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YSSP Report
Young Scientists Summer Program

Impacts and Synergies of Environmental Health Services and Housing Infrastructure on Child Health

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Approved by

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Program: Energy, Climate, and Environment (ECE)
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Abstract

Improving child health is central to the international community's mission to achieve a better future for all. Child malnutrition remains a persistent public health issue around the world. In addition to lack of food and limited dietary diversity, researchers have explored how access to different environmental services and household infrastructure impact child health, measured by height-for-age and weight-for-age. Numerous randomized control trials and observational studies have explored a causal relationship between clean cooking, clean lighting, clean water, proper sanitation, non-mud flooring, or handwashing facilities and child height and weight. These studies have had mix results suggesting the relationship between these different environmental services and housing infrastructure components may be more complex. Recent randomized control studies have tested the impact of joint access to a limited number of these services on child height and found conflicting results across different study sites. However, some researchers have hypothesized that only providing access to a limited subset of the environmental services and housing infrastructure would not result in sufficiently clean environments to improve children's nutrition. Therefore, in this report we explore the association between access to a larger suite of environmental services and housing infrastructure and child height-for-age and weight-for-age. This study contributes to a growing body of evidence exploring both the individual and joint impacts of access to environmental services and housing infrastructure on health outcomes. We analyze data from household surveys collected in Uganda as part of the World Bank's Living Standards Measurement Survey – Integrated Surveys on Agriculture (LSMS-ISA) program from seven waves collected between 2009 to 2019. We find that through a set of pooled regressions there are robust statistically significant associations between access to clean cooking, clean lighting, clean water, proper sanitation, non-mud flooring, and handwashing facilities and child height-for-age and weight-for-age. These findings suggest that further research exploring more comprehensive interventions is needed to ensure children live in sufficiently clean environmental to realize improved health outcomes.

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Introduction

In grossly contaminated environments, where childhood exposure to a variety of enteric pathogens occurs through multiple environmental pathways, partial or even absolute elimination of a single pathway may yield no health benefit (Cumming et al. 2019, pg. 3)

The international community has expended considerable efforts to improve child health, particularly malnutrition, by reducing enteric dysfunction. While many nutritional studies have focused on increasing food security and dietary diversity to improve child health, other studies have found that access to basic environmental services and housing infrastructure (ESHI), such as clean cooking, clean lighting, clean water, proper sanitation, non-mud flooring, and hand-washing, can reduce the incidence of enteric disease and have direct impacts on a children's height and weight (Adebowale et al. 2017, Adjiwanou et al. 2017, Amare et al. 2019, Banik et al. 2019, Bekele et al 2020, Benjamin-Chung et al. 2015, Benjamin-Chung et al. 2021, Dey et al. 2021, Duflo et al. 2015, Fink et al. 2011, Gil et al. 2019, Humphrey 2009, Humphrey et al. 2019, Husseini et al. 2018, Jack et al. 2021, Kennedy et al. 2006, Lin et al. 2013, Luby et al. 2018, Mbuya & Humprhey 2016, Miles & Cumming 2016, Momberg et al. 2021, Nshimyiryo et al. 2019, Null et al. 2018, Pickering et al. 2015, Pongou et al. 2006, Ravindra & Smith 2018, Schoeman et al. 2010, Shrestha et al. 2020, Sinharoy et al. 2020, Spears 2013, Takele et al. 2019, and Wolff et al. 2001).

Three recent randomized control trials (RCT) studying the impact of water, sanitation, and hygiene interventions found a lack of significant improvement on child health (Arnold et al. 2018, Coffey & Spears 2018, Cumming et al. 2019, and Pickering et al. 2019). In response to the disappointing results, many researchers concluded that the interventions were insufficient for ensuring a sufficiently clean environment that would improve health outcomes (Arnold et al. 2018 and Cumming et al. 2019). However, the consensus remained that water, sanitation, and hygiene are associated with inferior health outcomes through environmental enteric dysfunction, which results in malabsorption of nutrients and other gastro-intestinal issues that result in lower height and weight (Humphrey 2009).

Other scholars have explored the impact of other ESHI on child health outcomes. Benjamin-Chung et al. (2021) found that unimproved flooring is a likely transmission route for enteric pathogens. Sinharoy et al. (2020) note that air pollution is a potential but understudied source of stunting. The theory, based on a logarithmic or similar dose-response function between pathogens in the environment and health, suggests that even low levels of contaminants can lead to negative health outcomes (Interagency Microbiological Risk Assessment Guideline Workgroup 2012).

While the RCTs explored the synergies between water, sanitation, and hygiene (Humphrey et al. 2019, Luby et al. 2018, and Null et al. 2018), they did not consider other potential ESHI such as cooking, lighting, and flooring, which are also important

sources of environmental contaminants (Benjamin-Chung et al. 2015 and Clasen & Smith 2019).

In this report, we contribute to the evidence base on the relationships between access to ESHI and child health. We use data from the World Bank's Living Standard Monitoring Survey Integrated Surveys on Agriculture (LSMS-ISA) to explore the association between six different ESHI and child height-for-age Z scores (HAZ) and weight-for-age Z scores (WAZ) (UBS 2012, UBS 2014a, UBS 2014b, UBS 2016, UBS 2019, UBS 2020, UBS 2021). One major limitation for our analysis is that we are unable to control for access to a secure food supply and for the dietary intake for children five and under. Additionally, due to the slow increase in access to these different services and infrastructure, we are limited in the statistical methods we can use for analyzing this relationship, which limits our ability to make any causal claims. However, we find a robust association between having access to all services and increased child height and weight by using a nationally representative longitudinal dataset from 2009 to 2019. This new evidence suggests that access to all elements of modern ESHI will significantly contribute to children's health.

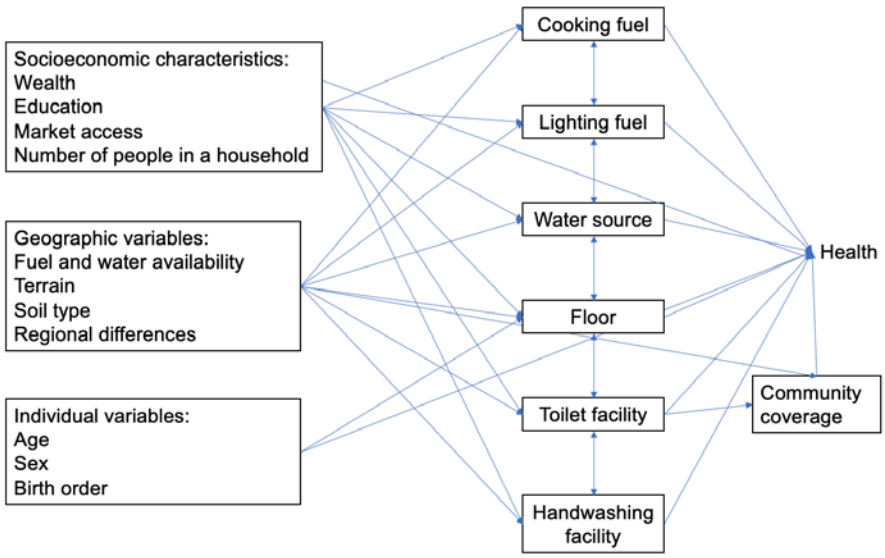
Background

The struggle to identify causal effects between access to improved ESHI and improved health outcomes has continued to confound public health researchers (Checkley et al. 2021, Kaali et al. 2021, Mortimer et al. 2020, and Whittington et al. 2020). The RCTs exploring the relationship between ESHI and health outcomes assume that treatments will ensure study participants experience a sufficiently clean environment that they will have a reduced health burden. However, one issue with these studies is that they do not reference a comprehensive theoretical understanding of how ESHI impacts health outcomes.

This paper presents the relationship between ESHI and health outcomes through a Directed Acyclic Graph (DAG) as presented in Figure 1. The six ESHI studied here are cooking fuel, lighting fuel, water source, floor, toilet facility, and handwashing facility. The model assumes that each of the ESHI variables included here have both a direct and an indirect impact on health outcomes. The direct impacts are based upon the existing evidence base (Benjamin-Chung et al. 2015, Feacham et al. 1983, and Pruss-Ustun & Corvalán 2006). However, we hypothesize that there is an additional indirect benefit from each of the ESHI indicators that occurs when a household has access to all the ESHI indicators. The socioeconomic characteristics, geographic variables, and individual variables included in the DAG were identified from the evidence base exploring the relationship between ESHI and health (Adebowale et al. 2017, Adjiwanou et al. 2017, Amare et al. 2019, Benjamin-Chung et al. 2015, Benjamin-Chung et al. 2021, Dey et al. 2021, Duflo et al. 2015, Fink et al. 2011, Humphrey 2009, Humphrey et al. 2019, Husseini et al. 2018, Jack et al. 2021, Kennedy et al. 2006, Lin et al. 2013, Luby et al. 2018, Miles & Cumming 2016, Momberg et al. 2021, Nshimyiryo et al. 2019, Null et al. 2018, Pickering et al. 2015, Pongou et al. 2006, Ravindra & Smith 2018, Schoeman et al. 2010, Spears 2013, Takele et al. 2019, and Wolff et al. 2001). The socioeconomic characteristics,

geographic variables, and individual variables are assumed to have a direct impact on health outcomes as well as to be drivers for access to the six ESHI. We also note that an emerging evidence base suggests that both individual and community level sanitation coverage impact health outcomes due to sanitation externalities, which would also have a direct impact on health outcomes (Alderman et al. 2003, Briceño et al. 2017, Cameron et al. 2021, Coffey et al. 2018, Fuller et al. 2016, and Harris et al. 2017).

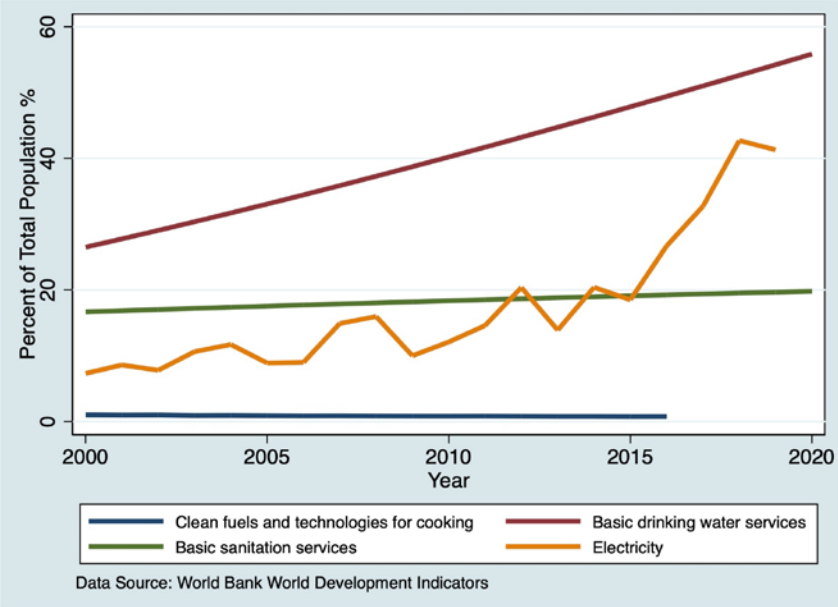
Figure 1: Relationship between Environmental Services and Infrastructure and Health DAG



Setting

To test the theoretical model presented here, we use data from Uganda that was collected through the LSMS-ISA. Uganda is a landlocked and rapidly growing low-income country in East Africa. We present the available data from the World Bank's World Development Indicators on access to clean fuels and technologies for cooking, basic water services, basic sanitation services and electricity from 2000 to 2020 (World Bank 2021). We see that access to basic drinking services is low but has steadily increased over the past two decades growing from about 20% to almost 60%. Access to electricity increased slowly from less than 10% to almost 20% in 2015 and then rapidly increased to 40% by 2020. Access to basic sanitation services increased incrementally from 2000 and was around 20% in 2020. Finally, from 2000 to 2015 access to clean fuels and technologies for cooking stayed around one percent.

Figure 2: Historical Access to Clean Cooking, Basic Water Services, Basic Sanitation Services, and Electricity



Data

The data used for the analysis comes from Uganda LSMS-ISA. The data is collected by the Uganda Bureau of Statistics with support from the World Bank and other donors. The Uganda LSMS-ISA has publicly available data from seven waves collected in 2009-10, 2010-11, 2011-12, 2013-14, 2015-16, 2018-2019, and 2019-2020. Data is collected from the following regions: Kampala, Other Urban, Central Rural, Eastern Rural, Western Rural, Northern Rural. In each wave households are visited twice a year to report on both pre-harvest and post-harvest questions. Households are randomly asked the household and individual questions during the first or second visit. A random subset of two households from each enumeration area were selected for tracking in the case of moving and of splitting households in 2009-10 and were tracked through each wave. Furthermore, in 2013-14 one third of the sample was refreshed with the expectation that going forward another one-third of the sample, drawn from those in the previous sample, would again be refreshed so that in the future two-third of the respondents in each survey would have also been surveyed in either one or two survey waves previously.

Data cleaning and merging across waves was completed in STATA Version 16 (StataCorp 2019). While we connected households and individuals across survey waves, this was made challenging due to changing methods for developing household identification numbers. When households were unable to be connected to previous surveyed households, they were assumed to be newly sampled households. Additionally, some questions changed over time, which impacted the analysis, and some relevant data were unavailable, or variables were randomly missing on the publicly available data set.

The six ESHI were identified by a series of survey questions. For some variables we used two definitions due to both changing survey questions as well as uncertainty in the association between different ESHI and improved health outcomes (Table 1).

For the cooking and lighting questions, households were asked whether they use a series of different fuels for either cooking or lighting. Any household that responded yes to any of the clean fuels (electricity or LPG for cooking and electricity or solar for lighting) were designated as households that used clean fuels for cooking or lighting respectively. Houses were designated as having an improved floor if the main material of the floor was reported as either cement, mosaic or tiles, bricks, or stones and not mud. There were two definitions used to identify houses with clean water. The first definition relied on the World Health Organization's (WHO) and United Nations Children's Fund's (UNICEF) Joint Monitoring Program (JMP), which monitors progress on the Sustainable Development Goals. During the Millennium Development Goal period, the JMP has identified improved sources which include: public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, rainwater collection (WHO & UNICEF 2013). We employ an alternative definition using responses to whether households treat drinking water by either boiling, filtration, or both. For the toilet variables, the first variable we use is an improved toilet as defined by the JMP during the MDG period, which includes: flush or pour flush, ventilated improved pit (VIP) latrine, pit latrine with slab, or composting toilet (WHO & UNICEF 2013). However, the sanitation infrastructure questions in the 2009-10, 2010-11, and 2011-12 surveys were not designed to be mapped to the JMP definition and therefore, only observations from the 2013-14, 2015-16, 2018-19, and 2019-20 survey rounds could be classified as having an improved toilet. We also test a variable regarding access to any toilet, which can be used across survey waves. Finally, for the handwashing variables we use the response to whether a household has a handwashing facility. For one definition we only count those that have both a facility and soap, and for the alternative definition we count those households that have a handwashing facility whether or not it has soap.

Table 1: ESHI Variable Definitions

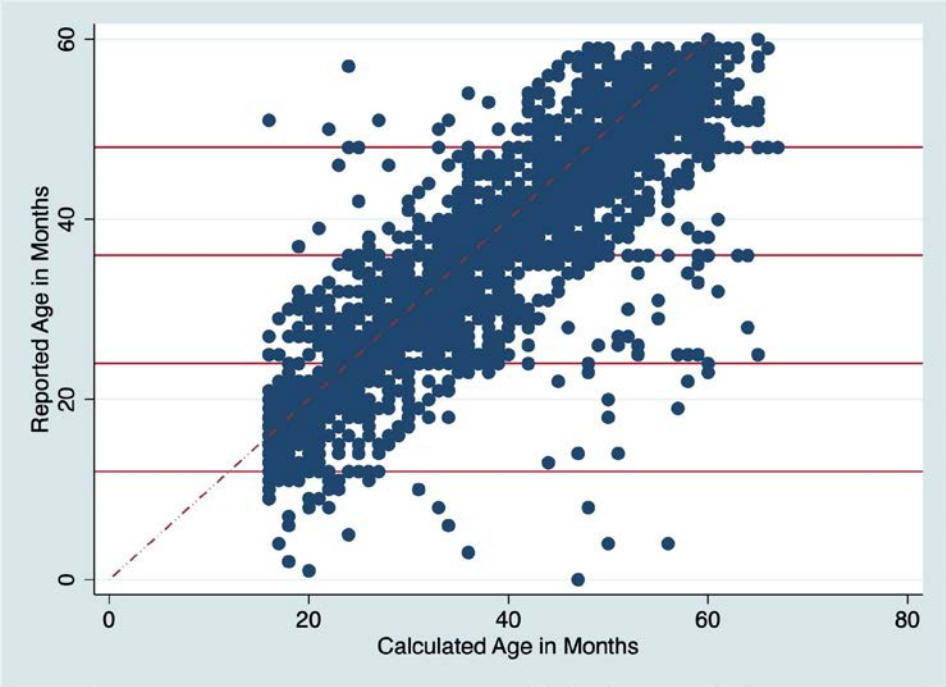
	Definition	**Alternative Definition**
Clean cooking	Some cooking with electricity or LPG	
Clean lighting	Some lighting with electricity or solar	
Improved floor/Non-mud floor	Major material of the floor is cement, mosaic or tiles, bricks, or stones	
Water	Piped water, public tap, borehole, protected well/spring, vendor, tanker trunk, gravity flow, rainwater, bottled water	Household treats drinking water
Toilet	Private flush toilet, private VIP latrine, private pit latrine with slab, and Ecosan toilet	Any toilet
Handwashing	Handwashing facility with soap	Any handwashing facility

The main health outcomes explored in this analysis are HAZ and WAZ. HAZ and WAZ are values based on the WHO growth standards for children zero to five years old (WHO 2006). A Z score represents the number of standard deviations away an individual is from the norm such that a Z score of 1 means that for a particular child's age in months and sex they are one standard deviation above the norm. To calculate Z scores we use the Stata *zscore06* command (Leroy 2011). To estimate the age of respondents we tested two approaches

1. the age in months of children five and under as recorded in each survey, and
2. the age in months calculated from the recorded birthdate of each child and the recorded day of the survey.

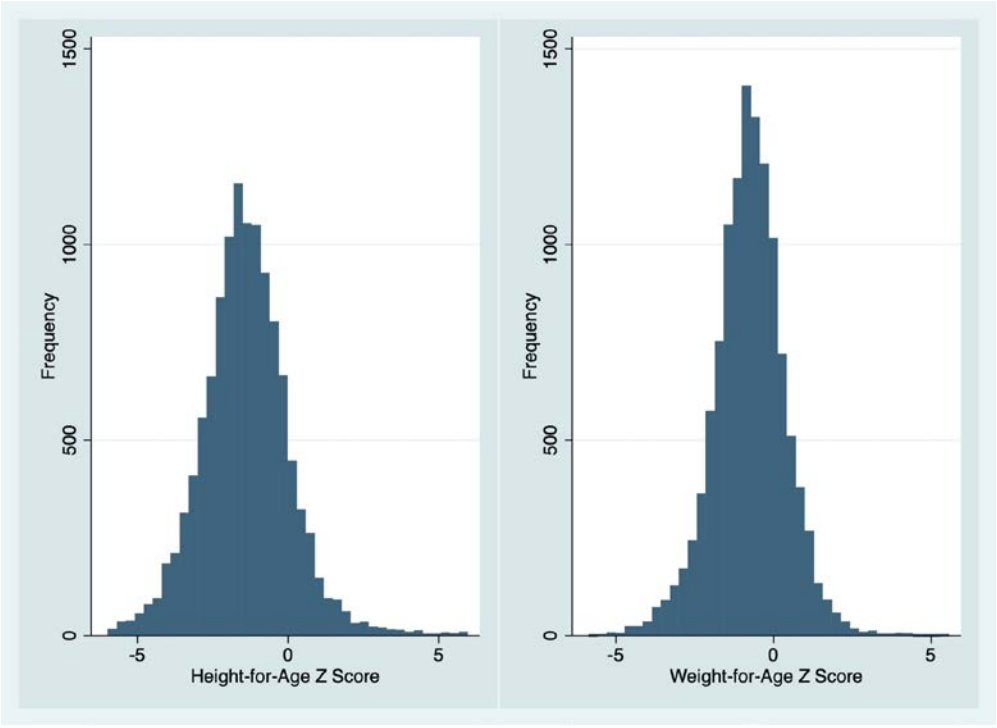
We plot the two approaches in Figure 3. When using the two approaches we find that 50% have the same age listed and almost 80% are within one month, while around 2.5% are different by a year or more. We placed horizontal lines at 12 months (1 year of age), 24 months (2 years of age), 36 months (3 years of age), and 48 months (4 years of age). We found that there are many observations that bunch at these reported ages suggesting either respondent or enumerator error as these number are easier to calculate or report rather than a specific age in months. We therefore use the age in months as calculated based on the birthday for our main model specification and the models using age recorded as a robustness check included in the supplementary materials.

Figure 3: Estimation of Respondent Ages for Children Five and Under



We present the distribution of HAZ and WAZ from the data in Figure 4. We removed outliers, which we defined as those observations with HAZ or WAZ larger than six or less than negative six (Cameron et al. 2021). The distribution of HAZ and WAZ for children in Uganda is below the world standards. The average HAZ is -1.4 standard deviations below the WHO norm, while the average WAZ is about -0.76 below the WHO.

Figure 4: HAZ and WAZ Distribution



Summary Statistics

We present the demographic and health statistics for the overall sample of children five and under across the seven survey waves of data in Table 2 (summary tables by wave are included in the supplementary materials). The average child under five in the dataset is between 33 and 34 months old. Almost 80% of the children live in a household where their parent is the head of household. Slightly more than 10% of the mothers have a non-agricultural formal sector job. The average household in the sample has seven people with five residents that are sixteen and under. Almost 18% of respondents reported owning a solar panel and less than 1% reported owning a generator. 10% of respondents reported having electricity in the household but only 10% of those have electricity for 19 hours a day or more. Additionally, around half of the households in the sample has experienced hunger in the past year and around half the households reported that each household member had at least one pair of shoes. More than 80% of respondents were classified as living in a rural area.

The variables on child health covered prevalence of diarrhea, bloody diarrhea, cough, fever, HAZ, stunted, WAZ, and wasted. Overall, only 16% of children in the sample had diarrhea in the past two weeks, 15% of whom had bloody diarrhea. Slightly more than a quarter of the children reported a cough in the past two weeks and more than a third reported a fever in the past two weeks. As mentioned previously, the average HAZ was -1.4 and almost one third of the respondents were stunted. The average WAZ was -0.76 and around 12% of respondents were wasted.

