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Executive Summary: "Differential Access to Improved Sanitation in Nigeria"

An estimated 2.5 billion people worldwide are unable to safely dispose of human waste. Children are especially likely to come into contact with fecal matter and are particularly vulnerable to illness. For those who survive to adulthood, childhood illness has been linked to lower levels of human capital and lower earnings. In Nigeria, I find that incidence of diarrhea rises sharply in a child's first year of life, peaking at 17 months of age, with 18 percent of children experiencing it in a two-week period, and declining by 5 years of age to around 5 percent of children. Furthermore, over 30 percent of households engage in open defecation, even a full 8 percent of the wealthiest quintile.

I investigate whether reported access to sanitation is associated with a change in reported incidence of child diarrhea using 2007 data from the UNICEF Multiple Indicator Cluster Survey in Nigeria, testing three classification systems for sanitation. No rigorous sanitation experiment has released findings to date, and I am careful to avoid shortcomings in other cross-sectional sanitation analyses. Logit specifications reproduce effects found in previous meta-analyses from improved sanitation in general and flush toilets in particular, but conditional logit specifications that account for cluster sampling with enumeration area fixed effects find no such benefits (Table 1). With coefficients on sanitation an order of magnitude lower, the conditional logit findings suggest that much of the existing literature is plagued by omitted variable bias from factors related to incidence of illness that do not vary within enumeration areas, such as proximity to a clinic or local sewage treatment. Given attenuation from mismeasured self-reports and higher standard errors from fixed effects' exclusion of areas with no diarrhea, my coefficients may be lower bounds on the true effect.

My findings are also relevant to the debate about whether development policy should encourage construction of arguably more sanitary private toilets or more cost-effective public toilets. A gender differential is uncovered in which boys experience a lower probability of diarrhea when shared sanitation rather than private facilities are available to them, while girls do not. Additional data is needed to determine the source of this differential, which withstands fixed effects. I recommend further investigation into the robustness of MICS data from other countries to cluster fixed effects and alternate methods to reduce omitted variable bias.

Table 1: Logit and Conditional Logit Regressions of Diarrhea on Sanitation

	Dependent variable: Child experienced diarrhea in the past two weeks											
	logit	logit	clogit	clogit	logit	logit	clogit	clogit	logit	logit	clogit	clogit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1 Imp. San.	-0.245***	-0.246***	-0.00199	-0.00325								
1 Imp. Water	-0.124	-0.126	-0.0895	-0.0959								
2 Flush San.					-0.360*	-0.359*	-0.0517	-0.0455				
2 Latrine San.					-0.0829	-0.0831	0.0678	0.0689				
2 Pump Water					-0.0851	-0.0836	0.0861	0.082				
2 Pipe Water					-0.0405	-0.0421	0.134	0.123				
3 Imp. San.									-0.229*	-0.229*	0.0647	0.065
3 Unimp. San.									0.0226	0.023	0.0816	0.0835
3 Imp. Water									-0.105	-0.105	0.0557	0.0515
3 Unimp. Water									0.0359	0.0397	0.224	0.228
Female	-0.126**	-0.205**	-0.125*	-0.273**	-0.127**	-0.198**	-0.124*	-0.267**	-0.126**	-0.206**	-0.123*	-0.270**
Shared	-0.0978	-0.199**	-0.109	-0.259**	-0.102	-0.198*	-0.0908	-0.237*	-0.0827	-0.184	-0.0805	-0.231*
Female*Shared		0.216*		0.325**		0.204*		0.318**		0.217*		0.326**
Breastfed	0.341***	0.380***	0.15	0.176	0.344***	0.385***	0.155	0.183	0.343***	0.383***	0.156	0.185
Female*Breastfed		-0.0823		-0.054		-0.0857		-0.0582		-0.0828		-0.0601
Mother Edu	-0.0622	-0.0627	-0.0212	-0.0227	-0.0741	-0.0747	-0.0211	-0.0231	-0.0589	-0.059	-0.0229	-0.0247
Child Age	0.162***	0.162***	0.174***	0.175***	0.162***	0.163***	0.175***	0.176***	0.162***	0.162***	0.174***	0.175***
[Child Age]^2	-0.00583***	-0.00584***	-0.00652***	-0.00657***	-0.00583***	-0.00583***	-0.00656***	-0.00661***	-0.00582***	-0.00583***	-0.00651***	-0.00655***
[Child Age]^3	5.60e-05***	5.61e-05***	6.37e-05***	6.42e-05***	5.59e-05***	5.59e-05***	6.41e-05***	6.46e-05***	5.60e-05***	5.61e-05***	6.35e-05***	6.40e-05***
Observations	15,330	15,330	10,346	10,346	15,330	15,330	10,346	10,346	15,330	15,330	10,346	10,346
Model df	18	20	17	19	20	22	19	21	20	22	19	21
F	10.14	9.158	8.62	7.788	9.45	8.637	7.808	7.128	9.135	8.333	7.726	7.064

*** $p<0.01$, ** $p<0.05$, * $p<0.1$; Suppressed regressors are child vaccination, household size, binary variables for household assets (electricity, radio, TV, refrigerator, bicycle), survey month, urban enumeration area, and a constant.