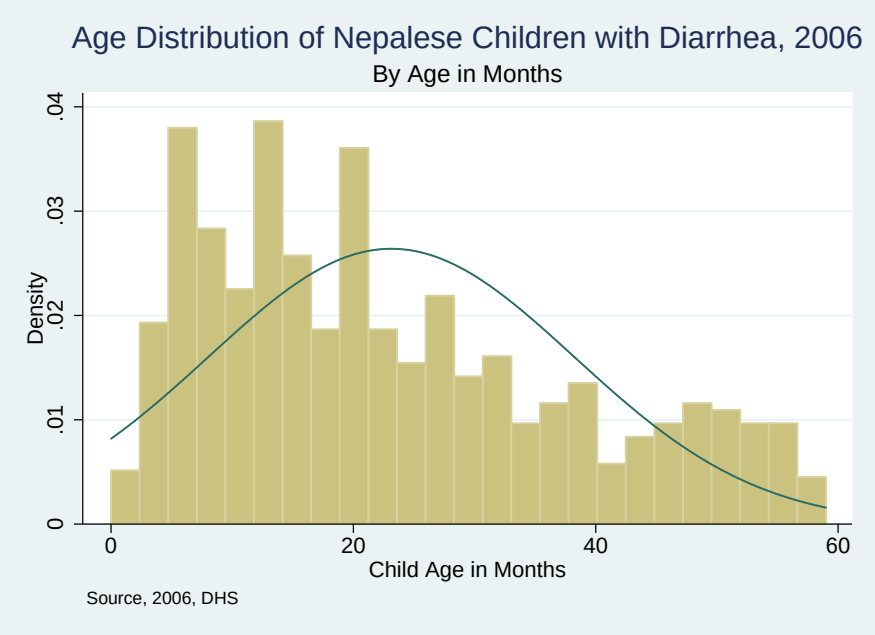
Table: **2006 Toilet Facility**

Type	Number	(%)
Flush Toilet	1192	**21**
Trad Pit Toilet	909	15
Vent. Pit Latrine	48	1
No facility	3,250	56
Not dejure resident	318	5
Total	5,782	100

Source: DHS 2006

Diarrhea Prevalence By Child Age in Months





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Mean = 24.1 Months
Median = 21 Months

2

Mean = 23.13 Months
Median = 19 Months

Diarrhea Prevalence: Access to "Improved Sanitation"

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	Diarrhea	
	1	**0**
Imp. Toilet		
1	111	1131
0	548	3993

Source: DHS 2006

2

Odds Ratio

$$\frac{\frac{P_1}{1-P_1}}{\frac{P_0}{1-P_0}} = 1.46$$

Naive Comparison: Access to "Improved Sanitation"

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Table: **Naive Comparison: Household Characteristics**

Variable	**Treatment**	**(Untreated)**
Pipewtr. in house?	23.2%	5%
Rural	52%	84%
Head Hd has sec. or more ed.	56%	30%
House Floor= Cement	29%	3%
Richest Quintile	54%	4%

Source: DHS 2006

Rubin Neyman Causal Model

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Fundamental problem with program evaluation is that it is physically impossible to observe counterfactual

2

Rubin (1974) gave us the model of identification of causal effects, which relies on the notion of a **synthetic counterfactual** for each observation. The model is based on work by Neyman (1923,1935) and Fisher (1918,1925); see also Tukey (1954), Wold (1956), Cochran (1965), Pearl (2000), and Rosenbaum (2002).

Matching

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Basic idea of **Matching** is to compare outcome of treated and untreated individuals with similar $x's$ and then aggregating across $x's$ to get population average treatment effect.
Advantage to regression approach is that it does not assume $x's$ linearly effect outcomes.

2

Estimate the **Propensity Score** from the data, and then use that estimate to weight treatment effects for each propensity score accordingly to arrive at average treatment effect.

Comparision of Groups: After Matching

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Table: **After Matching: Balanced Household Characteristics**

Variable	**Treatment**	**(Untreated)**
Pipewtr. in house?	23.2%	15%
Rural	53%	58%
Head Hd has sec. or more ed.	45%	41%
House Floor= Cement	30%	33%
Richest Quintile	52%	52%

Source: DHS 2006

Impact Evaluation: Kernel Matching Results

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Table: 2006 Results for Intervention on Diarrhea

Variable	Treatment	(Control)	Δ	S.E.
Unmatched	0.091	0.122	0.032	(0.01)**
Matched	0.084	0.143	-0.052	(0.02)**

Note: "Treatment"= *Improved Sanitation*

2

Odds Ratio

$$\frac{\frac{P_1}{1-P_1}}{\frac{P_0}{1-P_0}} = 1.66$$

Impact Evaluation: Kernel Matching Results

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Table: 2006 Results for Intervention on Diarrhea for **Boys**

Variable	**Treatment**	**(Control)**	**Δ**	**S.E.**
Unmatched	0.091	0.132	-0.04	$(0.01)^{**}$
Matched	0.086	0.151	-0.06	$(0.035)^{\dagger}$
			(OR=0.56)	

Note: "Treatment"= *Improved Sanitation*

2

Table: 2006 Results for Intervention on Diarrhea for **Girls**

Variable	**Treatment**	**(Control)**	**Δ**	**S.E.**
Unmatched	0.089	0.111	-0.02	(0.01)
Matched	0.082	0.142	-0.052	$(0.03)^{\dagger}$
			(OR=0.58)	