Table 2: Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	9778	33.103	14.963	1	60
Age calculated (months)	11839	33.896	15.583	0	60
Child's parent is head of household	11839	.781	.413	0	1
Mother age (years)	8259	30.244	7.296	0	79
Mother has a formal job	9835	.115	.319	0	1
Total number of people per household	11839	7.175	3.057	2	29
Total number of people ≥16 per household	11714	5.059	2.757	1	28
Percent of households members that are females	10217	.517	.173	.083	1
Owns a solar panel	11821	.172	.378	0	1

Owns a generator	11818	.004	.064	0	1
Owns a mobile phone	11826	.698	.459	0	1
Household has electricity	11819	.101	.301	0	1
Hours of electricity access	1025	19.213	6.825	0	24
Household members have at least one pair of shoes	9805	1.519	.5	0	1
Household faced hunger in the past year	9800	1.704	.544	0	1
Per capita expenses (UGX 100,000)	11839	5.869	6.852	.011	131.497
Rural household	11839	.821	.383	0	1
Health Variables					
Diarrhea (past two weeks)	6062	.163	.37	0	1
Bloody diarrhea (past two weeks)	987	.154	.361	0	1
Cough (past two weeks)	4233	.237	.425	0	1
Fever (past two weeks)	4232	.345	.476	0	1
Height-for-age Z score	11839	-1.415	1.469	-5.99	5.96
Stunted	11839	.328	.47	0	1
Weight-for-age Z score	11953	-.762	1.147	-5.86	5.57
Wasted	11746	.116	.32	0	1

We present a summary of the access to the different ESHI for the sample in Table 3 (summary tables for each unique survey wave are included in the supplementary materials). We also removed observations outliers based on the per capita expenditures that were more than three standard deviations above or below the average or had zero expenditures reported. Only 1.2% of the sample reported using any clean fuels for cooking. A majority of households report using dirty fuels for cooking as more than 85% of respondents cook on open fire and 85% report using firewood as fuel for cooking. Almost 30% of households report using some clean fuels for lighting. Most households use dirty fuels for lighting with kerosene as the most common fuel, used by almost 60% of respondents. Almost 86% of households draw water from improved sources and almost 40% treat their drinking water. Less than 30% of households have floors that are primarily made from a material that is not mud. Over 90% of respondents report access to a latrine while slightly more than a quarter of households reported having access to an improved latrine. Access to any handwashing facility is low at 10% and only 3% for access to a handwashing

facility with soap. Finally, when exploring an interaction between different definitions of the improved sources we find that less than 1% of households have access to the improved version of all six services at one time.

Table 3: ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	11752	.012	.111	0	1
Cooks on an open fire	9922	.863	.344	0	1
Cooks with firewood	11827	.863	.344	0	1
Cooks with charcoal	11832	.229	.42	0	1
Cooks with crop residue	11831	.153	.36	0	1
Cooks with kersosene	11829	.03	.17	0	1
Cooks with electricity	11830	.006	.077	0	1
Cooks with LPG	11833	.002	.048	0	1
Cooks with dung	11828	.001	.024	0	1
Household cooks outdoors	11781	.203	.402	0	1
Main stove has a chimney	11747	.059	.236	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	10501	.283	.45	0	1
Lights with kerosene	11829	.591	.492	0	1
Lights with solar power	11830	.169	.375	0	1
Lights with electricity	11830	.086	.28	0	1
Lights with firewood	11827	.033	.178	0	1
Lights with a torch	1091	.021	.144	0	1
Lights with crop residue	11831	.008	.09	0	1
Water Technology					
Uses an improved water source	10768	.858	.349	0	1

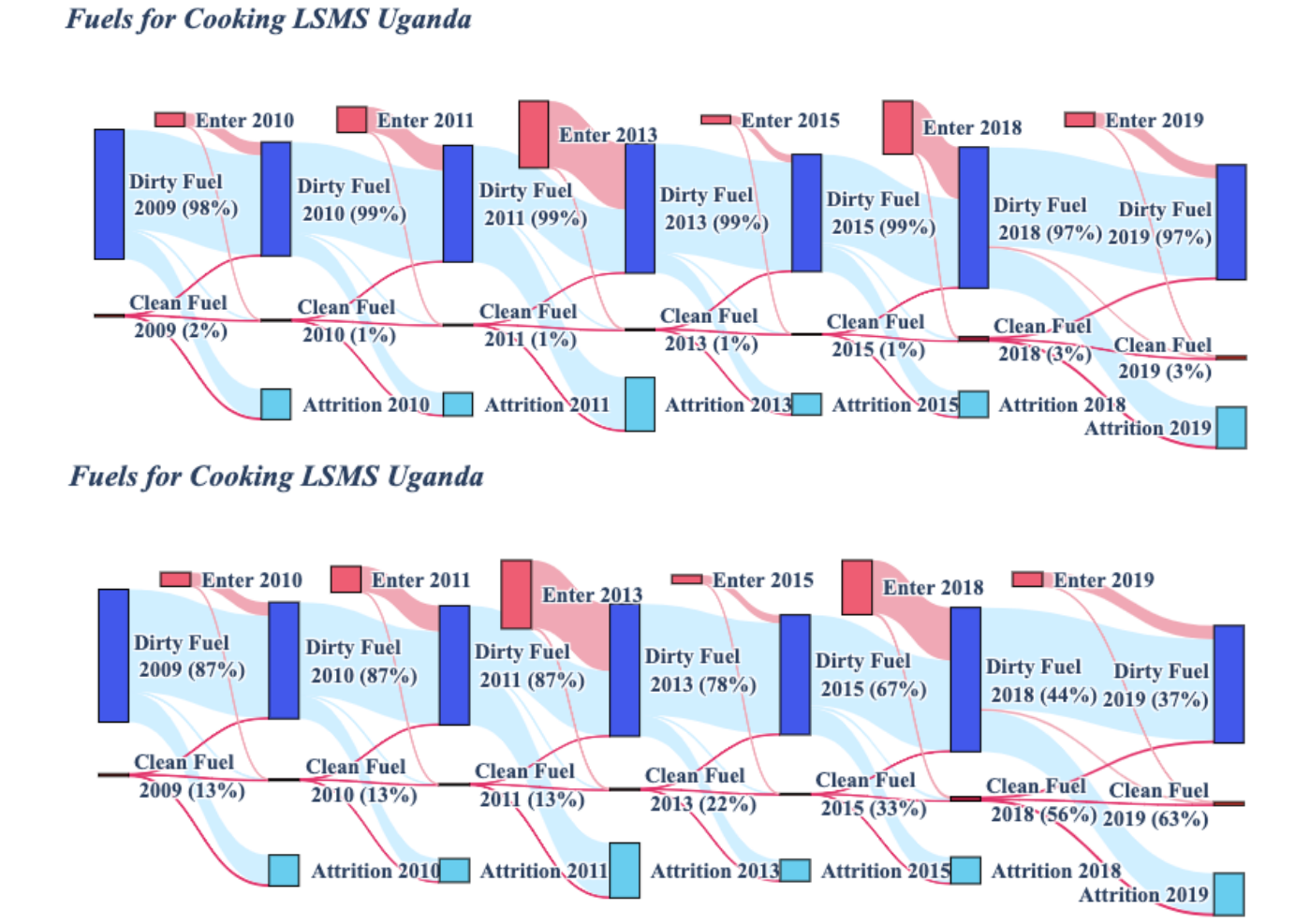
Treats water before drinking	11819	.38	.485	0	1
Flooring Technology					
Has a non-mud floor	11742	.279	.448	0	1
Sanitation Technology					
Has access to a toilet	11806	.902	.297	0	1
Has a private improved toilet	11814	.267	.443	0	1
Handwashing Technology					
Has a handwashing facility	11189	.1	.301	0	1
Has a handwashing facility with soap	11189	.028	.165	0	1
Six-way Interaction of All Services					
Total services 1*	4282	.002	.043	0	1
Total services 2*	5165	.003	.052	0	1
Total services 3*	8933	.003	.058	0	1
Total services 4*	9814	.003	.055	0	1

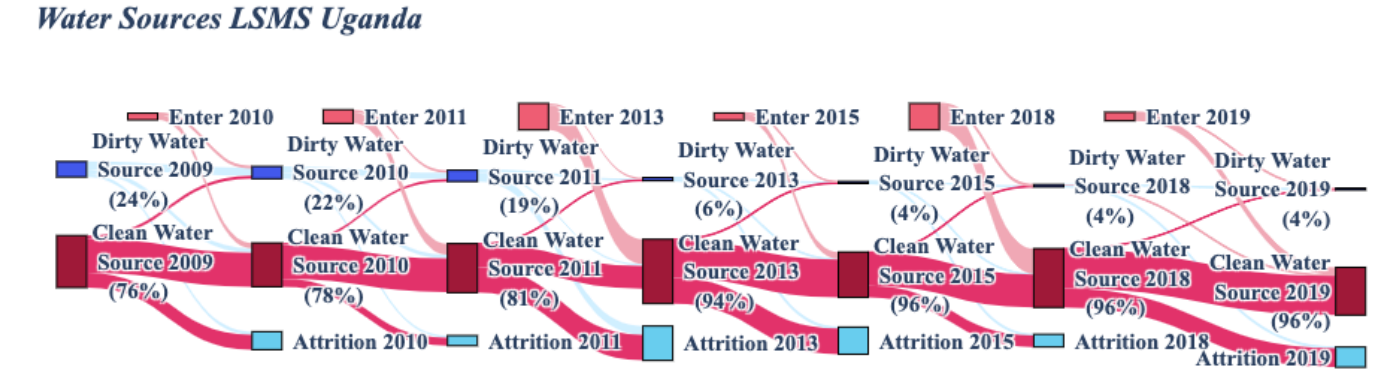
* Total services 1: cooks with clean fuels, lights with clean fuels, uses an improved water source, has an improved toilet, has a non-mud floor, and a handwashing facility with soap. Total services 2: cooks with clean fuels, lights with clean fuels, uses an improved water source, has an improved toilet, has a non-mud floor, and a handwashing facility. Total services 3: cooks with clean fuels, lights with clean fuels, treats water before drinking, has access to any toilet, has a non-mud floor, and a handwashing facility. Total services 4: cooks with clean fuels, lights with clean fuels, treats water before drinking, has access to any toilet, has a non-mud floor, and a handwashing facility.

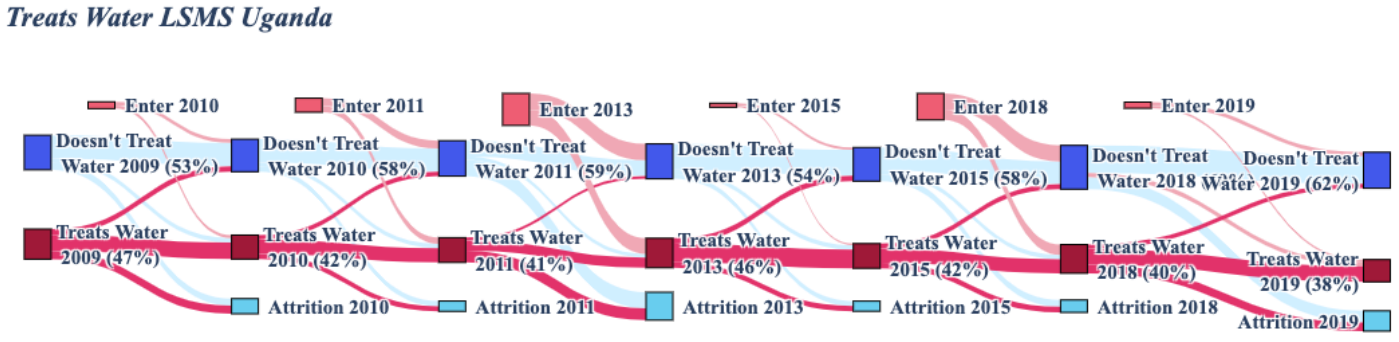
To leverage the longitudinal nature of the dataset, we also present access to the different ESHI through a Sankey diagram for each of the services and each definition in Figure 5. From the Sankey diagrams we can see that access to services are relatively stable across periods, with the exception in the increase in access to clean fuels for lighting. Furthermore, we find that few households transition from between the dirty ESHI and clean ESHI.

The Sankey diagrams also illustrate the proportion of access to the clean and dirty version of ESHI in Uganda. While the proportion of children five and under living in houses using improved water sources or any toilet dominates is larger than the proportion using unimproved sources or practicing open defecation, for all other ESHI the clear majority use dirty or unimproved ESHI. However, we can clearly see that limited usage of clean fuels for cooking and access to handwashing facilities with or without soap across all survey waves.

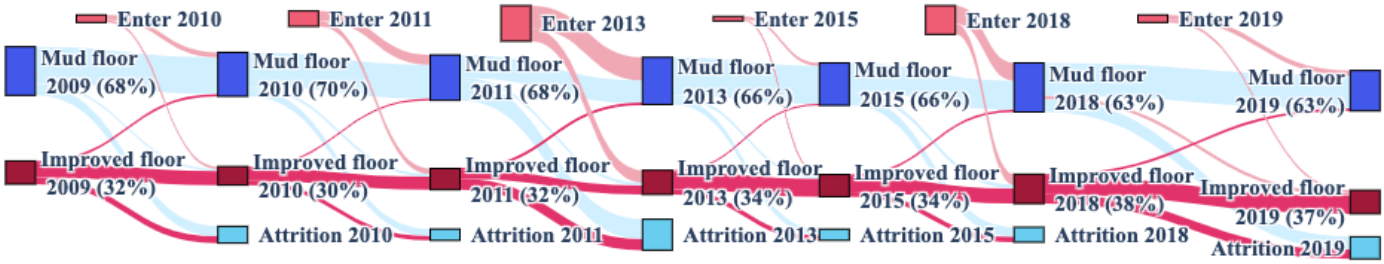
Figure 5: ESHI Sankey Diagrams



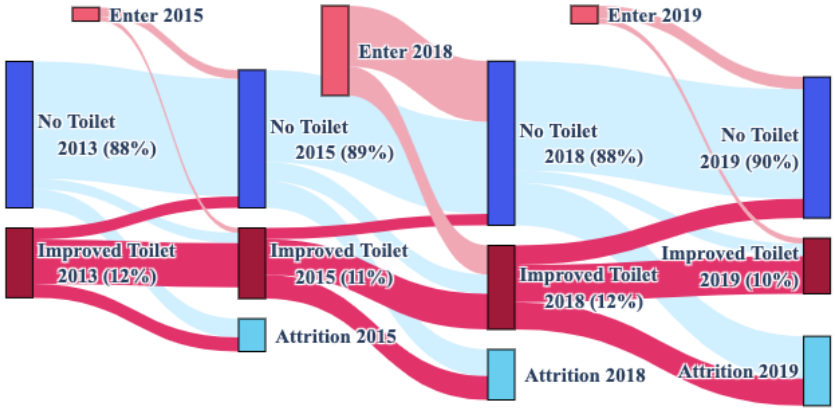




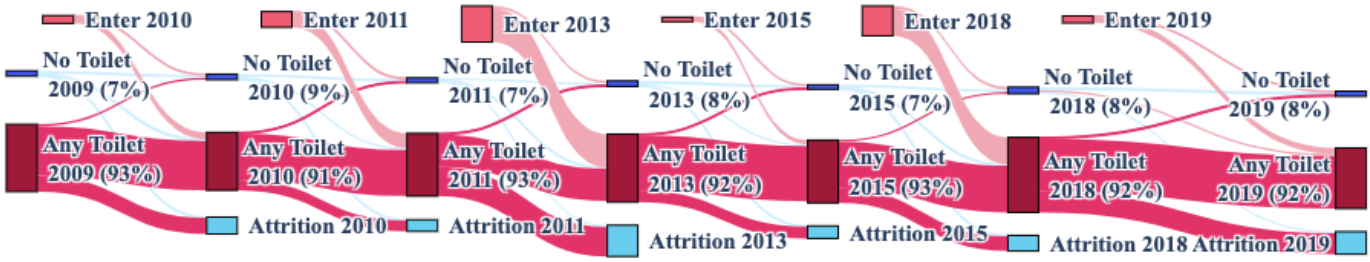
Improved Flooring LSMS Uganda



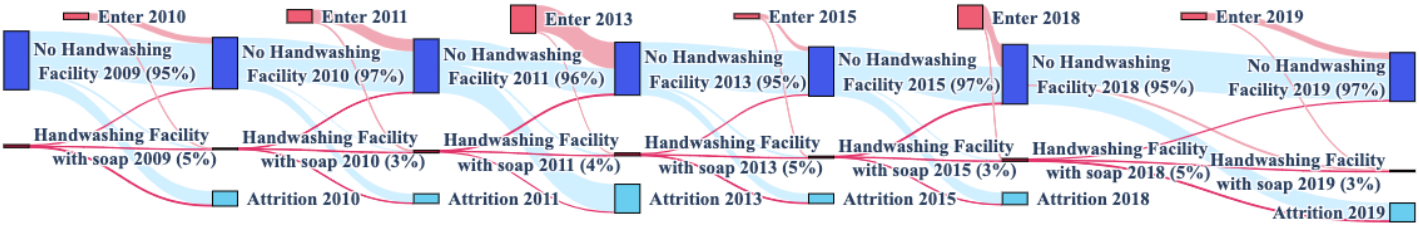
Improved Toilets LSMS Uganda



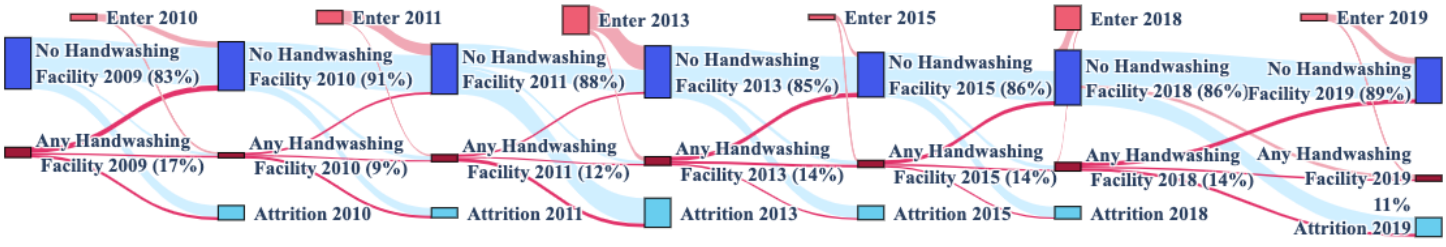
Any Toilet LSMS Uganda



Handwashing Facility with Soap LSMS Uganda



Handwashing Facility LSMS Uganda



Analysis and Results

Model

We present our approach to test the relationship between ESHI and HAZ and WAZ based on data from seven waves of the Uganda LSMS-ISA data. Due to the limited switching between clean/improved and dirty/unimproved ESHI across survey waves we are unable to use a fixed-effects model. Therefore, we use an ordinary least squares (OLS) pooled regression with time and place fixed effects and present results with robust standard errors clustered at the individual level. Our model is presented below:

$$HAZ_{ihjt} = \beta_0 + \beta_1 Total\ Services_h + \beta_2 Clean\ Fuel\ Cook_h + \beta_3 Clean\ Fuel\ Lighting_h + \beta_4 Clean\ Water_h + \beta_5 Improved\ Floor_h + \beta_6 Toilet_h + \beta_7 Handwashing_h + \gamma_1 X_i + \gamma_2 H_h + \delta_j + \tau_t + \delta_j * \tau_t + \varepsilon_i$$

HAZ for an individual child, *i*, in household, *h*, in region, *j*, in survey wave, *t*, is the unit of analysis. The total services variable is a six-way interaction between all the individual services. Therefore, ß$_1$ represents the association between a child's HAZ in a household with all the services as compared to a child's HAZ score in a house that does not have all six services but could have at least some. In addition to including measures for each of the six services at the household level, we include individual control variables in the vector X and household variables in the vector H. We used a fixed-effects approach for region (represented by δ), survey wave (represented by τ), and an interaction between the two. Finally, there is an error term that is clustered at the individual level.

Results

We present the results of our analysis in Tables 4 & 5 (full regression results along as the results of the alternative specification for HAZ and WAZ are presented in the supplementary materials). The four different total service variables are:

1. Total services 1: cooks with clean fuels, lights with clean fuels, uses an improved water source, has an improved toilet, has a non-mud floor, and a handwashing facility with soap.
2. Total services 2: cooks with clean fuels, lights with clean fuels, uses an improved water source, has an improved toilet, has a non-mud floor, and a handwashing facility.
3. Total services 3: cooks with clean fuels, lights with clean fuels, treats water before drinking, has access to any toilet, has a non-mud floor, and a handwashing facility.
4. Total services 4: cooks with clean fuels, lights with clean fuels, treats water before drinking, has access to any toilet, has a non-mud floor, and a handwashing facility.

For all version of the total services variables, we present a model without any individual or household level controls as well as a model with individual and household controls. For the models using total services 3 and 4 we also present a

version with additional controls such as mother's age and whether the mother had a formal non-agricultural job. We do not use this model with total services 1 and 2 because that publicly available data for two of the four waves where data on access to improved latrines were reported did not have those variables. Therefore, the sample size became too small with this model specification.

Table 4: HAZ Regression Results

VARIABLES	(1) Total Services 1	(2) Controls with Total Services 1	(3) Total Services 2	(4) Controls with Total Services 2	(5) Total Services 3	(6) Controls with Total Services 3	(7) Controls+ with Total Services 3	(8) Total Services 4	(9) Controls with Total Services 4	(10) Controls+ with Total Services 4
Total Services 1	1.070**	0.714								
	(0.527)	(0.513)								
Total Services 2			1.160**	0.918**						
			(0.463)	(0.438)						
Total Services 3					0.843***	0.922***	0.754*			
					(0.319)	(0.308)	(0.413)			
Total Services 4								0.877***	0.906***	0.770*
								(0.315)	(0.322)	(0.413)
Clean fuel for cooking	0.237	0.202	0.108	0.0665	-0.0126	-0.108	-0.0770	-0.0307	-0.116	-0.0766
	(0.188)	(0.187)	(0.176)	(0.176)	(0.150)	(0.154)	(0.192)	(0.141)	(0.144)	(0.189)
Clean fuel for lighting	0.206**	0.121**	0.185**	0.0964*	0.232**	0.104**	0.112	0.207**	0.0781*	0.0665
	(0.0512)	(0.0550)	(0.0464)	(0.0492)	(0.0451)	(0.0501)	(0.0695)	(0.0417)	(0.0456)	(0.0624)
Improved water source	0.340***	0.336***			0.0279	0.0181	-0.0241			
	(0.104)	(0.103)			(0.0534)	(0.0533)	(0.0595)			
Treats water			0.0516	0.0239				0.0738*	0.0284	0.0259
			(0.0548)	(0.0544)				(0.0413)	(0.0413)	(0.0494)
Improved toilet	0.197***	0.163***	0.216***	0.193***						
	(0.0604)	(0.0611)	(0.0548)	(0.0557)						
Any toilet					0.163*	0.0862	0.126	0.168*	0.0961	0.127
					(0.0912)	(0.0899)	(0.0964)	(0.0904)	(0.0890)	(0.0962)
Improved floor	0.181***	0.108*	0.169***	0.105*	0.339***	0.234***	0.218***	0.318***	0.224***	0.209***
	(0.0591)	(0.0600)	(0.0538)	(0.0552)	(0.0454)	(0.0467)	(0.0574)	(0.0431)	(0.0443)	(0.0543)
Handwashing with soap	0.195	0.109								
	(0.137)	(0.134)								

Handwashing			0.0459	0.00781	0.0795	-0.00638	0.0291	0.0705	-0.000806	0.0198
			(0.0662)	(0.0654)	(0.0584)	(0.0584)	(0.0727)	(0.0549)	(0.0549)	(0.0686)
Observations	4,282	4,271	5,165	5,146	8,933	8,795	6,236	9,814	9,668	6,745

Table 5: WAZ Regression Results

VARIABLES	(1) Total Services 1	(2) Controls with Total Services 1	(3) Total Services 2	(4) Controls with Total Services 2	(5) Total Services 3	(6) Controls with Total Services 3	(7) Controls+ with Total Services 3	(8) Total Services 4	(9) Controls with Total Services 4	(10) Controls+ with Total Services 4
Total Services 1	0.869***	0.663**								
	(0.288)	(0.296)								
Total Services 2			0.851***	0.688***						
			(0.240)	(0.235)						
Total Services 3					0.475*	0.253	0.273			
					(0.267)	(0.220)	(0.284)			
Total Services 4								0.645**	0.423**	0.276
								(0.256)	(0.208)	(0.283)
Clean fuel for cooking	0.0620	0.0290	-0.000174	-0.0380	0.0457	-0.0316	-0.00431	0.000921	-0.0701	0.0190
	(0.134)	(0.133)	(0.133)	(0.131)	(0.108)	(0.109)	(0.131)	(0.108)	(0.108)	(0.128)
Clean fuel for lighting	0.179***	0.116***	0.153***	0.0909**	0.165***	0.0863**	0.0809	0.140***	0.0631*	0.0394
	(0.0404)	(0.0430)	(0.0374)	(0.0397)	(0.0357)	(0.0392)	(0.0527)	(0.0336)	(0.0365)	(0.0486)
Improved water source	0.179**	0.145*			-0.0459	-0.0692	-0.121**			
	(0.0846)	(0.0847)			(0.0434)	(0.0435)	(0.0489)			
Treats water			0.0213	0.00879				0.0525*	0.0243	0.0192
			(0.0411)	(0.0416)				(0.0310)	(0.0315)	(0.0378)
Improved toilet	0.152***	0.140***	0.163***	0.151***						
	(0.0481)	(0.0486)	(0.0439)	(0.0443)						
Any toilet					0.220**	0.171**	0.183**	0.224**	0.175**	0.179**

					*			*		
					(0.0714)	(0.0719)	(0.0776)	(0.0709)	(0.0712)	(0.0776)
Improved floor	0.112**	0.0509	0.0897*	0.0361	0.214**	0.146***	0.138***	0.188**	0.126***	0.122***
			*		*			*		
	(0.0460)	(0.0472)	(0.0417)	(0.0431)	(0.0355)	(0.0372)	(0.0457)	(0.0337)	(0.0353)	(0.0436)
Handwashing with soap	0.193*	0.144								
	(0.101)	(0.101)								
Handwashing			0.0679	0.0477	0.0773*	0.0207	0.0162	0.0640	0.0143	0.00778
			(0.0481)	(0.0488)	(0.0422)	(0.0427)	(0.0539)	(0.0404)	(0.0409)	(0.0518)
Observations	4,325	4,314	5,219	5,200	9,019	8,876	6,271	9,911	9,760	6,790

The coefficients on the total service variables are positive and statistically significant at least at the ten percent level for nine out of the ten HAZ regressions and seven of the ten for the WAZ regressions. Furthermore, the coefficients range from 0.75 to 1.16 in the HAZ regression, suggesting a sizable association between access to all six ESHI and child height. The coefficients on the total services variables for the WAZ regression ranges from 0.25 to 0.87, also suggesting a potentially sizable association between access to all six ESHI and child weight. We also note that the coefficient on the clean fuel for lighting variable in statistically significant across eight of ten for both the HAZ and WAZ regressions, suggesting that lighting has an important direct association with increased height and weight. Similarly, the coefficients on improved toilets are statistically significant in all models with that variable, while the coefficients on any toilet are statistically significant in two of six models for HAZ but for six of six models for WAZ. Finally, we also find that the coefficients on improved flooring are statistically significant and positive for every HAZ model and for eight of ten WAZ models. The coefficients on the other individual ESHI are less consistent across models and are often not statistically significant.

The estimated effect sizes here are substantial with across models presented in Figures 6 and 7. The associations here indicate that if the entire sample had access to these six ESHI, the average HAZ and WAZ would almost approach international standards, with means of zero or very close to zero. The coefficients on the individual ESHI variables suggest that interventions focusing on one ESHI would likely have a positive impact on HAZ and WAZ, but not sufficient for closing the gap between Uganda and international standards.

Figure 6: Coefficient Plot for HAZ Regressions

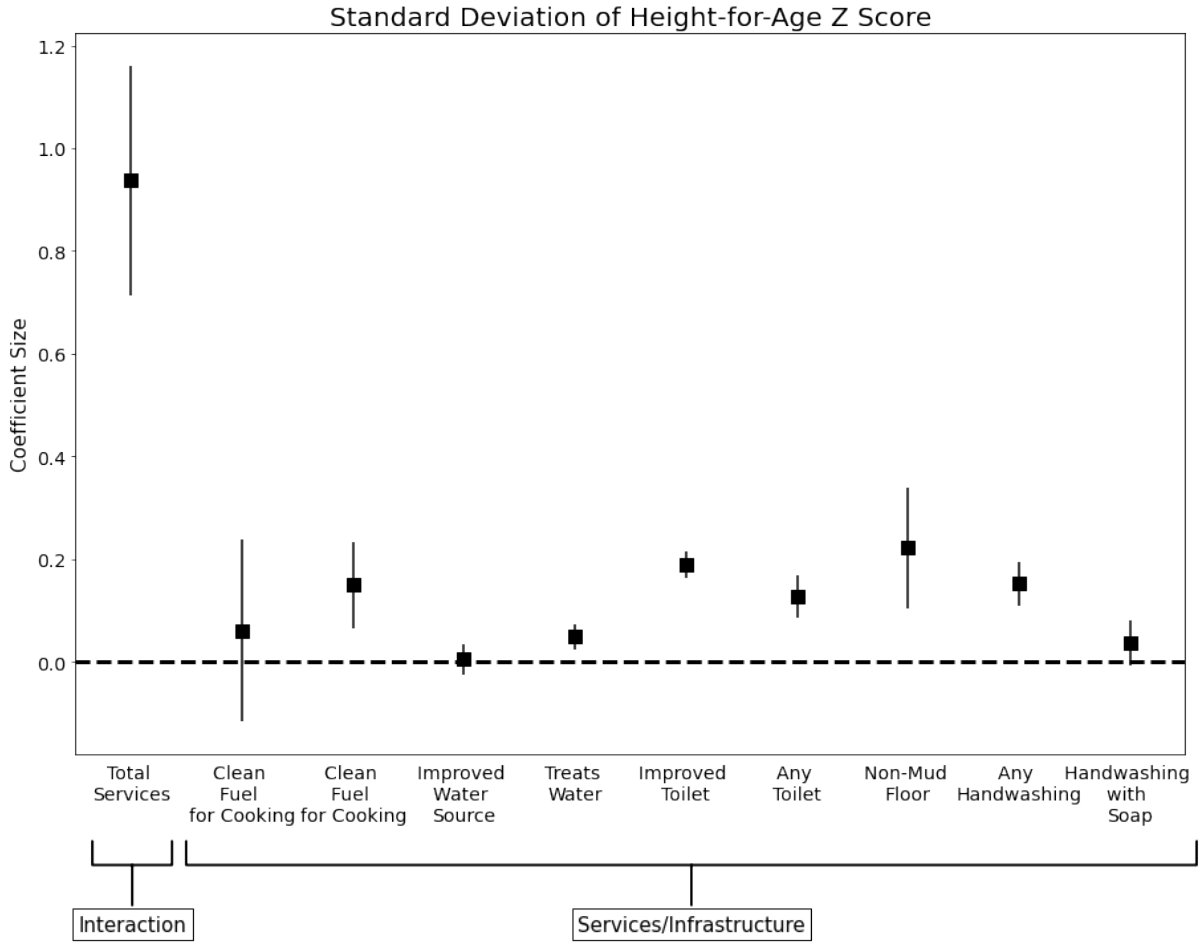
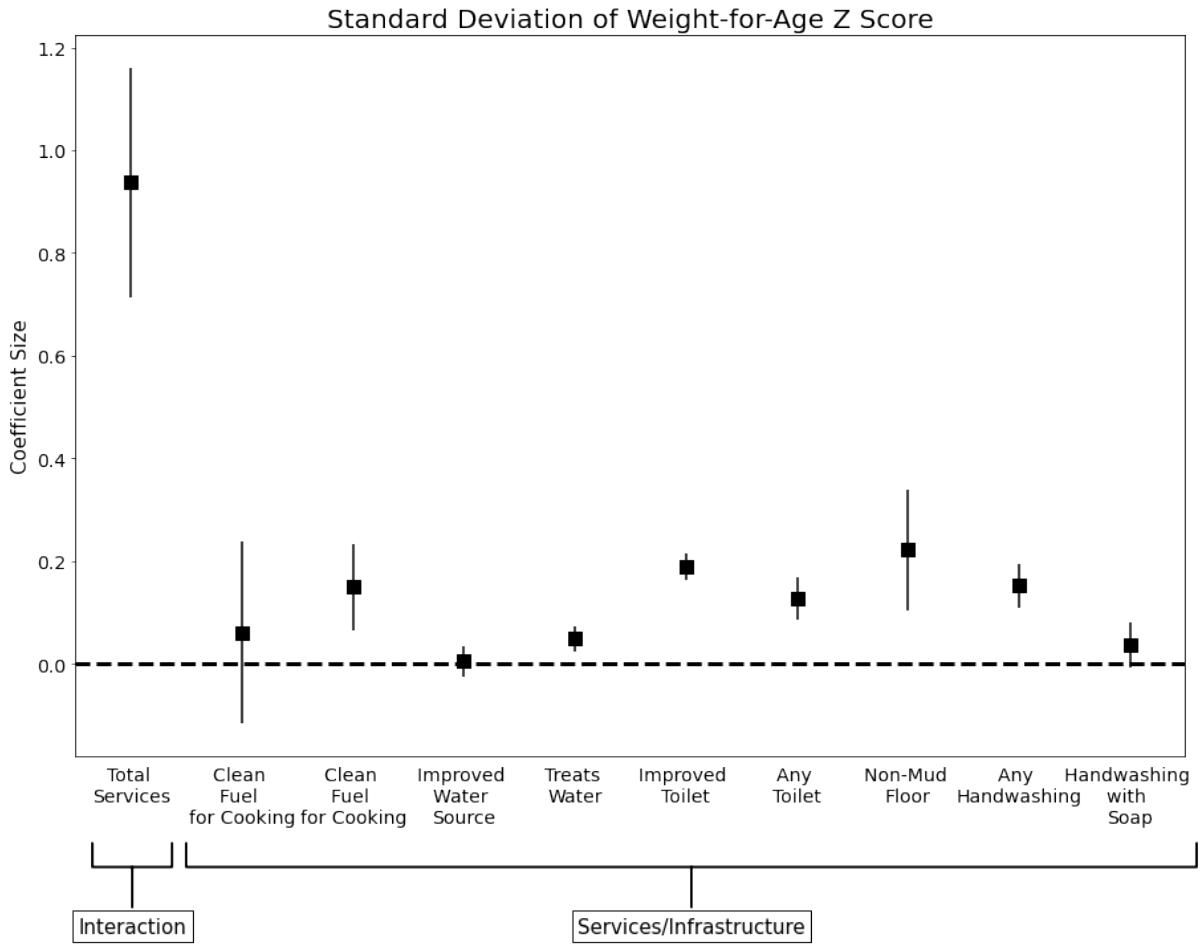


Figure 7: Coefficient Plot for WAZ Regressions



Discussion

The results of this analysis suggest that there are important associations between access to multiple ESHI. Public health practitioners should proceed with caution when implementing siloed environmental health interventions. Observational studies continue to suggest that important synergies exist between multiple ESHI, despite the disappointing results from the WASH Benefits and SHINE Trials (Humphrey et al. 2019, Null et al. 2018, and Luby et al. 2018). New multisectoral interventions may be necessary to ensure children realize improved health outcomes

While numerous scholars have called for transformational WASH (Cumming et al. 2019), we echo the call for a more comprehensive call for transformational housing as mentioned in Whittington et al. (2020). Scholars also need to develop a more comprehensive and sectoral theory of change that relates both ESHI and other individual, household, or geographic variables that have strong associations or causal relationships with health outcomes.

A strong comprehensive theory of change would also help researchers better understand the importance of using multiple or different definitions of ESHI. For example, in this study three services (water, sanitation, and handwashing) were

defined with two alternatives. However, there is insufficient evidence for determining which of these alternative definitions is preferred for informing future analyses.

We also note here that there is substantial variation in how household interact with each of the ESHI variables. For example, having an improved/non-mud floor is consistent as households do not change their flooring material daily. However, the other variables exhibit much more variation. Households that sometimes cook with electricity or LPG may choose to cook with dirty fuels some days. However, the strongest direct relationship between ESHI and health outcomes were observed with the flooring and lighting variables. These two variables may exhibit the most consistency across daily usage, as households are more likely to maintain using the same flooring or lighting fuel than the other ESHI, which could partially explain the results here. This implies that further clarification and refinement of the ESHI variables are important for improving future analyses and theory building.

Limitations

This paper has a number of limitations. First, we note previously that we are unable to incorporated variables for nutritional intake or dietary diversity of children five and under, which have direct links on child height and weight outcomes. Second, we note that our definitions of improved ESHI do not necessarily indicate that children live in households that always use these improved ESHI. For example, our definition of clean fuels for lighting and cooking indicates if a household ever uses clean fuels, which means these households may also sometimes use dirty fuels. Similarly, households with toilets or handwashing facilities may not use these facilities. Therefore, just having access to the improved sources would not necessarily lead to a cleaner environment in all circumstances. Third, we are also limited in the options for statistical analyses due to limited ESHI switching from the different ESHI across survey waves. While we use region, time, and region by time fixed effects with the pooled regression, there is still substantial uncontrolled endogeneity in this sample. Fourth, we are limited by the variations across survey waves and limitations on the publicly available data. Fifth, while every attempt was made to clean the data and connect observations across survey waves, we were unable to address any data entry or reporting errors. We note wo significant data issues. One is related to the measure issue with reporting and entry of child age in months. The other is inability to incorporate community level variables, which are likely to be important due to externalities. Sixth, identifying households rather than individuals to track over time proved too difficult due to both changing conventions for identifying households as well as both splitting and shifting of households in the sample.

Conclusion

The results of analyzing data from multiple surveys in Uganda suggest that there are positive synergies for child health outcomes when a household has access to all six ESHI. While interventions that focus on increasing access to individual ESHI can improve health, children are likely exposed to contaminated environments and experience significant health burdens in the absence of access to all ESHI

To substantially increase child height and weight to meet WHO standards will likely require comprehensive cross-sector interventions promoting access to multiple ESHI. Access to numerous ESHI is essential for reducing the pathogen load sufficiently for children to live healthier lives.

Further research is needed to better understand the causal relationship between ESHI and health. Exploring these relationships using additional longitudinal datasets, especially in contexts where substantial switching between ESHI is observed, would help better support the findings here. Furthermore, while the WASH Benefits and SHINE found limited synergies between multi-sectoral interventions, additional studies should continue exploring these relationships. New experimental evidence is required for both developing a stronger theory behind the relationship between ESHI and child health, but to also help direct future interventions.

References

Adebowale, S. A., Morakinyo, O. M., & Ana, G. R. (2017). Housing materials as predictors of under-five mortality in Nigeria: evidence from 2013 demographic and health survey. *BMC pediatrics*, *17*(1), 1-13.

Adjiwanou, V., & Engdaw, A. W. (2017). Household environmental health hazards' effect on under-five mortality in sub-Saharan Africa: What can we learn from the Demographic and Health Survey?. *Global public health*, *12*(6), 780-794.

Alderman, H., Hentschel, J., & Sabates, R. (2003). With the help of one's neighbors: externalities in the production of nutrition in Peru. *Social science & medicine*, *56*(10), 2019-2031.

Amare, Z. Y., Ahmed, M. E., & Mehari, A. B. (2019). Determinants of nutritional status among children under age 5 in Ethiopia: further analysis of the 2016 Ethiopia demographic and health survey. *Globalization and health*, *15*(1), 1-11.

Andres, L., Briceño, B., Chase, C., & Echenique, J. A. (2017). Sanitation and externalities: evidence from early childhood health in rural India. *Journal of Water, Sanitation and Hygiene for Development*, *7*(2), 272-289.

Arnold, B. F., Null, C., Luby, S. P., & Colford, J. M. (2018). Implications of WASH benefits trials for water and sanitation–authors' reply. *The Lancet Global Health*, *6*(6), e616-e617.

Banik, D. (2019). Achieving Food Security in a Sustainable Development Era. *Food ethics* 4**,** 117–121. https://doi.org/10.1007/s41055-019-00057-1

Bekele, T., Rahman, B., & Rawstorne, P. (2020). The effect of access to water, sanitation and handwashing facilities on child growth indicators: Evidence from the Ethiopia Demographic and Health Survey 2016. *PloS one*, *15*(9), e0239313.

Benjamin-Chung, J., Nazneen, A., Halder, A. K., Haque, R., Siddique, A., Uddin, M. S., Koporc, K., Arnold, B. F., Hubbard, A. E., Unicomb, L., Luby, S. P., Addiss, D.G. & Colford Jr, J. M. (2015). The interaction of deworming, improved sanitation, and household flooring with soil-transmitted helminth infection in rural Bangladesh. *PLoS neglected tropical diseases*, *9*(12), e0004256.

Benjamin-Chung, J., Crider, Y. S., Mertens, A., Ercumen, A., Pickering, A. J., Lin, A., Steinbaum, L., Swarthout, J., Rahman, M., Parvez, S. M., Haque, R., Njenga, S. M., Kihara, J., Null, C., Luby, S, P., Colford Jr., J. M. & Arnold, B. F. (2021). Household finished flooring and soil-transmitted helminth and Giardia infections among children in rural Bangladesh and Kenya: a prospective cohort study. The Lancet Global Health, 9(3), e301-e308.

Cameron, L., Santos, P., Thomas, M., & Albert, J. (2021). Sanitation, financial incentives and health spillovers: A cluster randomised trial. *Journal of Health Economics*, *77*, 102456.

Checkley, W., Williams, K. N., Kephart, J. L., Fandiño-Del-Rio, M., Steenland, N. K., Gonzales, G. F., Naeher, L. P., Harvey, S. A., Moulton, L. H., Davila-Roman, V. G., Goodman, D., Tarazona-Meza, C., Miele, C. H., Simkovich, S., Chiang, M., Chartier, R. T., Koehler, K., & CHAP Trial Investigators. (2021). Effects of a Household Air Pollution Intervention with Liquefied Petroleum Gas on Cardiopulmonary Outcomes in Peru. A Randomized Controlled Trial. *American Journal of Respiratory and Critical Care Medicine*, *203*(11), 1386-1397.

Clasen, T., & Smith, K. R. (2019). Let the "A" in WASH stand for air: integrating research and interventions to improve household air pollution (HAP) and water, sanitation and hygiene (WaSH) in low-income settings. *Environmental health perspectives*, *127*(2), 025001.

Coffey, D., & Spears, D. (2018). Implications of WASH benefits trials for water and sanitation. *The Lancet Global Health*, *6*(6), e615.

Coffey, D., Geruso, M., & Spears, D. (2018). Sanitation, disease externalities and anaemia: evidence from Nepal. *The Economic Journal*, *128*(611), 1395-1432.

Dey, N. C., & Parvez, M. (2021). Household finished flooring as a guard against enteric illness in children. The Lancet Global Health, 9(3), e227-e228.

Duflo, E., Greenstone, M., Guiteras, R., & Clasen, T. (2015). *Toilets can work: Short and medium run health impacts of addressing complementarities and externalities in water and sanitation* (No. w21521). National Bureau of Economic Research.

Fuller, J. A., Villamor, E., Cevallos, W., Trostle, J., & Eisenberg, J. N. (2016). I get height with a little help from my friends: herd protection from sanitation on child growth in rural Ecuador. *International journal of epidemiology*, *45*(2), 460-469.

Feachem, R. G., Bradley, D. J., Garelick, H., & Mara, D. D. (1983). *Sanitation and disease: health aspects of excreta and wastewater management*. John Wiley and Sons.

Fink, G., Günther, I., & Hill, K. (2011). The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986–2007. *International journal of epidemiology*, *40*(5), 1196-1204.

Gil, J. D. B., Reidsma, P., Giller, K., Todman, L., Whitmore, A., & van Ittersum, M. (2019). Sustainable development goal 2: Improved targets and indicators for agriculture and food security. *Ambio*, *48*(7), 685-698.

Harris, M., Alzua, M. L., Osbert, N., & Pickering, A. (2017). Community-level sanitation coverage more strongly associated with child growth and household drinking water quality than access to a private toilet in rural Mali. *Environmental science & technology*, *51*(12), 7219-7227.

Hawkes, C., & Fanzo, J. (2017). Nourishing the SDGs: Global Nutrition Report 2017.

Humphrey, J. H. (2009). Child undernutrition, tropical enteropathy, toilets, and handwashing. *The Lancet*, *374*(9694), 1032-1035.

Humphrey, J. H., Mbuya, M. N. N., Ntozini, R., Moulton, L. H., Stoltzfus, R. J., Tavengwa, N. v., Mutasa, K., Majo, F., Mutasa, B., Mangwadu, G., Chasokela, C. M., Chigumira, A., Chasekwa, B., Smith, L. E., Tielsch, J. M., Jones, A. D., Manges, A. R., Maluccio, J. A., Prendergast, A. J., ... Makoni, T. (2019). Independent and combined effects of improved water, sanitation, and hygiene, and improved complementary feeding, on child stunting and anaemia in rural Zimbabwe: a cluster-randomised trial. *The Lancet Global Health*, *7*(1). https://doi.org/10.1016/S2214-109X(18)30374-7

Husseini, M., Darboe, M. K., Moore, S. E., Nabwera, H. M., & Prentice, A. M. (2018). Thresholds of socio-economic and environmental conditions necessary to escape from childhood malnutrition: a natural experiment in rural Gambia. *BMC medicine*, *16*(1), 1-9.

Interagency Microbiological Risk Assessment Guideline Workgroup. (2012). Microbial Risk Assessment Guideline: Pathogenic Microorganisms with Focus on Food and Water [EPA/100/J-12/001]. U.S. Environmental Protection Agency (EPA).

Jack, D. W., Ayuurebobi, K., Gould, C. F., Boamah-Kaali, E., Lee, A. G., Mujtaba, M. N., Chillrud, S., Kaali, S., Quinn, A. K., Gyaase, S., Oppong, F. B., Carrión, D. Agyei, O., Burkhart, K., Ana-aro, J. A., Liu, X., Berko, Y. A., Wylie, B, J., Etego, S. A., Whyatt, R., Owusu-Agyei, S., Kinney, P. & Asante, K. P. (2021). A cluster randomised trial of cookstove interventions to improve infant health in Ghana. *BMJ Global Health*, *6*(8), e005599.

Kaali, S., Jack, D., & Lee, A. G. (2021). The Conundrum of Cleaner Cookstove Interventions: Necessary but Insufficient? *American Journal of Respiratory and Critical Care Medicine*, 203(11), 1336-1337.

Kennedy, G., Nantel, G., Brouwer, I. D., & Kok, F. J. (2006). Does living in an urban environment confer advantages for childhood nutritional status? Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal. *Public Health Nutrition*, *9*(2), 187-193.

Leroy, Jef L (2011). zscore06: Stata command for the calculation of anthropometric z-scores using the 2006 WHO child growth standards. http://www.ifpri.org/staffprofile/jef-leroy

Lin, A., Arnold, B. F., Afreen, S., Goto, R., Huda, T. M. N., Haque, R., Raqib, R., Unicomb, L., Ahmed, T., Colford Jr., J. M., & Luby, S. P. (2013). Household environmental conditions are associated with enteropathy and impaired growth in rural Bangladesh. *The American journal of tropical medicine and hygiene*, *89*(1), 130.