Note: "Treatment"= *Improved Sanitation*

Diarrhea Incidence Among Very Young Children

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Table: **2001 Child Diarrhea Prevalence Among ≤ 24 Months**

Response	Number	(%)
None	1,911	72.25
Yes	733	***27.7***
Total	2,645	100

Source: DHS 2001

2

Table: **2006 Child Diarrhea Prevalence Among ≤ 24 Months**

Respone	Number	(%)
None	1,744	81.27
Yes	402	***18.7***
Total	2,146	100

Source: DHS 2006

Diarrhea Incidence Among Very Young Children

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Table: 2006 Results for Intervention for **Children** $\leq$ 24 **Months**

Variable	**Treatment**	**(Control)**	Δ	**S.E.**
Unmatched	0.151	0.203	-0.052	$(0.02)^{**}$
Matched	0.147	0.261	-0.11	$(0.05)^{**}$

Note: "Treatment"= *Improved Sanitation*

2

Odds Ratio

$$\frac{\frac{P_1}{1-P_1}}{\frac{P_0}{1-P_0}} = 1.75$$

Post-Estimation: Propensity Score Distribution

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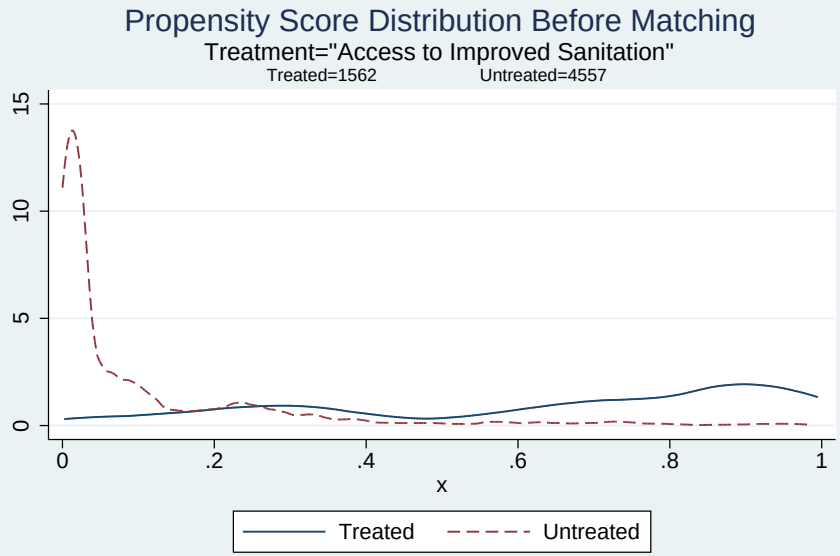

Source:2006, Nepal DHS

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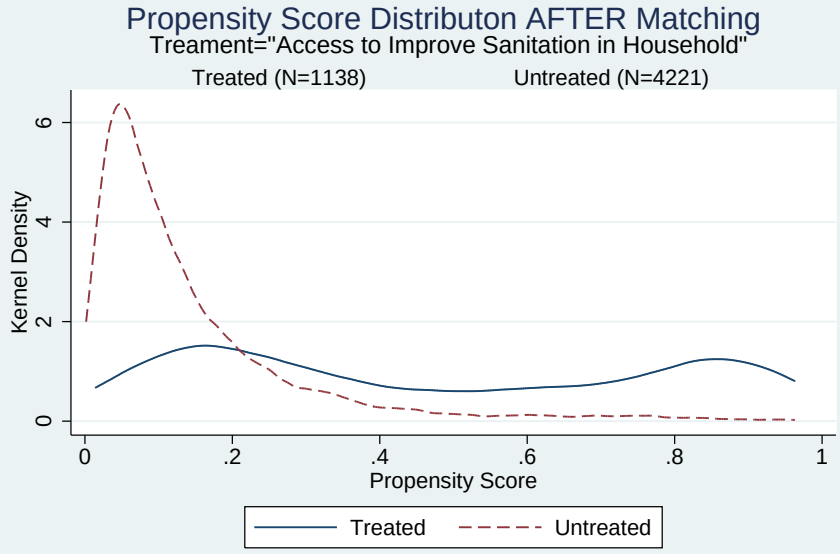

Source:2006, Nepal DHS

Assessing Match Quality

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Table: Summary Statistics

Variable	Pseudo-R^2	(LR χ^2)
Unmatched	0.47	2703.05
Matched	0.041	154.24

Source: DHS 2006

2

Table: Abs(Standardized Bias)

Variable	Mean	(Median)
Before Matching	28%	16%
After Matching	6.7%	2.6%

Source: DHS 2006

Hidden Bias: Sensitivity Analysis

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Table: Mantel-Haenszel bounds for *Outcome* = *Diarrhea*

Γ	Q_{MH+}	Q_{MH-}	p_{MH+}	p_{MH-}
$\Gamma = 1$	3.05	3.05	.001	.001
$\Gamma = 1.25$	5.12	1.01	0	.15
$\Gamma = 1.50$	6.85	.53	0	.29
$\Gamma = 1.75$	8.34	1.93	0	.02
$\Gamma = 2.0$	9.66	3.16	0	0

Note: $\Gamma = 1 \approx$ No "*Hidden*" Heterogeneity

Note: Q_{mh+} : Mantel-Haenszel statistic

Note: Q_{mh-} : Mantel-Haenszel statistic

Note: p_{mh+} : significance level

Note: p_{mh-} : significance level