Luby, S. P., Rahman, M., Arnold, B. F., Unicomb, L., Ashraf, S., Winch, P. J., Stewart, C. P., Begum, F., Hussain, F., Benjaming-Chung, B., Leontsini, E., Naser, A. M., Parvez, S. M., Hubbard, A. E., Lin, A., Nizame, F. A., Jannat, K. Ercumen, A., Ram, P. K., Das, K. K., Abedin, J., Clasen, T. F., Dewey, K. G., Fernald, L. C., Null, C., Ahmed, T. & Colford Jr, J. M. (2018). Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomised controlled trial. *The Lancet Global Health*, *6*(3), e302-e315.

Mbuya, M. N., & Humphrey, J. H. (2016). Preventing environmental enteric dysfunction through improved water, sanitation and hygiene: an opportunity for stunting reduction in developing countries. *Maternal & child nutrition*, *12*, 106-120.

Mills, J. E., & Cumming, O. (2016). The impact of water, sanitation and hygiene on key health and social outcomes. *Sanitation and Hygiene Applied Research for Equity (SHARE) and UNICEF*, 112.

Momberg, D. J., Ngandu, B. C., Voth-Gaeddert, L. E., Ribeiro, K. C., May, J., Norris, S. A., & Said-Mohamed, R. (2021). Water, sanitation and hygiene (WASH) in sub-Saharan Africa and associations with undernutrition, and governance in children under five years of age: a systematic review. Journal of Developmental Origins of Health and Disease, 12(1), 6-33.

Mortimer, K., Lesosky, M., Semple, S., Malava, J., Katundu, C., Crampin, A., Wang, D., Weston, W., Pope, D., Havens, D., Gordon, S.B., & Balmes, J. (2020). Pneumonia and exposure to household air pollution in children under the age of 5 years in rural Malawi: findings from the cooking and pneumonia study. *Chest*, *158*(2), 501-511.

Nshimyiryo, A., Hedt-Gauthier, B., Mutaganzwa, C., Kirk, C. M., Beck, K., Ndayisaba, A., Mubiligi, J., Kateera, F. & El-Khatib, Z. (2019). Risk factors for stunting among children under five years: a cross-sectional population-based study in Rwanda using the 2015 Demographic and Health Survey. *BMC public health*, *19*(1), 1-10.

Null, C., Stewart, C. P., Pickering, A. J., Dentz, H. N., Arnold, B. F., Arnold, C. D., Benjamin-Chung, J., Clasen, T., Dewey, K. G., Fernald, L. C. H., Hubbard, A. E.,

Kariger, P., Lin, A., Luby, S. P., Mertens, A., Njenga, S. M., Nyambane, G., Ram, P. K. & Colford Jr, J. M. (2018). Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: a cluster-randomised controlled trial. *The Lancet Global Health*, *6*(3), e316-e329.

Pickering, A. J., Djebbari, H., Lopez, C., Coulibaly, M., & Alzua, M. L. (2015). Effect of a community-led sanitation intervention on child diarrhoea and child growth in rural Mali: a cluster-randomised controlled trial. *The Lancet Global Health*, *3*(11), e701-e711.

Pickering, A. J., Null, C., Winch, P. J., Mangwadu, G., Arnold, B. F., Prendergast, A. J., Njenga, S. M., Rahman, M., Ntozini, R., Benjamin-Chung, J., Stewart, C. P., Huda, T. M. N., Moulton, L. H., Colford Jr., J. M., Luby, S. P. & Humphrey, J. H. (2019). The WASH Benefits and SHINE trials: interpretation of WASH intervention effects on linear growth and diarrhoea. The Lancet Global Health, 7(8), e1139-e1146.

Pongou, R., Ezzati, M., & Salomon, J. A. (2006). Household and community socioeconomic and environmental determinants of child nutritional status in Cameroon. *BMC public health*, *6*(1), 1-19.

Pruss-Ustun, A., Corvalán, C. F., & World Health Organization. (2006). *Preventing disease through healthy environments: towards an estimate of the environmental burden of disease*. World Health Organization.

Ravindra, K., & Smith, K. R. (2018). Better kitchens and toilets: both needed for better health. *Environmental Science and Pollution Research*, *25*(13), 12299-12302.

Schoeman, S., Faber, M., Adams, V., Smuts, C., Ford-Ngomane, N., Laubscher, J., & Dhansay, M. (2010). Adverse social, nutrition and health conditions in rural districts of KwaZulu-Natal and the Eastern Cape provinces, South Africa. *South African journal of clinical nutrition*, *23*(3).

Shrestha, A., Six, J., Dahal, D., Marks, S., & Meierhofer, R. (2020). Association of nutrition, water, sanitation and hygiene practices with children's nutritional status, intestinal parasitic infections and diarrhoea in rural Nepal: a cross-sectional study. *BMC public health*, *20*(1), 1-21.

Sinharoy, S. S., Clasen, T., & Martorell, R. (2020). Air pollution and stunting: a missing link?. *The Lancet Global Health*, *8*(4), e472-e475.

Spears, D. (2013). How much international variation in child height can sanitation explain?. *World Bank policy research working paper*, (6351).

StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC.

Takele, K., Zewotir, T., & Ndanguza, D. (2019). Understanding correlates of child stunting in Ethiopia using generalized linear mixed models. *BMC Public Health*, *19*(1), 1-8.

Tusting, L. S., Gething, P. W., Gibson, H. S., Greenwood, B., Knudsen, J., Lindsay, S. W., & Bhatt, S. (2020). Housing and child health in sub-Saharan Africa: A cross-sectional analysis. *PLoS medicine*, *17*(3), e1003055.

Uganda Bureau of Statistics (UBS). (2012) Uganda- National Panel Survey (UNPS) 2005-2009, Ref. UGA_2005_2009_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2014a). Uganda- National Panel Survey (UNPS) 2010-2011, Ref. UGA_2010_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2014b). Uganda- National Panel Survey (UNPS) 2011-2012, Ref. UGA_2011_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2016). Uganda- National Panel Survey (UNPS) 2013-2014, Ref. UGA_2013_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2019). Uganda- National Panel Survey (UNPS) 2015-2016, Ref. UGA_2015_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2020). Uganda- National Panel Survey (UNPS) 2018-2019, Ref. UGA_2018_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Uganda Bureau of Statistics (UBS). (2021). Uganda- National Panel Survey (UNPS) 2019-2020, Ref. UGA_2019_UNPS_v01_M. Dataset downloaded from https://microdata.worldbank.org/index.php/catalog/lsms on April 21, 2021.

Wamani, H., Åstrøm, A. N., Peterson, S., Tumwine, J. K., & Tylleskär, T. (2007). Boys are more stunted than girls in sub-Saharan Africa: a meta-analysis of 16 demographic and health surveys. *BMC pediatrics*, *7*(1), 1-10.

Whittington, D., Radin, M., & Jeuland, M. (2020). Evidence-based policy analysis? The strange case of the randomized controlled trials of community-led total sanitation. *Oxford Review of Economic Policy*, *36*(1), 191-221.

Wolff, C. G., Schroeder, D. G., & Young, M. W. (2001). Effect of improved housing on illness in children under 5 years old in northern Malawi: cross sectional study. *Bmj*, *322*(7296), 1209-1212.

World Bank. (2021). World Development Indicators DataBank. Accessed 16 September 2021. Washington, DC, USA: The World Bank. http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators.

World Health Organization (WHO). (2006). *WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development*. World Health Organization.

World Health Organization, & United Nations Children's Fund (WHO & UNICEF). (2013). *Progress on sanitation and drinking-water*. World Health Organization.

Supplementary Materials

Table S1: Wave 1 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	2020	31.935	15.025	5	59
Age calculated (months)	2021	32.67	15.226	1	60
Child's parent is head of household	2021	.776	0.417	0	1
Mother age (years)	1639	30.34	7.596	0	76
Mother has a formal job	2021	.027	0.163	0	1
Total number of people per household	2021	7.448	3.134	2	23
Total number of people ≥16 per household	1896	5.712	2.834	1	19
Percent of households members that are females	2021	.517	0.172	.1	1
Owns a solar panel	2020	.012	0.108	0	1
Owns a generator	2016	.007	0.086	0	1
Owns a mobile phone	2020	.526	0.499	0	1
Household has electricity	2016	.086	0.281	0	1
Hours of electricity access	168	19.53	6.431	0	24
Household members have at least one pair of shoes	2012	.431	0.495	0	1

Household faced hunger in the past year	2008	.501	0.500	0	1
Per capita expenses (UGX 100,000)	2021	3.047	3.333	.011	30.216
Rural household	2021	.815	0.388	0	1
Health Variables					
Diarrhea (past two weeks)	720	.344	0.476	0	1
Bloody diarrhea (past two weeks)	247	.19	0.393	0	1
Cough (past two weeks)	723	.314	0.464	0	1
Fever (past two weeks)	723	.497	0.500	0	1
Height-for-age Z score	2021	-1.496	1.646	-5.95	5.96
Stunted	2021	.368	0.482	0	1
Weight-for-age Z score	2063	-.875	1.263	-5.86	4.25
Wasted	2008	.156	0.363	0	1

Table S2: Wave 1 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	2001	.01	0.099	0	1
Cooks on an open fire	2019	.789	0.408	0	1
Cooks with firewood	2020	.855	0.352	0	1
Cooks with charcoal	2020	.225	0.418	0	1
Cooks with crop residue	2020	.118	0.322	0	1
Cooks with kersosene	2020	.043	0.202	0	1
Cooks with electricity	2020	.007	0.086	0	1
Cooks with LPG	2020	.002	0.044	0	1
Cooks with dung	2020	0	0.000	0	0
Household cooks outdoors	2004	.232	0.422	0	1

Main stove has a chimney	1986	.04	0.195	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	1938	.085	0.278	0	1
Lights with kerosene	2020	.894	0.308	0	1
Lights with solar power	2020	.007	0.086	0	1
Lights with electricity	2020	.073	0.261	0	1
Lights with firewood	2020	.033	0.179	0	1
Lights with a torch	0	.	.	.	.
Lights with crop residue	2020	.003	0.054	0	1
Water Technology					
Uses an improved water source	2020	.739	0.439	0	1
Treats water before drinking	2018	.428	0.495	0	1
Flooring Technology					
Has a non-mud floor	2018	.26	0.439	0	1
Sanitation Technology					
Has access to a toilet	2010	.903	0.295	0	1
Has a private improved toilet	2020	.484	0.500	0	1
Handwashing Technology					
Has a handwashing facility	2011	.122	0.328	0	1
Has a handwashing facility with soap	2011	.033	0.180	0	1
Six-way Interaction of All Services					
Total services 1*	0	.	.	.	.
Total services 2*	0	.	.	.	.
Total services 3*	1903	.004	0.065	0	1
Total services 4*	1901	.005	0.069	0	1

Table S3: Wave 2 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	1614	33.003	14.691	2	59
Age calculated (months)	1614	33.915	15.389	2	60
Child's parent is head of household	1614	.773	0.419	0	1
Mother age (years)	1352	30.361	7.130	8	69
Mother has a formal job	1614	.027	0.161	0	1
Total number of people per household	1614	7.333	2.837	2	20
Total number of people ≥16 per household	1614	5.645	2.820	1	19
Percent of households members that are females	1612	.521	.168	0	1
Owns a solar panel	1610	.025	0.156	0	1
Owns a generator	1600	.007	0.083	0	1
Owns a mobile phone	1610	.612	0.487	0	1
Household has electricity	1601	.089	0.285	0	1
Hours of electricity access	143	17.846	6.673	3	24
Household members have at least one pair of shoes	1597	.436	0.496	0	1
Household faced hunger in the past year	1597	.264	0.441	0	1
Per capita expenses (UGX 100,000)	1614	4.364	4.762	.112	33.117
Rural household	1614	.838	0.368	0	1
Health Variables					
Diarrhea (past two weeks)	497	.27	0.444	0	1
Bloody diarrhea (past two weeks)	134	.119	0.325	0	1
Cough (past two weeks)	498	.191	0.393	0	1
Fever (past two weeks)	498	.347	0.477	0	1

Height-for-age Z score	1614	-1.506	1.553	-5.98	5.86
Stunted	1614	.367	0.482	0	1
Weight-for-age Z score	1603	-.761	1.208	-5.41	5.57
Wasted	1582	.121	0.327	0	1

Table S4: Wave 2 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	1602	.012	0.108	0	1
Cooks on an open fire	1601	.786	0.410	0	1
Cooks with firewood	1610	.848	0.359	0	1
Cooks with charcoal	1610	.235	0.424	0	1
Cooks with crop residue	1610	.087	0.282	0	1
Cooks with kersosene	1610	.045	0.208	0	1
Cooks with electricity	1610	.009	0.096	0	1
Cooks with LPG	1610	.002	0.043	0	1
Cooks with dung	1610	0	0.000	0	0
Household cooks outdoors	1595	.214	0.410	0	1
Main stove has a chimney	1595	.035	0.184	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	1496	.101	0.301	0	1
Lights with kerosene	1610	.839	0.368	0	1
Lights with solar power	1610	.021	0.144	0	1
Lights with electricity	1610	.073	0.260	0	1
Lights with firewood	1610	.053	0.224	0	1
Lights with a torch	0	.	.	.	.

Lights with crop residue	1610	.006	0.075	0	1
Water Technology					
Uses an improved water source	1602	.76	0.427	0	1
Treats water before drinking	1600	.398	0.490	0	1
Flooring Technology					
Has a non-mud floor	1592	.263	0.440	0	1
Sanitation Technology					
Has access to a toilet	1597	.884	0.320	0	1
Has a private improved toilet	1602	.465	0.499	0	1
Handwashing Technology					
Has a handwashing facility	1600	.066	0.248	0	1
Has a handwashing facility with soap	1600	.019	0.136	0	1
Six-way Interaction of All Services					
Total services 1*	0	.	.	.	.
Total services 2*	0	.	.	.	.
Total services 3*	1465	.004	0.064	0	1
Total services 4*	1465	.004	0.064	0	1

Table S5: Wave 3 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	1540	31.99	15.022	6	59
Age calculated (months)	1540	33.486	15.644	2	60
Child's parent is head of household	1540	.797	0.403	0	1
Mother age (years)	1374	30.187	7.167	6	66
Mother has a formal job	1540	.018	0.134	0	1
Total number of people per household	1540	7.385	3.010	2	22

Total number of people ≥16 per household	1540	6.152	3.413	1	28
Percent of households members that are females	1539	.516	0.167	.111	1
Owns a solar panel	1537	.032	0.176	0	1
Owns a generator	1538	.006	0.076	0	1
Owns a mobile phone	1537	.704	0.457	0	1
Household has electricity	1538	.101	0.302	0	1
Hours of electricity access	152	18.164	6.98	2	24
Household members have at least one pair of shoes	1538	.469	0.499	0	1
Household faced hunger in the past year	1538	.237	0.425	0	1
Per capita expenses (UGX 100,000)	1540	5.473	6.077	.036	58.551
Rural household	1540	.851	0.356	0	1
Health Variables					
Diarrhea (past two weeks)	550	.236	0.425	0	1
Bloody diarrhea (past two weeks)	130	.115	0.321	0	1
Cough (past two weeks)	550	.282	0.450	0	1
Fever (past two weeks)	550	.398	0.490	0	1
Height-for-age Z score	1540	-1.638	1.373	-5.97	5.03
Stunted	1540	.372	0.484	0	1
Weight-for-age Z score	1554	-.851	1.160	-5.42	4.3
Wasted	1525	.13	0.336	0	1

Table S6: Wave 3 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	1540	.856	0.351	0	1

Cooks on an open fire	1540	.245	0.430	0	1
Cooks with firewood	1540	.102	0.303	0	1
Cooks with charcoal	1540	.034	0.181	0	1
Cooks with crop residue	1540	.003	0.057	0	1
Cooks with kersosene	1540	.002	0.044	0	1
Cooks with electricity	1540	.001	0.025	0	1
Cooks with LPG	1538	.215	0.411	0	1
Cooks with dung	1537	.041	0.198	0	1
Household cooks outdoors	1540	.856	0.351	0	1
Main stove has a chimney	1540	.245	0.430	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	1305	.107	0.310	0	1
Lights with kerosene	1540	.776	0.417	0	1
Lights with solar power	1540	.021	0.143	0	1
Lights with electricity	1540	.07	0.255	0	1
Lights with firewood	1540	.031	0.172	0	1
Lights with a torch	0	.	.	.	.
Lights with crop residue	1540	.016	0.126	0	1
Water Technology					
Uses an improved water source	1538	.791	0.407	0	1
Treats water before drinking	1538	.395	0.489	0	1
Flooring Technology					
Has a non-mud floor	1528	.256	0.437	0	1
Sanitation Technology					
Has access to a toilet	1535	.906	0.293	0	1
Has a private improved toilet	1538	.467	0.499	0	1
Handwashing Technology					

Has a handwashing facility	1538	.096	0.294	0	1
Has a handwashing facility with soap	1538	.038	0.192	0	1
Six-way Interaction of All Services					
Total services 1*	0	.	.	.	.
Total services 2*	0	.	.	.	.
Total services 3*	1283	.001	0.028	0	1
Total services 4*	1283	.001	0.028	0	1

Table S7: Wave 4 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	1691	32.171	15.115	6	59
Age calculated (months)	1691	32.879	15.381	1	60
Child's parent is head of household	1691	.777	0.416	0	1
Mother age (years)	1526	29.678	6.961	16	50
Mother has a formal job	1691	.024	0.154	0	1
Total number of people per household	1691	7.241	3.157	2	24
Total number of people ≥16 per household	1691	4.491	2.310	1	16
Percent of households members that are females	1691	.524	0.172	.111	1
Owns a solar panel	1691	.064	0.245	0	1
Owns a generator	1691	.005	0.069	0	1
Owns a mobile phone	1691	.724	0.447	0	1
Household has electricity	1691	.09	0.287	0	1
Hours of electricity access	152	18.164	6.980	2	24
Household members have at least one pair of shoes	1690	.498	0.500	0	1
Household faced hunger in the past year	1690	.279	0.448	0	1

Per capita expenses (UGX 100,000)	1691	5.721	6.072	.171	51.303
Rural household	1691	.812	0.391	0	1
Health Variables					
Diarrhea (past two weeks)	1689	.137	0.344	0	1
Bloody diarrhea (past two weeks)	232	.198	0.400	0	1
Cough (past two weeks)	574	.256	0.437	0	1
Fever (past two weeks)	573	.312	0.464	0	1
Height-for-age Z score	1691	-1.426	1.459	-5.91	5.85
Stunted	1691	.344	0.475	0	1
Weight-for-age Z score	1700	-.743	1.149	-5.28	5.43
Wasted	1676	.119	0.324	0	1

Table S8: Wave 4 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	1679	.006	0.077	0	1
Cooks on an open fire	1691	.853	0.354	0	1
Cooks with firewood	1690	.87	0.337	0	1
Cooks with charcoal	1690	.205	0.404	0	1
Cooks with crop residue	1690	.122	0.327	0	1
Cooks with kersosene	1690	.026	0.159	0	1
Cooks with electricity	1690	.004	0.059	0	1
Cooks with LPG	1690	.004	0.059	0	1
Cooks with dung	1690	0	0.000	0	0
Household cooks outdoors	1690	.204	0.403	0	1
Main stove has a chimney	1687	.068	0.251	0	1

Lighting Technology					
Uses at least some clean fuels for lighting	1369	.162	0.369	0	1
Lights with kerosene	1690	.694	0.461	0	1
Lights with solar power	1690	.054	0.226	0	1
Lights with electricity	1690	.08	0.272	0	1
Lights with firewood	1690	.032	0.176	0	1
Lights with a torch	0	.	.	.	.
Lights with crop residue	1690	.005	0.073	0	1
Water Technology					
Uses an improved water source	1384	.936	0.245	0	1
Treats water before drinking	1691	.394	0.489	0	1
Flooring Technology					
Has a non-mud floor	1689	.269	0.444	0	1
Sanitation Technology					
Has access to a toilet	1691	.906	0.292	0	1
Has a private improved toilet	1684	.093	0.290	0	1
Handwashing Technology					
Has a handwashing facility	1532	.121	0.327	0	1
Has a handwashing facility with soap	1532	.033	0.179	0	1
Six-way Interaction of All Services					
Total services 1*	990	.003	0.055	0	1
Total services 2*	1240	.005	0.069	0	1
Total services 3*	990	.005	0.071	0	1
Total services 4*	1240	.005	0.069	0	1

Table S9: Wave 5 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max

Demographic and Socioeconomic Variables					
Age reported (months)	1291	37.256	13.124	7	59
Age calculated (months)	1291	38.24	13.060	12	60
Child's parent is head of household	1291	.824	0.381	0	1
Mother age (years)	1172	30.172	7.003	16	57
Mother has a formal job	1291	.02	0.141	0	1
Total number of people per household	1291	6.513	2.871	2	24
Total number of people ≥16 per household	1291	4.111	2.228	1	16
Percent of households members that are females	1288	.528	0.175	.111	1
Owns a solar panel	1291	.158	0.365	0	1
Owns a generator	1291	.004	0.062	0	1
Owns a mobile phone	1291	.768	0.423	0	1
Household has electricity	1291	.096	0.295	0	1
Hours of electricity access	124	19.226	7.189	0	24
Household members have at least one pair of shoes	1290	.496	0.500	0	1
Household faced hunger in the past year	1289	.23	0.421	0	1
Per capita expenses (UGX 100,000)	1291	6.865	7.018	.201	65.614
Rural household	1291	.813	0.390	0	1
Health Variables					
Diarrhea (past two weeks)	972	.082	0.275	0	1
Bloody diarrhea (past two weeks)	79	.152	0.361	0	1
Cough (past two weeks)	254	.228	0.421	0	1
Fever (past two weeks)	254	.283	0.452	0	1
Height-for-age Z score	1291	-1.381	1.337	-5.99	4.56
Stunted	1291	.311	0.463	0	1
Weight-for-age Z score	1295	-.732	1.027	-4.71	3.08

Wasted	1287	.092	0.290	0	1

Table S10: Wave 5 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	1289	.004	0.062	0	1
Cooks on an open fire	1291	.876	0.330	0	1
Cooks with firewood	1291	.878	0.328	0	1
Cooks with charcoal	1291	.23	0.421	0	1
Cooks with crop residue	1291	.204	0.403	0	1
Cooks with kersosene	1291	.023	0.151	0	1
Cooks with electricity	1291	.003	0.056	0	1
Cooks with LPG	1291	.001	0.028	0	1
Cooks with dung	1291	.002	0.039	0	1
Household cooks outdoors	1291	.181	0.385	0	1
Main stove has a chimney	1290	.064	0.244	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	989	.311	0.463	0	1
Lights with kerosene	1291	.559	0.497	0	1
Lights with solar power	1291	.149	0.357	0	1
Lights with electricity	1291	.09	0.286	0	1
Lights with firewood	1291	.029	0.167	0	1
Lights with a torch	0	.	.	.	.
Lights with crop residue	1291	.008	0.088	0	1
Water Technology					
Uses an improved water source	1050	.945	0.229	0	1
Treats water before drinking	1291	.35	0.477	0	1

Flooring Technology					
Has a non-mud floor	1289	.279	0.448	0	1
Sanitation Technology					
Has access to a toilet	1291	.918	0.275	0	1
Has a private improved toilet	1290	.098	0.298	0	1
Handwashing Technology					
Has a handwashing facility	1184	.097	0.296	0	1
Has a handwashing facility with soap	1184	.018	0.132	0	1
Six-way Interaction of All Services					
Total services 1*	735	.001	0.037	0	1
Total services 2*	915	.001	0.033	0	1
Total services 3*	735	.001	0.037	0	1
Total services 4*	915	.001	0.033	0	1

Table S11: Wave 7 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	0	.	.	.	.
Age calculated (months)	2004	33.22	16.707	0	60
Child's parent is head of household	2004	.77	0.421	0	1
Mother age (years)	0	.	.	.	.
Mother has a formal job	0	.	.	.	.
Total number of people per household	2004	7.399	3.382	2	29
Total number of people ≥16 per household	2004	5.044	2.711	1	23
Percent of households members that are females	2002	.491	0.174	.083	1
Owns a solar panel	1996	.404	0.491	0	1

Owns a generator	2004	0	0.000	0	0
Owns a mobile phone	1999	.789	0.408	0	1
Household has electricity	2004	.113	0.317	0	1
Hours of electricity access	227	19.441	7.179	1	24
Household members have at least one pair of shoes	0	.	.	.	.
Household faced hunger in the past year	0	.	.	.	.
Per capita expenses (UGX 100,000)	2004	7.669	9.196	.03	131.497
Rural household	2004	.799	0.401	0	1
Health Variables					
Diarrhea (past two weeks)	0	.	.	.	.
Bloody diarrhea (past two weeks)	0	.	.	.	.
Cough (past two weeks)	0	.	.	.	.
Fever (past two weeks)	0	.	.	.	.
Height-for-age Z score	2004	-1.208	1.393	-5.82	5.83
Stunted	2004	.266	0.442	0	1
Weight-for-age Z score	2042	-.65	1.092	-5.07	4.53
Wasted	2000	.093	0.291	0	1

Table S12: Wave 7 ESHI Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Cooking Technology					
Uses at least some clean fuels for cooking	1984	.023	0.151	0	1
Cooks on an open fire	1703	1	0.000	1	1
Cooks with firewood	1998	.877	0.329	0	1
Cooks with charcoal	2003	.229	0.420	0	1
Cooks with crop residue	2002	.207	0.405	0	1

Cooks with kersosene	2000	.018	0.133	0	1
Cooks with electricity	2001	.006	0.080	0	1
Cooks with LPG	2004	.004	0.063	0	1
Cooks with dung	1999	.001	0.032	0	1
Household cooks outdoors	1996	.186	0.390	0	1
Main stove has a chimney	1990	.112	0.315	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	1823	.553	0.497	0	1
Lights with kerosene	2000	.221	0.415	0	1
Lights with solar power	2001	.413	0.492	0	1
Lights with electricity	2001	.098	0.298	0	1
Lights with firewood	1998	.029	0.167	0	1
Lights with a torch	590	.019	0.135	0	1
Lights with crop residue	2002	.006	0.080	0	1
Water Technology					
Uses an improved water source	1708	.952	0.214	0	1
Treats water before drinking	2004	.351	0.477	0	1
Flooring Technology					
Has a non-mud floor	1964	.304	0.460	0	1
Sanitation Technology					
Has access to a toilet	2004	.895	0.306	0	1
Has a private improved toilet	2004	.121	0.327	0	1
Handwashing Technology					
Has a handwashing facility	1801	.102	0.303	0	1
Has a handwashing facility with soap	1801	.035	0.184	0	1
Six-way Interaction of All Services					
Total services 1*	1340	.003	0.055	0	1

Total services 2*	1601	.004	0.061	0	1
Total services 3*	1340	.006	0.077	0	1
Total services 4*	1601	.004	0.061	0	1

Table S13: Wave 8 Demographic, Socioeconomic, and Health Variables for Children 5 and Under

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographic and Socioeconomic Variables					
Age reported (months)	1622	33.38	15.729	1	60
Age calculated (months)	1678	34.221	16.166	1	60
Child's parent is head of household	1678	.765	0.424	0	1
Mother age (years)	1196	30.836	7.849	11	79
Mother has a formal job	1678	1	0.000	1	1
Total number of people per household	1678	6.675	2.691	2	19
Total number of people ≥16 per household	1678	4.074	1.948	1	13
Percent of households members that are females	1676	.531	0.174	.143	1
Owns a solar panel	1676	.482	0.500	0	1
Owns a generator	1678	0	0.000	0	0
Owns a mobile phone	1678	.796	0.403	0	1
Household has electricity	1678	.126	0.332	0	1
Hours of electricity access	211	20.389	6.304	1	24
Household members have at least one pair of shoes	1678	.565	0.496	0	1
Household faced hunger in the past year	1678	.203	0.402	0	1
Per capita expenses (UGX 100,000)	1678	8.31	7.986	.125	60.058
Rural household	1678	.825	0.380	0	1
Health Variables					
Diarrhea (past two weeks)	1634	.101	0.301	0	1

Bloody diarrhea (past two weeks)	165	.097	0.297	0	1
Cough (past two weeks)	1634	.196	0.397	0	1
Fever (past two weeks)	1634	.282	0.450	0	1
Height-for-age Z score	1678	-1.289	1.393	-5.74	5.63
Stunted	1678	.277	0.447	0	1
Weight-for-age Z score	1696	-.719	1.063	-4.84	4.23
Wasted	1668	.091	0.288	0	1

Table S14: Wave 8 ESHI Summary Statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Cooking Technology					
Uses at least some clean fuels for cooking	1664	.022	0.147	0	1
Cooks on an open fire	1678	.851	0.356	0	1
Cooks with firewood	1678	.859	0.348	0	1
Cooks with charcoal	1678	.239	0.427	0	1
Cooks with crop residue	1678	.231	0.422	0	1
Cooks with kersosene	1678	.018	0.133	0	1
Cooks with electricity	1678	.008	0.088	0	1
Cooks with LPG	1678	.001	0.035	0	1
Cooks with dung	1678	.001	0.035	0	1
Household cooks outdoors	1667	.182	0.386	0	1
Main stove has a chimney	1662	.049	0.215	0	1
Lighting Technology					
Uses at least some clean fuels for lighting	1581	.619	0.486	0	1
Lights with kerosene	1678	.178	0.383	0	1
Lights with solar power	1678	.48	0.500	0	1

Lights with electricity	1678	.116	0.321	0	1
Lights with firewood	1678	.023	0.151	0	1
Lights with a torch	501	.024	0.153	0	1
Lights with crop residue	1678	.014	0.119	0	1
Water Technology					
Uses an improved water source	1466	.953	0.212	0	1
Treats water before drinking	1677	.332	0.471	0	1
Flooring Technology					
Has a non-mud floor	1662	.316	0.465	0	1
Sanitation Technology					
Has access to a toilet	1678	.906	0.291	0	1
Has a private improved toilet	1676	.114	0.318	0	1
Handwashing Technology					
Has a handwashing facility	1523	.092	0.289	0	1
Has a handwashing facility with soap	1523	.016	0.125	0	1
Six-way Interaction of All Services					
Total services 1*	1217	0	0.000	0	0
Total services 2*	1409	.001	0.027	0	1
Total services 3*	1217	.001	0.029	0	1
Total services 4*	1409	.001	0.027	0	1

Table S15: Full Regression Results HAZ

VARIABLES	(1) Model 1 Simple	(2) Model 1: Simple with Total Services 1	(3) Model 1: Controls with Total Services 1	(4) Model 2 Simple	(5) Model 2: Simple with Total Services 2	(6) Model 2: Controls with Total Services 2	(7) Model 3: Simple	(8) Model 3: Simple with Total Services 3	(9) Model 3: Controls with Total Services 3	(10) Model 3: More Controls with Total Services 3	(11) Model 4 Simple	(12) Model 4: Simple with Total Services 4	(13) Model 4: Controls with Total Services 4	(14) Model 4: More Controls with Total Services 4
Total Services 1		1.070**	0.714											
		(0.527)	(0.513)											
Total Services 2					1.160**	0.918**								
					(0.463)	(0.438)								
Total Services 3								0.843***	0.922***	0.754*				
								(0.319)	(0.308)	(0.413)				
Total Services 4												0.877***	0.906***	0.770*
												(0.315)	(0.322)	(0.413)
Clean fuel for cooking	0.352**	0.237	0.202	0.316*	0.108	0.0665	0.204	-0.0126	-0.108	-0.0770	0.185	-0.0307	-0.116	-0.0766
	(0.179)	(0.188)	(0.187)	(0.170)	(0.176)	(0.176)	(0.141)	(0.150)	(0.154)	(0.192)	(0.135)	(0.141)	(0.144)	(0.189)
Clean fuel for lighting	0.204***	0.206***	0.121**	0.185***	0.185***	0.0964*	0.232***	0.232***	0.104**	0.112	0.207***	0.207***	0.0781*	0.0665
	(0.0512)	(0.0512)	(0.0550)	(0.0464)	(0.0464)	(0.0492)	(0.0451)	(0.0451)	(0.0501)	(0.0695)	(0.0417)	(0.0417)	(0.0456)	(0.0624)
Improved water source	0.340***	0.340***	0.336***				0.0276	0.0279	0.0181	-0.0241				
	(0.104)	(0.104)	(0.103)				(0.0534)	(0.0534)	(0.0533)	(0.0595)				
Treats water				0.0524	0.0516	0.0239					0.0735*	0.0738*	0.0284	0.0259
				(0.0549)	(0.0548)	(0.0544)					(0.0413)	(0.0413)	(0.0413)	(0.0494)
Improved toilet	0.194***	0.197***	0.163***	0.214***	0.216***	0.193***								
	(0.0604)	(0.0604)	(0.0611)	(0.0548)	(0.0548)	(0.0557)								
Any toilet							0.162*	0.163*	0.0862	0.126	0.168*	0.168*	0.0961	0.127
							(0.0912)	(0.0912)	(0.0899)	(0.0964)	(0.0904)	(0.0904)	(0.0890)	(0.0962)
Improved floor	0.179***	0.181***	0.108*	0.166***	0.169***	0.105*	0.337***	0.339***	0.234***	0.218***	0.315***	0.318***	0.224***	0.209***
	(0.0591)	(0.0591)	(0.0600)	(0.0539)	(0.0538)	(0.0552)	(0.0454)	(0.0454)	(0.0467)	(0.0574)	(0.0431)	(0.0431)	(0.0443)	(0.0543)
Handwashing with soap	0.254*	0.195	0.109											
	(0.137)	(0.137)	(0.134)											
Handwashing				0.0702	0.0459	0.00781	0.102*	0.0795	-0.00638	0.0291	0.0913*	0.0705	-0.000806	0.0198
				(0.0666)	(0.0662)	(0.0654)	(0.0580)	(0.0584)	(0.0584)	(0.0727)	(0.0546)	(0.0549)	(0.0549)	(0.0686)
Female			0.163***			0.183***			0.138***	0.140***			0.152***	0.153***
			(0.0465)			(0.0426)			(0.0360)	(0.0424)			(0.0341)	(0.0405)
Parent is head of household			0.00338			0.0165			0.0599	-0.0326			0.0630	-0.00634
			(0.0622)			(0.0554)			(0.0453)	(0.0662)			(0.0428)	(0.0627)
Number ≥16 in household			-0.0121			-0.0126			0.00838	0.0117			0.00730	0.0105
			(0.0204)			(0.0185)			(0.0116)	(0.0142)			(0.0113)	(0.0140)
Per capita expenses (UGX 100,000)			0.0153***			0.0157***			0.0175***	0.0135***			0.0172***	0.0136***
			(0.00364)			(0.00344)			(0.00325)	(0.00493)			(0.00315)	(0.00475)
Age (months)			-0.0667***			-0.0680***			-0.0699***	-0.0746***			-0.0705***	-0.0750***
			(0.00699)			(0.00639)			(0.00522)	(0.00646)			(0.00494)	(0.00612)
Age^2 (months)			0.000935***			0.000942***			0.000953***	0.00103***			0.000958***	0.00103***
			(9.55e-05)			(8.74e-05)			(7.25e-05)	(9.08e-05)			(6.87e-05)	(8.61e-05)
Age of mother										0.00926***				0.00825***
										(0.00303)				(0.00292)
Mother has formal job										-0.188				-0.261

										(0.374)				(0.365)
Faced hunger in past year										-0.0850*				-0.0895**
										(0.0460)				(0.0445)
Has electricity			-0.130			-0.121			-0.0623	-0.105			-0.0495	-0.0658
			(0.101)			(0.0949)			(0.0829)	(0.111)			(0.0795)	(0.105)
Owns a generator			-0.441			-0.578*			0.404	0.367			0.346	0.362
			(0.342)			(0.341)			(0.322)	(0.377)			(0.319)	(0.377)
Owns a TV			0.199**			0.175**			0.166**	0.209**			0.167**	0.199**
			(0.0905)			(0.0840)			(0.0761)	(0.103)			(0.0723)	(0.0975)
Owns a mobile phone			0.0912			0.105*			0.154***	0.187***			0.152***	0.164***
			(0.0635)			(0.0571)			(0.0428)	(0.0499)			(0.0408)	(0.0480)
Owns a bike			-0.0109			0.0284			0.0611*	0.0537			0.0673*	0.0624
			(0.0505)			(0.0458)			(0.0371)	(0.0439)			(0.0352)	(0.0420)
Owns a radio			-0.0612			-0.0217			0.0888**	0.0814*			0.0868**	0.0863*
			(0.0700)			(0.0623)			(0.0436)	(0.0480)			(0.0416)	(0.0460)
Number in the household			0.00603			0.00977			0.00199	-0.00991			0.00447	-0.00491
			(0.0166)			(0.0147)			(0.0104)	(0.0128)			(0.00990)	(0.0123)
Interviewed in February			-0.133			-0.152*			-0.125*	-0.164*			-0.136**	-0.164**
			(0.0961)			(0.0890)			(0.0725)	(0.0854)			(0.0691)	(0.0802)
Interviewed in March			-0.154			-0.137			-0.0603	0.00211			-0.0570	0.00576
			(0.0956)			(0.0867)			(0.0738)	(0.0971)			(0.0695)	(0.0913)
Interviewed in April			0.114			0.0953			-0.108	-0.121			-0.0962	-0.0924
			(0.117)			(0.106)			(0.0790)	(0.0954)			(0.0747)	(0.0893)
Interviewed in May			-0.0622			-0.137*			-0.158**	-0.129			-0.191***	-0.141
			(0.0874)			(0.0813)			(0.0734)	(0.0930)			(0.0693)	(0.0882)
Interviewed in June			-0.0131			-0.0498			-0.155**	-0.207**			-0.152**	-0.191**
			(0.0932)			(0.0877)			(0.0744)	(0.0959)			(0.0709)	(0.0917)
Interviewed in July			-0.0433			-0.109			-0.114	-0.215**			-0.140**	-0.204**
			(0.0948)			(0.0905)			(0.0735)	(0.0899)			(0.0704)	(0.0852)
Interviewed in August			-0.0315			-0.0428			-0.129*	-0.147			-0.117*	-0.123
			(0.0957)			(0.0846)			(0.0725)	(0.0902)			(0.0676)	(0.0837)
Interviewed in September			0.0787			0.0586			-0.0351	-0.0466			-0.0368	-0.0312
			(0.0966)			(0.0899)			(0.0765)	(0.0958)			(0.0729)	(0.0905)
Interviewed in October			0.222*			0.137			0.0700	0.0145			0.0463	0.0347
			(0.115)			(0.102)			(0.0799)	(0.0948)			(0.0751)	(0.0889)
Interviewed in November			-0.0644			-0.0705			-0.0259	-0.000858			-0.0348	-0.00433
			(0.0991)			(0.0900)			(0.0783)	(0.0981)			(0.0735)	(0.0914)
Interviewed in December			-0.196**			-0.205**			-0.165**	-0.202**			-0.171**	-0.179**
			(0.0984)			(0.0880)			(0.0729)	(0.0897)			(0.0684)	(0.0840)
Region 10							-0.149	-0.136	-0.156	-0.275	-0.178	-0.164	-0.178	-0.289
							(0.208)	(0.209)	(0.230)	(0.265)	(0.208)	(0.209)	(0.230)	(0.266)
Region 11	0.464**	0.444**	0.445**	0.420***	0.405**	0.385**	0.0594	0.0790	0.0848	-0.0574	0.0488	0.0603	0.0736	-0.0623
	(0.187)	(0.188)	(0.188)	(0.160)	(0.161)	(0.162)	(0.228)	(0.229)	(0.253)	(0.294)	(0.227)	(0.228)	(0.253)	(0.294)
Region 20	0.340**	0.346**	0.407***	0.340**	0.343**	0.359***	-0.0863	-0.0704	-0.0676	-0.150	-0.0660	-0.0479	-0.0677	-0.163
	(0.153)	(0.153)	(0.149)	(0.134)	(0.134)	(0.132)	(0.202)	(0.203)	(0.226)	(0.259)	(0.203)	(0.205)	(0.227)	(0.261)
Region 21	0.903***	0.914***	0.845***	0.880***	0.845***	0.766***	0.367	0.370	0.594*	0.318	0.380	0.384	0.596*	0.314
	(0.261)	(0.261)	(0.241)	(0.246)	(0.239)	(0.222)	(0.313)	(0.316)	(0.337)	(0.369)	(0.313)	(0.316)	(0.338)	(0.370)
Region 30	0.553***	0.556***	0.603***	0.504***	0.505***	0.506***	0.0495	0.0642	0.130	0.0563	0.0750	0.0919	0.136	0.0560
	(0.167)	(0.167)	(0.165)	(0.146)	(0.146)	(0.143)	(0.205)	(0.206)	(0.228)	(0.262)	(0.206)	(0.208)	(0.229)	(0.264)
Region 31	0.327	0.332	0.274	0.414*	0.417*	0.334	0.354	0.370	0.408	0.393	0.379	0.397	0.411	0.380
	(0.268)	(0.268)	(0.257)	(0.231)	(0.231)	(0.223)	(0.256)	(0.257)	(0.281)	(0.312)	(0.256)	(0.258)	(0.282)	(0.314)
Region 40	0.189	0.190	0.181	0.0162	0.0189	0.0144	-0.184	-0.169	-0.136	-0.285	-0.197	-0.180	-0.153	-0.300
	(0.180)	(0.181)	(0.176)	(0.137)	(0.138)	(0.134)	(0.214)	(0.215)	(0.236)	(0.267)	(0.212)	(0.214)	(0.235)	(0.267)
Region 41	0.115	0.117	0.146	0.121	0.127	0.134	0.272	0.287	0.214	0.0915	0.266	0.283	0.213	0.0850

	(0.235)	(0.235)	(0.229)	(0.212)	(0.212)	(0.208)	(0.271)	(0.272)	(0.304)	(0.348)	(0.271)	(0.272)	(0.304)	(0.349)
Survey Round 2							-0.554**	-0.556**	-0.481*	-0.503	-0.552**	-0.553**	-0.483*	-0.500
							(0.258)	(0.259)	(0.286)	(0.307)	(0.259)	(0.259)	(0.286)	(0.308)
Survey Round 3							0.427	0.434	0.378	0.388	0.419	0.427	0.375	0.378
							(0.426)	(0.425)	(0.414)	(0.474)	(0.425)	(0.425)	(0.414)	(0.477)
Survey Round 4							-0.507*	-0.502*	-0.532*	-0.635*	-0.416	-0.412	-0.459	-0.558*
							(0.282)	(0.282)	(0.292)	(0.332)	(0.273)	(0.273)	(0.285)	(0.323)
Survey Round 5	0.149	0.149	0.184	0.194*	0.197*	0.229*	-0.540*	-0.544*	-0.530*	-0.504	-0.474	-0.477	-0.471	-0.439
	(0.157)	(0.157)	(0.157)	(0.116)	(0.116)	(0.117)	(0.308)	(0.308)	(0.317)	(0.337)	(0.303)	(0.303)	(0.314)	(0.333)
Survey Round 7	0.301*	0.301*	0.338**	0.213*	0.215*	0.249*	-0.0283	-0.0410	-0.0316		0.00565	-0.00612	0.00591	
	(0.168)	(0.168)	(0.172)	(0.129)	(0.129)	(0.135)	(0.249)	(0.248)	(0.268)		(0.246)	(0.246)	(0.265)	
Survey Round 8	0.156	0.157	0.104	0.129	0.135	0.139	-0.0768	-0.0602	-0.0793		-0.116	-0.101	-0.122	
	(0.185)	(0.185)	(0.189)	(0.147)	(0.148)	(0.153)	(0.302)	(0.302)	(0.320)		(0.296)	(0.297)	(0.313)	
Region 10*Survey Round 2							0.718**	0.724**	0.598*	0.696**	0.721**	0.727***	0.607**	0.696**
							(0.281)	(0.281)	(0.306)	(0.332)	(0.281)	(0.282)	(0.306)	(0.333)
Region 10*Survey Round 3							-0.482	-0.484	-0.531	-0.500	-0.462	-0.465	-0.519	-0.485
							(0.440)	(0.440)	(0.428)	(0.489)	(0.440)	(0.439)	(0.428)	(0.491)
Region 10*Survey Round 4							0.330	0.329	0.292	0.468	0.325	0.322	0.312	0.466
							(0.322)	(0.322)	(0.329)	(0.372)	(0.304)	(0.304)	(0.313)	(0.355)
Region 10*Survey Round 5							0.517	0.522	0.473	0.617	0.574*	0.579*	0.555	0.613*
							(0.344)	(0.344)	(0.353)	(0.379)	(0.331)	(0.331)	(0.341)	(0.365)
Region 10*Survey Round 7							0.142	0.156	0.208		0.110	0.126	0.172	
							(0.286)	(0.285)	(0.300)		(0.275)	(0.275)	(0.290)	
Region 10*Survey Round 8							0.00624	-0.00572	0.0507	0.0852	0.134	0.124	0.216	0.285
							(0.342)	(0.342)	(0.356)	(0.423)	(0.329)	(0.329)	(0.341)	(0.400)
Region 11*Survey Round 2							0.554*	0.525*	0.331	0.384	0.561*	0.541*	0.345	0.376
							(0.317)	(0.317)	(0.342)	(0.372)	(0.317)	(0.316)	(0.342)	(0.372)
Region 11*Survey Round 3							-0.909**	-0.924**	-1.012**	-0.967*	-0.890*	-0.896*	-0.995**	-0.958*
							(0.459)	(0.458)	(0.451)	(0.517)	(0.459)	(0.458)	(0.452)	(0.519)
Region 11*Survey Round 4							0.609*	0.588*	0.504	0.683*	0.538*	0.529	0.456	0.594
							(0.338)	(0.338)	(0.353)	(0.401)	(0.327)	(0.327)	(0.343)	(0.388)
Region 11*Survey Round 5	-0.146	-0.133	-0.198	-0.253	-0.240	-0.280	0.638*	0.639*	0.518	0.485	0.533	0.543	0.434	0.369
	(0.234)	(0.233)	(0.228)	(0.198)	(0.197)	(0.193)	(0.367)	(0.366)	(0.376)	(0.402)	(0.359)	(0.358)	(0.369)	(0.396)
Region 11*Survey Round 7	-0.566**	-0.569**	-0.705***	-0.450**	-0.456**	-0.586***	-0.113	-0.115	-0.312		-0.112	-0.105	-0.316	
	(0.246)	(0.246)	(0.240)	(0.214)	(0.214)	(0.208)	(0.308)	(0.306)	(0.323)		(0.304)	(0.302)	(0.319)	
Region 11*Survey Round 8	-0.471*	-0.447*	-0.534**	-0.450**	-0.439*	-0.552**	-0.140	-0.160	-0.266	-0.250	-0.0830	-0.0917	-0.206	-0.157
	(0.259)	(0.259)	(0.259)	(0.227)	(0.228)	(0.227)	(0.353)	(0.353)	(0.370)	(0.434)	(0.347)	(0.347)	(0.363)	(0.424)
Region 20*Survey Round 2							0.523*	0.523*	0.419	0.440	0.527*	0.527*	0.423	0.439
							(0.273)	(0.273)	(0.299)	(0.320)	(0.273)	(0.273)	(0.299)	(0.320)
Region 20*Survey Round 3							-0.526	-0.535	-0.549	-0.601	-0.510	-0.519	-0.545	-0.592
							(0.439)	(0.438)	(0.426)	(0.485)	(0.438)	(0.437)	(0.426)	(0.487)

Region 20*Survey Round 4							0.612**	0.607**	0.599*	0.640*	0.545*	0.540*	0.548*	0.596*
							(0.304)	(0.304)	(0.314)	(0.353)	(0.295)	(0.295)	(0.306)	(0.344)
Region 20*Survey Round 5	-0.132	-0.134	-0.117	-0.208	-0.210	-0.182	0.647**	0.650**	0.663**	0.590*	0.580*	0.582*	0.605*	0.536
	(0.188)	(0.188)	(0.185)	(0.153)	(0.153)	(0.151)	(0.327)	(0.327)	(0.336)	(0.356)	(0.322)	(0.322)	(0.332)	(0.353)
Region 20*Survey Round 7	-0.0965	-0.0998	-0.190	-0.0275	-0.0288	-0.0977	0.313	0.327	0.306		0.296	0.309	0.275	
	(0.200)	(0.200)	(0.196)	(0.168)	(0.168)	(0.164)	(0.268)	(0.267)	(0.282)		(0.265)	(0.264)	(0.280)	
Region 20*Survey Round 8	-0.125	-0.128	-0.111	-0.110	-0.113	-0.124	0.201	0.187	0.251	0.327	0.261	0.248	0.311	0.435
	(0.215)	(0.215)	(0.211)	(0.183)	(0.183)	(0.180)	(0.316)	(0.317)	(0.331)	(0.385)	(0.311)	(0.312)	(0.325)	(0.377)
Region 21*Survey Round 2							0.610	0.635*	0.396	0.655	0.626*	0.652*	0.412	0.656
							(0.380)	(0.381)	(0.418)	(0.440)	(0.380)	(0.381)	(0.417)	(0.441)
Region 21*Survey Round 3							-0.666	-0.662	-0.972*	-0.937	-0.650	-0.645	-0.962*	-0.921
							(0.585)	(0.586)	(0.573)	(0.632)	(0.583)	(0.584)	(0.573)	(0.634)
Region 21*Survey Round 4							0.740*	0.724	0.366	0.668	0.654	0.638	0.302	0.586
							(0.445)	(0.443)	(0.447)	(0.484)	(0.438)	(0.437)	(0.442)	(0.477)
Region 21*Survey Round 5	-1.026***	-1.028***	-0.950***	-1.055***	-1.018***	-0.946***	-0.0862	-0.0690	-0.349	-0.173	-0.139	-0.121	-0.394	-0.224
	(0.388)	(0.388)	(0.360)	(0.371)	(0.366)	(0.343)	(0.479)	(0.480)	(0.489)	(0.514)	(0.475)	(0.477)	(0.486)	(0.511)
Region 21*Survey Round 7	-0.502	-0.514	-0.443	-0.403	-0.373	-0.304	0.0320	0.0525	-0.178		0.0307	0.0516	-0.191	
	(0.332)	(0.333)	(0.315)	(0.313)	(0.307)	(0.293)	(0.395)	(0.396)	(0.416)		(0.392)	(0.393)	(0.414)	
Region 21*Survey Round 8	-0.366	-0.372	-0.388	-0.375	-0.335	-0.365	0.101	0.106	-0.184	-0.162	0.128	0.135	-0.130	-0.0478
	(0.332)	(0.332)	(0.315)	(0.308)	(0.301)	(0.285)	(0.422)	(0.424)	(0.438)	(0.489)	(0.415)	(0.417)	(0.429)	(0.478)
Region 30*Survey Round 2							0.476*	0.476*	0.355	0.336	0.470*	0.471*	0.356	0.330
							(0.274)	(0.274)	(0.300)	(0.321)	(0.274)	(0.274)	(0.300)	(0.322)
Region 30*Survey Round 3							-0.574	-0.582	-0.604	-0.648	-0.564	-0.572	-0.600	-0.642
							(0.437)	(0.436)	(0.425)	(0.485)	(0.436)	(0.436)	(0.425)	(0.487)
Region 30*Survey Round 4							0.684**	0.678**	0.619*	0.666*	0.573*	0.569*	0.520*	0.560
							(0.313)	(0.313)	(0.323)	(0.362)	(0.301)	(0.301)	(0.312)	(0.350)
Region 30*Survey Round 5	-0.333	-0.334	-0.351*	-0.328*	-0.331*	-0.335*	0.516	0.519	0.475	0.398	0.478	0.480	0.437	0.350
	(0.210)	(0.210)	(0.208)	(0.175)	(0.175)	(0.173)	(0.340)	(0.340)	(0.347)	(0.369)	(0.333)	(0.333)	(0.342)	(0.363)
Region 30*Survey Round 7	-0.0897	-0.0873	-0.163	0.0316	0.0348	-0.0186	0.418	0.437	0.352		0.398	0.416	0.324	
	(0.212)	(0.212)	(0.210)	(0.176)	(0.176)	(0.173)	(0.271)	(0.270)	(0.286)		(0.267)	(0.266)	(0.282)	
Region 30*Survey Round 8	-0.134	-0.133	-0.112	-0.0599	-0.0600	-0.0693	0.259	0.248	0.265	0.345	0.334	0.324	0.330	0.456
	(0.227)	(0.227)	(0.225)	(0.191)	(0.191)	(0.189)	(0.320)	(0.321)	(0.335)	(0.390)	(0.313)	(0.314)	(0.327)	(0.380)
Region 31*Survey Round 2							0.823**	0.822**	0.654*	0.472	0.814**	0.814**	0.659*	0.482
							(0.339)	(0.339)	(0.361)	(0.398)	(0.340)	(0.340)	(0.361)	(0.398)
Region 31*Survey Round 3							-0.868*	-0.875*	-0.979**	-1.109**	-0.863*	-0.870*	-0.972**	-1.094**
							(0.481)	(0.481)	(0.473)	(0.530)	(0.480)	(0.480)	(0.474)	(0.532)
Region 31*Survey Round							0.142	0.137	-0.000426	-0.0281	0.164	0.159	0.0359	0.0192

4														
							(0.406)	(0.407)	(0.412)	(0.451)	(0.383)	(0.384)	(0.393)	(0.428)
Region 31*Survey Round 5	0.00309	0.00197	0.0765	-0.0185	-0.0231	0.0196	0.338	0.339	0.307	0.172	0.409	0.410	0.362	0.235
	(0.299)	(0.300)	(0.296)	(0.272)	(0.272)	(0.267)	(0.377)	(0.377)	(0.391)	(0.410)	(0.387)	(0.387)	(0.399)	(0.422)
Region 31*Survey Round 7	0.103	0.0981	0.0514	0.0333	0.0282	-0.0107	0.0869	0.0976	-0.0277		0.0275	0.0377	-0.0902	
	(0.332)	(0.332)	(0.322)	(0.290)	(0.290)	(0.284)	(0.344)	(0.343)	(0.362)		(0.341)	(0.340)	(0.360)	
Region 31*Survey Round 8	-0.0433	-0.0479	-0.0511	-0.106	-0.110	-0.147	-0.160	-0.176	-0.251	-0.415	-0.0810	-0.0949	-0.163	-0.276
	(0.345)	(0.345)	(0.329)	(0.301)	(0.302)	(0.289)	(0.389)	(0.389)	(0.401)	(0.457)	(0.381)	(0.382)	(0.393)	(0.448)
Region 40*Survey Round 2							0.204	0.204	0.124	0.136	0.194	0.194	0.127	0.133
							(0.290)	(0.291)	(0.313)	(0.335)	(0.290)	(0.290)	(0.313)	(0.335)
Region 40*Survey Round 3							-0.678	-0.686	-0.710	-0.690	-0.672	-0.681	-0.705	-0.676
							(0.447)	(0.446)	(0.436)	(0.495)	(0.446)	(0.445)	(0.436)	(0.497)
Region 40*Survey Round 4							0.521	0.516	0.423	0.567	0.365	0.361	0.320	0.483
							(0.327)	(0.327)	(0.334)	(0.373)	(0.306)	(0.306)	(0.316)	(0.352)
Region 40*Survey Round 5	0.0775	0.0773	0.151	-0.122	-0.125	-0.0473	0.760**	0.763**	0.764**	0.758*	0.475	0.478	0.522	0.586
	(0.259)	(0.259)	(0.262)	(0.184)	(0.184)	(0.185)	(0.361)	(0.361)	(0.370)	(0.390)	(0.339)	(0.339)	(0.349)	(0.368)
Region 40*Survey Round 7	-0.378*	-0.375	-0.477**	-0.132	-0.130	-0.235	-0.0103	0.00232	-0.0923		0.0284	0.0460	-0.0534	
	(0.229)	(0.229)	(0.221)	(0.180)	(0.180)	(0.173)	(0.281)	(0.280)	(0.294)		(0.276)	(0.276)	(0.289)	
Region 40*Survey Round 8	-0.299	-0.298	-0.263	-0.0297	-0.0324	-0.0468	-0.0487	-0.0616	-0.0558	0.0218	0.129	0.117	0.132	0.246
	(0.250)	(0.250)	(0.246)	(0.198)	(0.198)	(0.194)	(0.335)	(0.336)	(0.348)	(0.402)	(0.324)	(0.325)	(0.337)	(0.388)
Region 41*Survey Round 5	-0.210	-0.213	-0.218	-0.250	-0.260	-0.271								
	(0.356)	(0.356)	(0.354)	(0.329)	(0.329)	(0.326)								
Region 41*Survey Round 7	0.157	0.169	0.0108	0.237	0.211	0.0978								
	(0.300)	(0.300)	(0.294)	(0.269)	(0.269)	(0.264)								
Region 41*Survey Round 8	0.228	0.238	0.124	0.167	0.172	0.0385								
	(0.356)	(0.355)	(0.346)	(0.324)	(0.324)	(0.316)								
Constant	-2.217***	-2.220***	-1.414***	-1.868***	-1.870***	-1.066***	-1.757***	-1.772***	-0.942***	-0.848***	-1.767***	-1.783***	-0.940***	-0.885***
	(0.156)	(0.156)	(0.220)	(0.107)	(0.108)	(0.184)	(0.215)	(0.216)	(0.258)	(0.309)	(0.210)	(0.212)	(0.253)	(0.304)
Observations	4,282	4,282	4,271	5,165	5,165	5,146	8,933	8,933	8,795	6,236	9,814	9,814	9,668	6,745
R-squared	0.055	0.056	0.099	0.048	0.050	0.094	0.054	0.055	0.097	0.090	0.051	0.052	0.095	0.088

Table S16: Full Regression Results WAZ

VARIABLES	(1) Model 1 Simple	(2) Model 1: Simple with Total	(3) Model 1: Total	(4) Model 2 Simple	(5) Model 2: Simple with Total	(6) Model 2: Total	(7) Model 3 Simple	(8) Model 3: Simple with Total	(9) Model 3: Total	(10) Model 3: Total V2	(11) Model 4 Simple	(12) Model 4: Simple with Total	(13) Model 4: Total	(14) Model 4: Total V2
Total Services 1		0.869***	0.663**											
		(0.288)	(0.296)											
Total Services 2					0.851***	0.688***								
					(0.240)	(0.235)								
Total Services 3								0.475*	0.253	0.273				
								(0.267)	(0.220)	(0.284)				
Total Services 4												0.645**	0.423**	0.276
												(0.256)	(0.208)	(0.283)
Clean fuel for cooking	0.155	0.0620	0.0290	0.152	-0.000174	-0.0380	0.173	0.0457	-0.0316	-0.00431	0.167	0.000921	-0.0701	0.0190
	(0.127)	(0.134)	(0.133)	(0.122)	(0.133)	(0.131)	(0.118)	(0.108)	(0.109)	(0.131)	(0.114)	(0.108)	(0.108)	(0.128)
Clean fuel for lighting	0.178***	0.179***	0.116***	0.152***	0.153***	0.0909**	0.166***	0.165***	0.0863**	0.0809	0.141***	0.140***	0.0631*	0.0394
	(0.0403)	(0.0404)	(0.0430)	(0.0374)	(0.0374)	(0.0397)	(0.0357)	(0.0357)	(0.0392)	(0.0527)	(0.0336)	(0.0336)	(0.0365)	(0.0486)
Improved water source	0.179**	0.179**	0.145*				-0.0460	-0.0459	-0.0692	-0.121**				
	(0.0846)	(0.0846)	(0.0847)				(0.0434)	(0.0434)	(0.0435)	(0.0489)				
Treats water				0.0218	0.0213	0.00879					0.0523*	0.0525*	0.0243	0.0192
				(0.0411)	(0.0411)	(0.0416)					(0.0310)	(0.0310)	(0.0315)	(0.0378)
Improved toilet	0.149***	0.152***	0.140***	0.161***	0.163***	0.151***								
	(0.0481)	(0.0481)	(0.0486)	(0.0439)	(0.0439)	(0.0443)								
Any toilet							0.220***	0.220***	0.171**	0.183**	0.223***	0.224***	0.175**	0.179**
							(0.0714)	(0.0714)	(0.0719)	(0.0776)	(0.0709)	(0.0709)	(0.0712)	(0.0776)
Improved floor	0.110**	0.112**	0.0509	0.0878**	0.0897**	0.0361	0.212***	0.214***	0.146***	0.138***	0.186***	0.188***	0.126***	0.122***
	(0.0460)	(0.0460)	(0.0472)	(0.0417)	(0.0417)	(0.0431)	(0.0354)	(0.0355)	(0.0372)	(0.0457)	(0.0337)	(0.0337)	(0.0353)	(0.0436)
Handwashing with soap	0.241**	0.193*	0.144											
	(0.0989)	(0.101)	(0.101)											
Handwashing				0.0854*	0.0679	0.0477	0.0902**	0.0773*	0.0207	0.0162	0.0797**	0.0640	0.0143	0.00778
				(0.0478)	(0.0481)	(0.0488)	(0.0418)	(0.0422)	(0.0427)	(0.0539)	(0.0400)	(0.0404)	(0.0409)	(0.0518)
Female			0.0357			0.0403			0.0237	0.0397			0.0292	0.0460
			(0.0359)			(0.0332)			(0.0288)	(0.0339)			(0.0275)	(0.0325)
Parent is head of household			-0.00777			0.00726			0.0522	0.0178			0.0549	0.0382
			(0.0466)			(0.0430)			(0.0366)	(0.0545)			(0.0349)	(0.0519)
Number ≥16 in household			0.00635			0.00129			0.0131	0.00915			0.0112	0.00744
			(0.0153)			(0.0142)			(0.00893)	(0.0116)			(0.00876)	(0.0114)
Per capita expenses (UGX 100,000)			0.00778***			0.00749***			0.0114***	0.00922***			0.0105***	0.00877***
			(0.00258)			(0.00247)			(0.00242)	(0.00333)			(0.00232)	(0.00322)
Age (months)			-0.0144***			-0.0114**			-0.0127***	-0.0122**			-0.0115***	-0.0119**
			(0.00530)			(0.00485)			(0.00409)	(0.00503)			(0.00386)	(0.00476)

Age^2 (months)	0.000124*	8.10e-05	0.000108*	0.000107	8.87e-05*	0.000101
	(7.31e-05)	(6.69e-05)	(5.68e-05)	(7.04e-05)	(5.36e-05)	(6.66e-05)
Age of mother				0.00414*		0.00321
				(0.00251)		(0.00242)
Mother has formal job				3.001***		3.002***
				(0.177)		(0.176)
Faced hunger in past year				-0.114***		-0.116***
				(0.0372)		(0.0359)
Has electricity	-0.0178	-0.0166	-0.00877	-0.0109	-0.00498	0.00132
	(0.0720)	(0.0701)	(0.0602)	(0.0772)	(0.0592)	(0.0749)
Owns a generator	0.00362	-0.0560	0.418**	0.331	0.408**	0.334
	(0.381)	(0.352)	(0.190)	(0.211)	(0.186)	(0.210)
Owns a TV	0.129**	0.107*	0.0831	0.118*	0.0821	0.116*
	(0.0635)	(0.0623)	(0.0538)	(0.0705)	(0.0530)	(0.0682)
Owns a mobile phone	0.158***	0.145***	0.113***	0.124***	0.109***	0.112***
	(0.0497)	(0.0441)	(0.0343)	(0.0393)	(0.0326)	(0.0377)
Owns a bike	0.0112	0.0235	0.0770***	0.0641*	0.0714***	0.0596*
	(0.0388)	(0.0351)	(0.0291)	(0.0344)	(0.0277)	(0.0329)
Owns a radio	-0.112**	-0.0417	0.0305	0.0339	0.0446	0.0494
	(0.0516)	(0.0467)	(0.0338)	(0.0372)	(0.0323)	(0.0357)
Number in the household	-0.00859	-0.00300	-0.00585	-0.00594	-0.00348	-0.000778
	(0.0126)	(0.0116)	(0.00808)	(0.0104)	(0.00788)	(0.0101)
Interviewed in February	0.0150	-0.0177	-0.0217	-0.0125	-0.0399	-0.0419
	(0.0742)	(0.0687)	(0.0542)	(0.0629)	(0.0520)	(0.0599)
Interviewed in March	-0.0716	-0.0590	-0.0386	0.0164	-0.0365	-0.00978
	(0.0730)	(0.0664)	(0.0564)	(0.0733)	(0.0532)	(0.0691)
Interviewed in April	0.0126	0.0152	-0.119**	-0.0835	-0.110*	-0.0880
	(0.0861)	(0.0800)	(0.0605)	(0.0724)	(0.0577)	(0.0685)
Interviewed in May	-0.0621	-0.125*	-0.101*	-0.0866	-0.137**	-0.117*
	(0.0686)	(0.0649)	(0.0566)	(0.0720)	(0.0540)	(0.0681)
Interviewed in June	-0.0960	-0.0794	-0.113**	-0.101	-0.0985*	-0.0937
	(0.0719)	(0.0666)	(0.0575)	(0.0742)	(0.0545)	(0.0706)
Interviewed in July	0.0160	-0.0328	-0.0521	-0.0748	-0.0712	-0.106
	(0.0746)	(0.0704)	(0.0563)	(0.0698)	(0.0540)	(0.0661)
Interviewed in August	0.0466	0.0279	0.00401	-0.0286	0.00242	-0.0569
	(0.0688)	(0.0629)	(0.0552)	(0.0671)	(0.0520)	(0.0630)
Interviewed in September	0.0457	0.0375	0.0430	0.0535	0.0374	0.0353
	(0.0725)	(0.0683)	(0.0584)	(0.0729)	(0.0557)	(0.0690)
Interviewed in October	0.110	0.0984	0.0464	0.0596	0.0428	0.0591
	(0.0913)	(0.0816)	(0.0618)	(0.0725)	(0.0585)	(0.0687)
Interviewed in November	0.00965	-0.0122	0.0540	0.0899	0.0336	0.0577
	(0.0763)	(0.0698)	(0.0579)	(0.0726)	(0.0548)	(0.0678)
Interviewed in December	-0.134*	-0.153**	-0.0298	-0.0291	-0.0524	-0.0486
	(0.0750)	(0.0671)	(0.0552)	(0.0674)	(0.0520)	(0.0633)

Region 10							-0.0233	-0.0136	-0.0224	-0.0666	-0.0263	-0.0122	-0.0171	-0.0482
							(0.160)	(0.160)	(0.167)	(0.176)	(0.159)	(0.159)	(0.167)	(0.175)
Region 11	-0.0399	-0.0560	-0.108	0.0158	0.00420	-0.0403	0.209	0.223	0.251	0.151	0.210	0.223	0.251	0.161
	(0.144)	(0.144)	(0.145)	(0.128)	(0.128)	(0.128)	(0.178)	(0.177)	(0.187)	(0.203)	(0.178)	(0.176)	(0.187)	(0.203)
Region 20	0.109	0.114	0.132	0.163	0.165	0.169*	-0.0131	-0.000859	0.00848	-0.0151	-0.00861	0.00928	-0.000974	-0.0357
	(0.118)	(0.118)	(0.115)	(0.103)	(0.103)	(0.101)	(0.156)	(0.156)	(0.165)	(0.172)	(0.157)	(0.156)	(0.165)	(0.174)
Region 21	0.397**	0.406**	0.361*	0.443**	0.418**	0.360**	0.103	0.108	0.227	0.150	0.103	0.111	0.220	0.134
	(0.188)	(0.189)	(0.188)	(0.177)	(0.175)	(0.174)	(0.217)	(0.219)	(0.232)	(0.247)	(0.218)	(0.219)	(0.232)	(0.248)
Region 30	-0.0786	-0.0762	-0.0752	-0.0104	-0.00966	-0.0203	-0.0874	-0.0759	-0.0121	-0.00204	-0.0704	-0.0534	-0.00714	0.00314
	(0.129)	(0.129)	(0.129)	(0.112)	(0.112)	(0.112)	(0.158)	(0.158)	(0.166)	(0.173)	(0.159)	(0.158)	(0.167)	(0.174)
Region 31	-0.129	-0.124	-0.190	0.00902	0.0109	-0.0493	0.197	0.209	0.180	0.189	0.206	0.224	0.170	0.163
	(0.239)	(0.239)	(0.244)	(0.189)	(0.189)	(0.194)	(0.196)	(0.196)	(0.212)	(0.232)	(0.198)	(0.197)	(0.213)	(0.233)
Region 40	0.0940	0.0955	0.0829	0.000297	0.00211	-0.00964	-0.0308	-0.0190	0.0356	0.0119	-0.0292	-0.0119	0.0333	0.0151
	(0.138)	(0.139)	(0.137)	(0.107)	(0.107)	(0.106)	(0.160)	(0.159)	(0.168)	(0.175)	(0.160)	(0.159)	(0.168)	(0.175)
Region 41	-0.206	-0.204	-0.240	-0.0983	-0.0940	-0.127	0.509**	0.521**	0.492**	0.586**	0.499**	0.516**	0.479**	0.563**
	(0.187)	(0.187)	(0.191)	(0.172)	(0.172)	(0.176)	(0.206)	(0.206)	(0.218)	(0.245)	(0.207)	(0.206)	(0.219)	(0.245)
Survey Round 2							-0.359	-0.360	-0.252	-0.387	-0.350	-0.351	-0.247	-0.379
							(0.235)	(0.236)	(0.242)	(0.277)	(0.236)	(0.236)	(0.242)	(0.278)
Survey Round 3							0.104	0.109	0.0775	0.0136	0.0959	0.103	0.0788	0.0187
							(0.339)	(0.338)	(0.328)	(0.352)	(0.340)	(0.340)	(0.331)	(0.357)
Survey Round 4							-0.626***	-0.623***	-0.648***	-0.741***	-0.526**	-0.523**	-0.549**	-0.635**
							(0.219)	(0.220)	(0.227)	(0.265)	(0.216)	(0.216)	(0.224)	(0.262)
Survey Round 5	-0.0170	-0.0172	0.0144	0.0412	0.0431	0.0632	-0.493**	-0.494**	-0.479**	-0.635***	-0.484**	-0.486**	-0.471**	-0.622***
	(0.117)	(0.117)	(0.115)	(0.0868)	(0.0868)	(0.0863)	(0.200)	(0.200)	(0.203)	(0.239)	(0.197)	(0.196)	(0.200)	(0.235)
Survey Round 7	-0.0639	-0.0636	-0.0968	-0.0187	-0.0168	-0.00284	-0.132	-0.139	-0.104		-0.0997	-0.108	-0.0627	
	(0.129)	(0.129)	(0.133)	(0.100)	(0.100)	(0.105)	(0.185)	(0.184)	(0.193)		(0.182)	(0.182)	(0.191)	
Survey Round 8	-0.173	-0.172	-0.245*	-0.0950	-0.0915	-0.0951	0.0429	0.0526	0.0654	-2.956***	0.0448	0.0566	0.0892	-2.978***
	(0.130)	(0.130)	(0.135)	(0.105)	(0.105)	(0.110)	(0.205)	(0.205)	(0.211)	(0.316)	(0.201)	(0.201)	(0.207)	(0.310)
Region 10*Survey Round 2							0.563**	0.567**	0.442*	0.660**	0.555**	0.560**	0.441*	0.651**
							(0.248)	(0.248)	(0.254)	(0.290)	(0.249)	(0.249)	(0.254)	(0.291)
Region 10*Survey Round 3							-0.0395	-0.0411	-0.0632	0.00214	-0.0292	-0.0311	-0.0606	-0.00609
							(0.350)	(0.349)	(0.339)	(0.364)	(0.351)	(0.350)	(0.342)	(0.369)
Region 10*Survey Round 4							0.750***	0.751***	0.783***	0.901***	0.624***	0.623***	0.646***	0.726**
							(0.249)	(0.250)	(0.256)	(0.291)	(0.239)	(0.239)	(0.246)	(0.283)
Region 10*Survey Round 5							0.612***	0.615***	0.623***	0.826***	0.624***	0.629***	0.625***	0.767***
							(0.232)	(0.232)	(0.236)	(0.273)	(0.221)	(0.221)	(0.225)	(0.261)
Region 10*Survey Round 7							0.208	0.217	0.242		0.192	0.204	0.225	
							(0.214)	(0.213)	(0.220)		(0.204)	(0.204)	(0.211)	
Region 10*Survey Round 8							-0.105	-0.111	-0.0660	-0.0766	-0.0420	-0.0484	-0.0158	-0.0243
							(0.231)	(0.231)	(0.235)	(0.288)	(0.222)	(0.222)	(0.227)	(0.274)
Region 11*Survey Round 2							0.447	0.431	0.294	0.425	0.433	0.418	0.283	0.391
							(0.276)	(0.276)	(0.281)	(0.316)	(0.276)	(0.276)	(0.282)	(0.317)
Region 11*Survey Round 3							-0.336	-0.346	-0.427	-0.285	-0.332	-0.339	-0.427	-0.306
							(0.367)	(0.366)	(0.357)	(0.384)	(0.368)	(0.367)	(0.359)	(0.390)
Region 11*Survey Round 4							0.526**	0.514*	0.479*	0.669**	0.438*	0.431*	0.397	0.552*
							(0.263)	(0.263)	(0.273)	(0.318)	(0.260)	(0.259)	(0.269)	(0.313)

Region 11*Survey Round 5	0.0885	0.0993	0.0684	-0.0154	-0.00551	-0.0140	0.455*	0.455*	0.381	0.595**	0.419*	0.426*	0.361	0.541*
	(0.174)	(0.173)	(0.169)	(0.151)	(0.150)	(0.146)	(0.249)	(0.248)	(0.254)	(0.292)	(0.244)	(0.244)	(0.249)	(0.287)
Region 11*Survey Round 7	0.0174	0.0152	-0.0317	-0.00211	-0.00527	-0.0692	-0.00452	-0.00544	-0.151		-0.00498	1.77e-05	-0.148	
	(0.189)	(0.188)	(0.187)	(0.167)	(0.166)	(0.165)	(0.232)	(0.231)	(0.238)		(0.229)	(0.228)	(0.236)	
Region 11*Survey Round 8	0.0903	0.109	0.0825	-0.00754	0.000586	-0.0484	-0.232	-0.243	-0.338	-0.334	-0.235	-0.242	-0.345	-0.306
	(0.190)	(0.190)	(0.191)	(0.170)	(0.170)	(0.170)	(0.248)	(0.248)	(0.253)	(0.306)	(0.243)	(0.243)	(0.249)	(0.300)
Region 20*Survey Round 2							0.378	0.378	0.264	0.406	0.373	0.373	0.259	0.398
							(0.245)	(0.245)	(0.251)	(0.286)	(0.246)	(0.246)	(0.252)	(0.287)
Region 20*Survey Round 3							-0.118	-0.124	-0.141	-0.0749	-0.109	-0.117	-0.143	-0.0832
							(0.348)	(0.348)	(0.338)	(0.361)	(0.350)	(0.349)	(0.340)	(0.367)
Region 20*Survey Round 4							0.847***	0.844***	0.862***	0.961***	0.763***	0.760***	0.778***	0.873***
							(0.237)	(0.237)	(0.244)	(0.282)	(0.233)	(0.234)	(0.241)	(0.278)
Region 20*Survey Round 5	-0.0132	-0.0144	-0.0154	-0.0944	-0.0962	-0.0877	0.674***	0.675***	0.679***	0.826***	0.664***	0.665***	0.668***	0.815***
	(0.142)	(0.142)	(0.140)	(0.118)	(0.118)	(0.116)	(0.219)	(0.219)	(0.222)	(0.257)	(0.215)	(0.215)	(0.218)	(0.252)
Region 20*Survey Round 7	0.00748	0.00474	-0.0130	-0.0507	-0.0516	-0.0731	0.289	0.297	0.283		0.270	0.279	0.259	
	(0.154)	(0.154)	(0.152)	(0.129)	(0.129)	(0.127)	(0.200)	(0.200)	(0.206)		(0.198)	(0.198)	(0.204)	
Region 20*Survey Round 8	-0.00693	-0.00988	-0.000630	-0.0840	-0.0858	-0.0957	0.00294	-0.00535	0.0124	0.0107	0.0229	0.0132	0.0193	0.0614
	(0.153)	(0.153)	(0.152)	(0.131)	(0.131)	(0.131)	(0.217)	(0.217)	(0.221)	(0.270)	(0.213)	(0.214)	(0.218)	(0.265)
Region 21*Survey Round 2							0.537*	0.552*	0.374	0.590	0.542*	0.561*	0.377	0.584
							(0.314)	(0.314)	(0.334)	(0.377)	(0.314)	(0.315)	(0.333)	(0.377)
Region 21*Survey Round 3							-0.0477	-0.0467	-0.182	-0.145	-0.0330	-0.0311	-0.181	-0.147
							(0.415)	(0.415)	(0.409)	(0.442)	(0.416)	(0.416)	(0.410)	(0.446)
Region 21*Survey Round 4							1.041***	1.033***	0.908***	1.050***	0.944***	0.933***	0.800**	0.934**
							(0.318)	(0.319)	(0.329)	(0.368)	(0.316)	(0.316)	(0.327)	(0.365)
Region 21*Survey Round 5	-0.535*	-0.538*	-0.546*	-0.586**	-0.560**	-0.552**	0.377	0.386	0.241	0.491	0.377	0.389	0.237	0.486
	(0.286)	(0.286)	(0.284)	(0.275)	(0.273)	(0.273)	(0.335)	(0.335)	(0.346)	(0.378)	(0.333)	(0.334)	(0.345)	(0.376)
Region 21*Survey Round 7	-0.117	-0.127	-0.0368	-0.152	-0.130	-0.0288	0.368	0.379	0.313		0.361	0.376	0.306	
	(0.253)	(0.253)	(0.248)	(0.238)	(0.236)	(0.232)	(0.286)	(0.287)	(0.295)		(0.285)	(0.286)	(0.294)	
Region 21*Survey Round 8	-0.167	-0.173	-0.133	-0.251	-0.221	-0.169	0.0434	0.0461	-0.0781	-0.0944	0.0571	0.0619	-0.0570	-0.0127
	(0.248)	(0.248)	(0.250)	(0.230)	(0.228)	(0.231)	(0.295)	(0.296)	(0.305)	(0.363)	(0.289)	(0.290)	(0.299)	(0.354)
Region 30*Survey Round 2							0.474*	0.474*	0.328	0.411	0.462*	0.462*	0.324	0.400
							(0.245)	(0.245)	(0.251)	(0.285)	(0.246)	(0.246)	(0.251)	(0.286)
Region 30*Survey Round 3							-0.151	-0.157	-0.175	-0.159	-0.146	-0.154	-0.182	-0.174
							(0.349)	(0.348)	(0.339)	(0.362)	(0.350)	(0.350)	(0.341)	(0.368)
Region 30*Survey Round 4							0.728***	0.725***	0.686***	0.704**	0.657***	0.653***	0.611**	0.624**
							(0.243)	(0.244)	(0.251)	(0.288)	(0.238)	(0.238)	(0.246)	(0.282)
Region 30*Survey	0.000350	-0.000162	-0.00896	-0.0586	-0.0605	-0.0644	0.572**	0.573**	0.527**	0.653**	0.590***	0.591***	0.536**	0.649**

Round 5														
	(0.160)	(0.160)	(0.160)	(0.131)	(0.131)	(0.131)	(0.229)	(0.229)	(0.232)	(0.266)	(0.223)	(0.223)	(0.226)	(0.259)
Region 30*Survey	0.303*	0.305*	0.297*	0.234*	0.237*	0.225	0.486**	0.497**	0.416**		0.457**	0.469**	0.386*	
Round 7														
	(0.164)	(0.164)	(0.165)	(0.136)	(0.136)	(0.137)	(0.203)	(0.202)	(0.209)		(0.199)	(0.199)	(0.206)	
Region 30*Survey	0.276*	0.276*	0.315*	0.160	0.160	0.178	0.161	0.155	0.135	0.132	0.156	0.148	0.112	0.146
Round 8														
	(0.164)	(0.164)	(0.165)	(0.140)	(0.140)	(0.141)	(0.221)	(0.221)	(0.225)	(0.273)	(0.216)	(0.217)	(0.221)	(0.266)
Region 31*Survey							0.756***	0.755***	0.676**	0.667**	0.743***	0.743***	0.676**	0.676**
Round 2														
							(0.280)	(0.280)	(0.287)	(0.335)	(0.281)	(0.281)	(0.288)	(0.336)
Region 31*Survey							-0.269	-0.273	-0.264	-0.235	-0.259	-0.265	-0.252	-0.219
Round 3														
							(0.384)	(0.384)	(0.378)	(0.405)	(0.386)	(0.385)	(0.380)	(0.410)
Region 31*Survey							0.388	0.385	0.373	0.402	0.387	0.384	0.376	0.403
Round 4														
							(0.337)	(0.338)	(0.348)	(0.389)	(0.308)	(0.308)	(0.320)	(0.359)
Region 31*Survey	0.0731	0.0720	0.0676	0.0362	0.0331	0.0451	0.332	0.332	0.338	0.447	0.440	0.440	0.461	0.555*
Round 5														
	(0.280)	(0.280)	(0.283)	(0.241)	(0.241)	(0.243)	(0.274)	(0.274)	(0.281)	(0.324)	(0.282)	(0.282)	(0.289)	(0.331)
Region 31*Survey	0.225	0.221	0.261	0.0688	0.0655	0.0803	0.0908	0.0966	0.0898		0.0583	0.0656	0.0539	
Round 7														
	(0.279)	(0.279)	(0.282)	(0.229)	(0.229)	(0.232)	(0.260)	(0.260)	(0.271)		(0.255)	(0.255)	(0.268)	
Region 31*Survey	0.195	0.191	0.245	0.0338	0.0307	0.0535	-0.224	-0.233	-0.193	-0.363	-0.199	-0.209	-0.172	-0.278
Round 8														
	(0.281)	(0.281)	(0.285)	(0.233)	(0.233)	(0.236)	(0.273)	(0.273)	(0.281)	(0.344)	(0.268)	(0.268)	(0.277)	(0.338)
Region 40*Survey							0.384	0.384	0.285	0.387	0.373	0.372	0.283	0.385
Round 2														
							(0.253)	(0.253)	(0.258)	(0.292)	(0.253)	(0.253)	(0.258)	(0.292)
Region 40*Survey							0.0376	0.0317	-0.00252	0.0389	0.0460	0.0382	-0.000593	0.0471
Round 3														
							(0.354)	(0.353)	(0.343)	(0.367)	(0.355)	(0.354)	(0.345)	(0.372)
Region 40*Survey							0.821***	0.818***	0.768***	0.795***	0.627***	0.624***	0.595**	0.643**
Round 4														
							(0.251)	(0.251)	(0.258)	(0.295)	(0.239)	(0.239)	(0.246)	(0.282)
Region 40*Survey	0.217	0.217	0.218	0.0378	0.0359	0.0601	0.880***	0.881***	0.839***	0.971***	0.654***	0.656***	0.637***	0.843***
Round 5														
	(0.179)	(0.179)	(0.178)	(0.131)	(0.131)	(0.131)	(0.235)	(0.235)	(0.237)	(0.270)	(0.223)	(0.222)	(0.226)	(0.257)
Region 40*Survey	0.0184	0.0211	-0.00511	0.103	0.104	0.0872	0.314	0.321	0.254		0.299	0.312	0.257	
Round 7														
	(0.176)	(0.176)	(0.174)	(0.139)	(0.139)	(0.138)	(0.207)	(0.207)	(0.213)		(0.203)	(0.203)	(0.209)	
Region 40*Survey	0.0850	0.0857	0.101	0.133	0.131	0.132	0.0865	0.0790	0.0495	0.0540	0.0827	0.0734	0.0388	0.0584
Round 8														
	(0.181)	(0.181)	(0.180)	(0.144)	(0.144)	(0.143)	(0.229)	(0.229)	(0.233)	(0.284)	(0.221)	(0.221)	(0.226)	(0.272)
Region 41*Survey	0.126	0.123	0.126	-0.00744	-0.0139	-0.00603								
Round 5														
	(0.228)	(0.228)	(0.233)	(0.208)	(0.207)	(0.211)								
Region 41*Survey	0.523**	0.533**	0.519**	0.450**	0.431**	0.407*								
Round 7														
	(0.231)	(0.231)	(0.234)	(0.209)	(0.209)	(0.211)								
Region 41*Survey	0.787***	0.795***	0.783***	0.642***	0.647***	0.619***								
Round 8														
	(0.249)	(0.249)	(0.248)	(0.227)	(0.228)	(0.227)								
Constant	-1.028***	-1.030***	-0.741***	-0.884***	-0.885***	-0.708***	-1.122***	-1.134***	-1.008***	-1.003***	-1.175***	-1.192***	-1.084***	-1.094***
	(0.122)	(0.122)	(0.171)	(0.0817)	(0.0817)	(0.140)	(0.164)	(0.164)	(0.194)	(0.216)	(0.162)	(0.161)	(0.191)	(0.212)

Observations	4,325	4,325	4,314	5,219	5,219	5,200	9,019	9,019	8,876	6,271	9,911	9,911	9,760	6,790
R-squared	0.038	0.039	0.061	0.030	0.031	0.051	0.044	0.044	0.062	0.067	0.040	0.040	0.057	0.061

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table S17: Regression Results with HAZ Alternative

VARIABLES	(1) Model 1 Simple	(2) Model 1: Simple with Total	(3) Model 1: Total	(4) Model 2 Simple	(5) Model 2: Simple with Total	(6) Model 2: Total	(7) Model 3 Simple	(8) Model 3: Simple with Total	(9) Model 3: Total	(10) Model 3: Total V2	(11) Model 4 Simple	(12) Model 4: Simple with Total	(13) Model 4: Total
Total Services 1		0.648	0.263										
		(0.537)	(0.534)										
Total Services 2					1.025	0.827							
					(0.863)	(0.820)							
Total Services 3								0.973**	1.208***	0.809*			
								(0.431)	(0.431)	(0.426)			
Total Services 4												0.877**	1.076**
												(0.412)	(0.435)
Clean fuel for cooking	0.616**	0.552*	0.544*	0.581**	0.387	0.372	0.299	0.0447	-0.0309	-0.0566	0.298*	0.0533	-0.0231
	(0.285)	(0.311)	(0.308)	(0.274)	(0.272)	(0.277)	(0.185)	(0.189)	(0.197)	(0.188)	(0.181)	(0.188)	(0.192)
Clean fuel for lighting	0.274***	0.274***	0.187***	0.234***	0.233***	0.154**	0.312***	0.310***	0.192***	0.142**	0.277***	0.275***	0.154***
	(0.0669)	(0.0670)	(0.0720)	(0.0595)	(0.0595)	(0.0639)	(0.0552)	(0.0552)	(0.0632)	(0.0713)	(0.0508)	(0.0508)	(0.0575)
Improved water source	0.365***	0.365***	0.373***				0.00441	0.00458	-0.0135	-0.0504			
	(0.137)	(0.137)	(0.135)				(0.0568)	(0.0568)	(0.0573)	(0.0611)			
Treats water				0.0380	0.0372	0.0254					0.0484	0.0488	0.0133
				(0.0656)	(0.0656)	(0.0659)					(0.0453)	(0.0453)	(0.0456)
Improved toilet	0.196**	0.198**	0.182**	0.225***	0.228***	0.222***							
	(0.0812)	(0.0813)	(0.0817)	(0.0729)	(0.0729)	(0.0736)							
Any toilet							0.198**	0.199**	0.110	0.170*	0.201**	0.202**	0.121
							(0.0917)	(0.0917)	(0.0911)	(0.0953)	(0.0917)	(0.0917)	(0.0911)
Improved floor	0.161**	0.162**	0.0967	0.128**	0.131**	0.0830	0.334***	0.338***	0.235***	0.199***	0.308***	0.312***	0.220***

	(0.0733)	(0.0733)	(0.0736)	(0.0653)	(0.0653)	(0.0663)	(0.0512)	(0.0512)	(0.0524)	(0.0575)	(0.0485)	(0.0485)	(0.0497)
Handwashing with soap	0.229	0.200	0.173										
	(0.182)	(0.188)	(0.188)										
Handwashing				0.0768	0.0583	0.0366	0.0920	0.0696	-0.0114	0.0153	0.0711	0.0511	-0.0151
				(0.0832)	(0.0826)	(0.0821)	(0.0631)	(0.0635)	(0.0648)	(0.0728)	(0.0597)	(0.0600)	(0.0612)
Female			0.217***			0.235***			0.177***	0.188***			0.190***
			(0.0556)			(0.0507)			(0.0400)	(0.0430)			(0.0382)
Parent is head of household			0.0452			0.104			0.0543	-0.0222			0.0742
			(0.0765)			(0.0671)			(0.0499)	(0.0671)			(0.0475)
Number ≥16 in household			-0.0133			-0.0199			0.0165	0.0215			0.0157
			(0.0305)			(0.0272)			(0.0126)	(0.0146)			(0.0124)
Per capita expenses (UGX 100,000)			0.0109**			0.0102**			0.0159***	0.0133***			0.0151***
			(0.00532)			(0.00494)			(0.00416)	(0.00468)			(0.00399)
Age (months)			-0.0655***			-0.0685***			-0.0631***	-0.0662***			-0.0648***
			(0.00856)			(0.00792)			(0.00541)	(0.00578)			(0.00524)
Age^2 (months)			0.000920***			0.000950***			0.000900***	0.000948***			0.000917***
			(0.000118)			(0.000110)			(7.70e-05)	(8.29e-05)			(7.46e-05)
Age of mother										0.00655**			
										(0.00312)			
Mother has formal job										-0.289			
										(0.394)			
Faced hunger in past year										-0.0818*			
										(0.0471)			
Has electricity			-0.150			-0.135			-0.0737	-0.137			-0.0550
			(0.130)			(0.121)			(0.0958)	(0.111)			(0.0911)
Owns a generator			-0.427			-0.613*			0.191	0.158			0.138
			(0.333)			(0.370)			(0.285)	(0.330)			(0.286)
Owns a TV			0.213*			0.176*			0.184**	0.253**			0.181**
			(0.111)			(0.103)			(0.0869)	(0.102)			(0.0825)
Owns a mobile phone			0.194**			0.157**			0.181***	0.217***			0.167***
			(0.0802)			(0.0705)			(0.0478)	(0.0513)			(0.0457)
Owns a bike			-0.0269			0.00240			0.0624	0.0404			0.0593
			(0.0599)			(0.0542)			(0.0409)	(0.0443)			(0.0389)
Owns a radio			-0.0452			0.00451			0.0653	0.0668			0.0697
			(0.0796)			(0.0708)			(0.0471)	(0.0503)			(0.0450)
Number in the household			5.80e-05			0.0109			-0.000682	-0.00959			0.00173
			(0.0230)			(0.0202)			(0.0114)	(0.0130)			(0.0110)
Interviewed in February			-0.0160			-0.0511			-0.0547	-0.108			-0.0737
			(0.107)			(0.0980)			(0.0792)	(0.0843)			(0.0748)
Interviewed in March			-0.105			-0.121			0.0461	0.0502			0.0239
			(0.165)			(0.146)			(0.0927)	(0.0986)			(0.0883)
Interviewed in April			0.223			0.171			-0.0463	-0.0643			-0.0483
			(0.139)			(0.122)			(0.0865)	(0.0949)			(0.0816)
Interviewed in May			-0.0373			-0.121			-0.132	-0.129			-0.166**
			(0.106)			(0.0976)			(0.0834)	(0.0914)			(0.0789)
Interviewed in June			0.0759			0.0308			-0.0896	-0.141			-0.0916
			(0.123)			(0.118)			(0.0884)	(0.0964)			(0.0850)

Interviewed in July			-0.0384			-0.110			-0.0982	-0.171*			-0.124
			(0.118)			(0.111)			(0.0827)	(0.0894)			(0.0789)
Interviewed in August			0.165			0.176*			-0.0125	-0.0472			0.0121
			(0.117)			(0.103)			(0.0818)	(0.0900)			(0.0767)
Interviewed in September			0.123			0.102			-0.0387	-0.0616			-0.0385
			(0.128)			(0.117)			(0.0869)	(0.0956)			(0.0824)
Interviewed in October			0.392***			0.265**			0.0663	0.0221			0.0461
			(0.146)			(0.127)			(0.0888)	(0.0950)			(0.0835)
Interviewed in November			-0.0687			-0.0807			-0.0962	-0.0760			-0.107
			(0.122)			(0.107)			(0.0855)	(0.0940)			(0.0798)
Interviewed in December			-0.0892			-0.111			-0.0890	-0.109			-0.0947
			(0.127)			(0.111)			(0.0830)	(0.0902)			(0.0775)
Region 10							-0.190	-0.177	-0.200	-0.509*	-0.221	-0.212	-0.224
							(0.225)	(0.226)	(0.247)	(0.269)	(0.225)	(0.226)	(0.247)
Region 11	0.271	0.258	0.279	0.288*	0.275*	0.291*	0.00835	0.0292	0.0557	-0.245	-0.00334	0.00465	0.0408
	(0.189)	(0.189)	(0.193)	(0.164)	(0.166)	(0.172)	(0.251)	(0.251)	(0.276)	(0.309)	(0.250)	(0.250)	(0.275)
Region 20	0.0707	0.0735	0.131	0.0616	0.0641	0.0929	-0.107	-0.0904	-0.0981	-0.446*	-0.116	-0.103	-0.128
	(0.161)	(0.161)	(0.156)	(0.142)	(0.142)	(0.140)	(0.221)	(0.223)	(0.244)	(0.264)	(0.223)	(0.223)	(0.245)
Region 21	0.688**	0.693**	0.600**	0.665**	0.634**	0.549**	0.447	0.449	0.672*	0.270	0.444	0.444	0.654*
	(0.291)	(0.291)	(0.268)	(0.278)	(0.265)	(0.247)	(0.326)	(0.330)	(0.352)	(0.379)	(0.326)	(0.329)	(0.352)
Region 30	0.353**	0.354**	0.396**	0.315**	0.317**	0.327**	-0.0313	-0.0155	0.0539	-0.224	-0.0341	-0.0219	0.0325
	(0.173)	(0.173)	(0.171)	(0.153)	(0.153)	(0.152)	(0.224)	(0.225)	(0.247)	(0.268)	(0.226)	(0.226)	(0.249)
Region 31	0.0248	0.0274	-0.0282	0.135	0.138	0.0727	0.299	0.316	0.336	-0.00216	0.301	0.314	0.316
	(0.268)	(0.268)	(0.256)	(0.242)	(0.242)	(0.234)	(0.271)	(0.272)	(0.299)	(0.316)	(0.272)	(0.273)	(0.300)
Region 40	-0.0254	-0.0244	-0.0569	-0.214	-0.211	-0.219	-0.336	-0.320	-0.284	-0.644**	-0.363	-0.350	-0.319
	(0.187)	(0.187)	(0.181)	(0.143)	(0.144)	(0.141)	(0.232)	(0.233)	(0.254)	(0.273)	(0.231)	(0.232)	(0.254)
Region 41	-0.0978	-0.0965	-0.0763	-0.108	-0.103	-0.0812	0.227	0.243	0.258	-0.0178	0.209	0.221	0.243
	(0.265)	(0.265)	(0.263)	(0.234)	(0.235)	(0.235)	(0.291)	(0.292)	(0.326)	(0.372)	(0.291)	(0.292)	(0.327)
Survey Round 2							-0.520*	-0.522*	-0.544*	-0.614*	-0.516*	-0.517*	-0.541*
							(0.293)	(0.294)	(0.312)	(0.359)	(0.294)	(0.294)	(0.314)
Survey Round 3							0.0751	0.0846	-0.0398	-0.285	0.0673	0.0764	-0.0424
							(0.356)	(0.356)	(0.368)	(0.423)	(0.356)	(0.356)	(0.369)
Survey Round 4							-0.573*	-0.567*	-0.658**	-0.841**	-0.502*	-0.497*	-0.598*
							(0.309)	(0.310)	(0.323)	(0.378)	(0.294)	(0.295)	(0.310)
Survey Round 5	0.125	0.125	0.163	0.181	0.184	0.222	-0.456	-0.458	-0.542	-0.627	-0.408	-0.410	-0.492
	(0.176)	(0.176)	(0.178)	(0.133)	(0.133)	(0.136)	(0.372)	(0.371)	(0.388)	(0.429)	(0.363)	(0.362)	(0.379)
Survey Round 8	-0.241	-0.240	-0.241	-0.256*	-0.250	-0.186	-0.0800	-0.0585	-0.174		-0.134	-0.115	-0.228
	(0.188)	(0.188)	(0.196)	(0.152)	(0.152)	(0.162)	(0.326)	(0.326)	(0.343)		(0.319)	(0.320)	(0.336)
Region 10*Survey Round 2							0.572*	0.579*	0.547*	0.664*	0.570*	0.576*	0.549*
							(0.312)	(0.312)	(0.329)	(0.379)	(0.313)	(0.313)	(0.331)
Region 10*Survey Round 3							-0.0904	-0.0942	-0.0821	0.183	-0.0756	-0.0794	-0.0742
							(0.372)	(0.372)	(0.383)	(0.440)	(0.373)	(0.373)	(0.385)
Region 10*Survey Round 4							0.546	0.545	0.564	0.790*	0.553*	0.550*	0.587*
							(0.348)	(0.348)	(0.359)	(0.415)	(0.325)	(0.325)	(0.338)
Region 10*Survey Round 5							0.555	0.560	0.591	0.843*	0.629	0.633	0.679*
							(0.406)	(0.406)	(0.425)	(0.470)	(0.388)	(0.388)	(0.406)

Region 10*Survey Round 8							-0.250	-0.265	-0.105	-0.00995	-0.109	-0.121	0.0774
							(0.360)	(0.361)	(0.374)	(0.433)	(0.348)	(0.348)	(0.360)
Region 11*Survey Round 2							0.464	0.432	0.269	0.391	0.465	0.447	0.282
							(0.348)	(0.347)	(0.365)	(0.427)	(0.348)	(0.347)	(0.366)
Region 11*Survey Round 3							-0.511	-0.530	-0.568	-0.323	-0.494	-0.502	-0.548
							(0.403)	(0.403)	(0.417)	(0.481)	(0.404)	(0.403)	(0.419)
Region 11*Survey Round 4							0.634*	0.610*	0.568	0.828*	0.632*	0.622*	0.594
							(0.364)	(0.364)	(0.381)	(0.447)	(0.350)	(0.350)	(0.369)
Region 11*Survey Round 5	-0.175	-0.167	-0.226	-0.320	-0.309	-0.341	0.464	0.463	0.401	0.494	0.391	0.400	0.352
	(0.254)	(0.254)	(0.248)	(0.216)	(0.216)	(0.212)	(0.426)	(0.425)	(0.448)	(0.499)	(0.414)	(0.414)	(0.436)
Region 11*Survey Round 8	-0.229	-0.214	-0.341	-0.260	-0.251	-0.409*	-0.332	-0.356	-0.381	-0.352	-0.260	-0.272	-0.300
	(0.259)	(0.259)	(0.260)	(0.230)	(0.231)	(0.233)	(0.378)	(0.378)	(0.393)	(0.456)	(0.371)	(0.371)	(0.386)
Region 20*Survey Round 2							0.521*	0.521*	0.518	0.620*	0.520*	0.520*	0.518
							(0.308)	(0.308)	(0.325)	(0.372)	(0.308)	(0.308)	(0.326)
Region 20*Survey Round 3							-0.168	-0.179	-0.139	0.0882	-0.157	-0.167	-0.138
							(0.372)	(0.372)	(0.383)	(0.436)	(0.373)	(0.373)	(0.384)
Region 20*Survey Round 4							0.539	0.533	0.587*	0.752*	0.495	0.490	0.559*
							(0.330)	(0.330)	(0.342)	(0.396)	(0.315)	(0.315)	(0.330)
Region 20*Survey Round 5	0.0322	0.0316	0.0568	-0.0527	-0.0552	-0.0200	0.565	0.567	0.677*	0.769*	0.517	0.519	0.636
	(0.206)	(0.206)	(0.204)	(0.168)	(0.168)	(0.167)	(0.389)	(0.389)	(0.405)	(0.447)	(0.380)	(0.379)	(0.397)
Region 20*Survey Round 8	0.223	0.221	0.233	0.235	0.232	0.204	0.0164	-0.00187	0.168	0.332	0.0953	0.0796	0.251
	(0.217)	(0.217)	(0.213)	(0.186)	(0.186)	(0.184)	(0.339)	(0.339)	(0.352)	(0.403)	(0.332)	(0.333)	(0.345)
Region 21*Survey Round 2							0.542	0.572	0.440	0.714	0.549	0.577	0.457
							(0.405)	(0.406)	(0.430)	(0.475)	(0.404)	(0.405)	(0.431)
Region 21*Survey Round 3							-0.527	-0.523	-0.773	-0.421	-0.511	-0.508	-0.754
							(0.516)	(0.518)	(0.524)	(0.580)	(0.515)	(0.516)	(0.524)
Region 21*Survey Round 4							0.623	0.605	0.330	0.571	0.553	0.538	0.284
							(0.469)	(0.464)	(0.468)	(0.512)	(0.459)	(0.454)	(0.459)
Region 21*Survey Round 5	-0.913**	-0.914**	-0.861**	-0.957**	-0.925**	-0.863**	-0.272	-0.253	-0.444	-0.218	-0.311	-0.295	-0.474
	(0.435)	(0.436)	(0.402)	(0.419)	(0.410)	(0.380)	(0.538)	(0.539)	(0.552)	(0.597)	(0.531)	(0.532)	(0.545)
Region 21*Survey Round 8	-0.0434	-0.0465	-0.0286	-0.0499	-0.0134	-0.0171	-0.161	-0.155	-0.367	-0.403	-0.116	-0.110	-0.285
	(0.363)	(0.363)	(0.346)	(0.340)	(0.328)	(0.313)	(0.445)	(0.447)	(0.459)	(0.507)	(0.436)	(0.438)	(0.450)
Region 30*Survey Round 2							0.494	0.494	0.452	0.473	0.485	0.486	0.449
							(0.307)	(0.307)	(0.325)	(0.371)	(0.307)	(0.307)	(0.326)
Region 30*Survey Round 3							0.0190	0.00895	0.0427	0.274	0.0253	0.0158	0.0443
							(0.373)	(0.373)	(0.384)	(0.439)	(0.374)	(0.374)	(0.386)
Region 30*Survey							0.742**	0.735**	0.737**	0.864**	0.670**	0.665**	0.676**

Round 4													
							(0.337)	(0.337)	(0.350)	(0.404)	(0.320)	(0.321)	(0.335)
Region 30*Survey	-0.193	-0.193	-0.213	-0.209	-0.211	-0.224	0.538	0.540	0.586	0.639	0.525	0.526	0.565
Round 5													
	(0.235)	(0.235)	(0.234)	(0.197)	(0.197)	(0.195)	(0.405)	(0.405)	(0.420)	(0.462)	(0.394)	(0.393)	(0.409)
Region 30*Survey	0.125	0.126	0.148	0.176	0.176	0.158	0.116	0.102	0.217	0.330	0.209	0.197	0.304
Round 8													
	(0.227)	(0.227)	(0.224)	(0.193)	(0.194)	(0.191)	(0.343)	(0.343)	(0.356)	(0.408)	(0.335)	(0.335)	(0.348)
Region 31*Survey							0.625*	0.625*	0.558	0.518	0.612*	0.612*	0.558
Round 2													
							(0.367)	(0.367)	(0.391)	(0.443)	(0.367)	(0.368)	(0.392)
Region 31*Survey							-0.103	-0.111	-0.115	0.112	-0.0993	-0.107	-0.107
Round 3													
							(0.443)	(0.443)	(0.459)	(0.508)	(0.444)	(0.444)	(0.461)
Region 31*Survey							0.0691	0.0633	0.0359	0.201	0.141	0.136	0.118
Round 4													
							(0.423)	(0.423)	(0.434)	(0.481)	(0.403)	(0.403)	(0.417)
Region 31*Survey	-0.0157	-0.0163	0.0542	-0.102	-0.106	-0.0800	0.0666	0.0671	0.127	0.236	0.128	0.129	0.167
Round 5													
	(0.319)	(0.319)	(0.315)	(0.290)	(0.290)	(0.282)	(0.440)	(0.440)	(0.460)	(0.497)	(0.437)	(0.437)	(0.455)
Region 31*Survey	0.259	0.257	0.270	0.168	0.164	0.134	-0.400	-0.418	-0.338	-0.312	-0.304	-0.320	-0.232
Round 8													
	(0.349)	(0.349)	(0.335)	(0.314)	(0.315)	(0.301)	(0.412)	(0.412)	(0.425)	(0.471)	(0.403)	(0.404)	(0.416)
Region 40*Survey							0.369	0.368	0.377	0.457	0.359	0.358	0.377
Round 2													
							(0.325)	(0.325)	(0.339)	(0.386)	(0.325)	(0.325)	(0.341)
Region 40*Survey							-0.124	-0.135	-0.102	0.137	-0.117	-0.127	-0.0917
Round 3													
							(0.383)	(0.383)	(0.395)	(0.449)	(0.384)	(0.384)	(0.397)
Region 40*Survey							0.632*	0.626*	0.610*	0.831**	0.484	0.480	0.506
Round 4													
							(0.351)	(0.351)	(0.362)	(0.414)	(0.325)	(0.325)	(0.339)
Region 40*Survey	0.00431	0.00410	0.0661	-0.153	-0.156	-0.0845	0.619	0.621	0.705	0.825*	0.394	0.395	0.524
Round 5													
	(0.266)	(0.267)	(0.271)	(0.195)	(0.195)	(0.198)	(0.413)	(0.413)	(0.430)	(0.470)	(0.392)	(0.392)	(0.409)
Region 40*Survey	-0.0293	-0.0287	0.00920	0.229	0.227	0.203	-0.126	-0.141	-0.0462	0.0778	0.0401	0.0260	0.140
Round 8													
	(0.252)	(0.252)	(0.248)	(0.202)	(0.202)	(0.197)	(0.357)	(0.357)	(0.369)	(0.419)	(0.345)	(0.345)	(0.357)
Region 41*Survey	-0.0348	-0.0365	-0.00606	-0.0780	-0.0862	-0.0708							
Round 5													
	(0.429)	(0.429)	(0.430)	(0.396)	(0.396)	(0.397)							
Region 41*Survey	0.687*	0.693*	0.553	0.620*	0.626*	0.453							
Round 8													
	(0.389)	(0.389)	(0.385)	(0.353)	(0.353)	(0.350)							
Constant	-1.933***	-1.934***	-1.324***	-1.543***	-1.544***	-0.922***	-1.576***	-1.592***	-0.976***	-0.673**	-1.570***	-1.582***	-0.953***
	(0.181)	(0.181)	(0.258)	(0.120)	(0.120)	(0.219)	(0.233)	(0.234)	(0.279)	(0.311)	(0.230)	(0.231)	(0.276)
Observations	2,904	2,904	2,900	3,524	3,524	3,515	7,610	7,610	7,465	6,269	8,228	8,228	8,078
R-squared	0.052	0.053	0.093	0.046	0.047	0.089	0.044	0.045	0.079	0.082	0.042	0.043	0.078

Table S18: Regression Results with WAZ Alternative

VARIABLES	(1) Model 1 Simple	(2) Model 1: Simple with Total	(3) Model 1: Total	(4) Model 2 Simple	(5) Model 2: Simple with Total	(6) Model 2: Total	(7) Model 3 Simple	(8) Model 3: Simple with Total	(9) Model 3: Total	(10) Model 3: Total V2	(11) Model 4 Simple	(12) Model 4: Simple with Total	(13) Model 4: Total	(14) Model 4: Total V2
Total Services 1		0.397	0.168											

		(0.358)	(0.393)											
Total Services 2					0.582	0.413								
					(0.367)	(0.375)								
Total Services 3								0.614*	0.380	0.294				
								(0.332)	(0.252)	(0.285)				
Total Services 4												0.560*	0.336	0.285
												(0.311)	(0.246)	(0.283)
Clean fuel for cooking	0.313*	0.274	0.246	0.336**	0.225	0.197	0.273*	0.102	0.0304	-0.00401	0.288**	0.123	0.0524	0.0232
	(0.161)	(0.174)	(0.177)	(0.153)	(0.167)	(0.170)	(0.144)	(0.128)	(0.131)	(0.135)	(0.141)	(0.129)	(0.129)	(0.132)
Clean fuel for lighting	0.232***	0.232***	0.153***	0.195***	0.194***	0.123**	0.217***	0.216***	0.124***	0.0954*	0.187***	0.186***	0.0975**	0.0546
	(0.0497)	(0.0497)	(0.0525)	(0.0455)	(0.0455)	(0.0486)	(0.0417)	(0.0417)	(0.0459)	(0.0512)	(0.0391)	(0.0391)	(0.0429)	(0.0477)
Improved water source	0.182	0.182	0.130				-0.0706	-0.0706	-0.0971**	-0.133***				
	(0.113)	(0.113)	(0.112)				(0.0458)	(0.0458)	(0.0464)	(0.0499)				
Treats water				-0.0395	-0.0399	-0.0455					0.0183	0.0185	-0.00811	0.0154
				(0.0496)	(0.0496)	(0.0506)					(0.0340)	(0.0340)	(0.0348)	(0.0381)
Improved toilet	0.147**	0.148**	0.133**	0.160***	0.161***	0.149***								
	(0.0626)	(0.0626)	(0.0625)	(0.0570)	(0.0570)	(0.0571)								
Any toilet							0.230***	0.231***	0.166**	0.187**	0.232***	0.233***	0.171**	0.183**
							(0.0719)	(0.0719)	(0.0724)	(0.0771)	(0.0720)	(0.0720)	(0.0724)	(0.0771)
Improved floor	0.124**	0.125**	0.0655	0.0944*	0.0958*	0.0530	0.213***	0.216***	0.142***	0.120***	0.190***	0.193***	0.126***	0.0992**
	(0.0558)	(0.0559)	(0.0573)	(0.0500)	(0.0500)	(0.0515)	(0.0391)	(0.0392)	(0.0412)	(0.0456)	(0.0375)	(0.0375)	(0.0393)	(0.0435)
Handwashing with soap	0.166	0.149	0.143											
	(0.129)	(0.133)	(0.134)											
Handwashing				0.142**	0.132**	0.119*	0.0972**	0.0824*	0.0282	0.0121	0.0889**	0.0756*	0.0281	0.0145
				(0.0598)	(0.0603)	(0.0614)	(0.0460)	(0.0464)	(0.0479)	(0.0547)	(0.0443)	(0.0447)	(0.0462)	(0.0528)
Female			0.114***			0.104***			0.0639**	0.0577*			0.0649**	0.0637*
			(0.0423)			(0.0387)			(0.0316)	(0.0340)			(0.0303)	(0.0326)
Parent is head of household			-0.00275			0.0363			0.0471	0.0120			0.0563	0.0264
			(0.0561)			(0.0518)			(0.0398)	(0.0545)			(0.0382)	(0.0521)
Number ≥16 in household			-0.000515			-0.0110			0.0153	0.0141			0.0136	0.0129
			(0.0219)			(0.0200)			(0.00964)	(0.0116)			(0.00953)	(0.0114)
Per capita expenses (UGX 100,000)			0.00524			0.00388			0.0112***	0.00998***			0.0101***	0.00915***
			(0.00346)			(0.00327)			(0.00291)	(0.00322)			(0.00280)	(0.00310)
Age (months)			-0.0102			-0.00989*			-0.00365	-0.00510			-0.00419	-0.00560
			(0.00626)			(0.00578)			(0.00407)	(0.00437)			(0.00393)	(0.00417)
Age^2 (months)			6.36e-05			5.92e-05			2.82e-05	4.96e-05			3.10e-05	5.52e-05
			(8.71e-05)			(8.05e-05)			(5.77e-05)	(6.21e-05)			(5.56e-05)	(5.92e-05)
Age of mother										0.00244				0.00166
										(0.00255)				(0.00247)
Mother has formal job										0.343*				0.345*
										(0.183)				(0.182)
Faced hunger in past year										-0.112***				-0.112***
										(0.0375)				(0.0363)
Has electricity			-0.00498			0.00305			0.00699	-0.0113			0.00990	0.00278
			(0.0905)			(0.0863)			(0.0688)	(0.0778)			(0.0668)	(0.0752)
Owns a generator			-0.00474			-0.0824			0.276*	0.195			0.270*	0.205

			(0.379)			(0.359)			(0.151)	(0.164)			(0.148)	(0.162)
Owns a TV			0.153*			0.123*			0.104*	0.142**			0.102*	0.132*
			(0.0781)			(0.0744)			(0.0621)	(0.0717)			(0.0603)	(0.0691)
Owns a mobile phone			0.249***			0.199***			0.131***	0.131***			0.119***	0.120***
			(0.0578)			(0.0512)			(0.0370)	(0.0397)			(0.0354)	(0.0381)
Owns a bike			-0.0101			-0.00263			0.0749**	0.0605*			0.0661**	0.0560*
			(0.0463)			(0.0416)			(0.0320)	(0.0345)			(0.0306)	(0.0331)
Owns a radio			-0.0810			-0.00842			0.0425	0.0392			0.0581*	0.0565
			(0.0581)			(0.0519)			(0.0352)	(0.0377)			(0.0337)	(0.0360)
Number in the household			-0.0115			0.000339			-0.00704	-0.00539			-0.00461	-0.00161
			(0.0166)			(0.0152)			(0.00878)	(0.0104)			(0.00865)	(0.0101)
Interviewed in February			0.128			0.0716			0.0584	0.0379			0.0264	-0.00129
			(0.0818)			(0.0756)			(0.0571)	(0.0606)			(0.0547)	(0.0580)
Interviewed in March			0.0356			-0.0228			0.0308	0.0559			-0.00201	0.0183
			(0.118)			(0.104)			(0.0673)	(0.0721)			(0.0643)	(0.0685)
Interviewed in April			0.0901			0.0566			-0.0532	-0.0281			-0.0617	-0.0485
			(0.100)			(0.0913)			(0.0644)	(0.0710)			(0.0616)	(0.0675)
Interviewed in May			-0.0516			-0.123			-0.0651	-0.0540			-0.108*	-0.100
			(0.0841)			(0.0782)			(0.0639)	(0.0712)			(0.0608)	(0.0675)
Interviewed in June			-0.0530			-0.0243			-0.0320	-0.0332			-0.0272	-0.0404
			(0.0970)			(0.0900)			(0.0681)	(0.0752)			(0.0652)	(0.0716)
Interviewed in July			0.0910			-0.0137			-0.000152	-0.0235			-0.0405	-0.0634
			(0.0927)			(0.0853)			(0.0628)	(0.0694)			(0.0600)	(0.0658)
Interviewed in August			0.133			0.119			0.0834	0.0423			0.0791	0.0165
			(0.0823)			(0.0753)			(0.0607)	(0.0661)			(0.0576)	(0.0621)
Interviewed in September			0.144			0.113			0.0776	0.0697			0.0616	0.0440
			(0.0908)			(0.0839)			(0.0640)	(0.0714)			(0.0607)	(0.0677)
Interviewed in October			0.159			0.133			0.0694	0.0902			0.0609	0.0743
			(0.111)			(0.0982)			(0.0679)	(0.0724)			(0.0644)	(0.0688)
Interviewed in November			0.0210			-0.00728			0.0419	0.0746			0.0151	0.0429
			(0.102)			(0.0909)			(0.0648)	(0.0714)			(0.0614)	(0.0671)
Interviewed in December			0.00424			-0.0552			0.0662	0.0366			0.0299	0.00640
			(0.0968)			(0.0838)			(0.0613)	(0.0667)			(0.0576)	(0.0628)
Region 10							-0.0530	-0.0420	-0.0423	-0.185	-0.0505	-0.0419	-0.0318	-0.167
							(0.158)	(0.158)	(0.166)	(0.181)	(0.158)	(0.157)	(0.165)	(0.180)
Region 11	-0.154	-0.162	-0.237	-0.0858	-0.0936	-0.137	0.146	0.164	0.230	0.0349	0.148	0.158	0.228	0.0431
	(0.142)	(0.143)	(0.146)	(0.127)	(0.127)	(0.129)	(0.180)	(0.178)	(0.190)	(0.214)	(0.180)	(0.178)	(0.190)	(0.214)
Region 20	-0.0789	-0.0771	-0.0511	-0.0706	-0.0692	-0.0418	-0.00140	0.0131	0.0282	-0.147	-0.0210	-0.00909	-0.00956	-0.175
	(0.117)	(0.117)	(0.116)	(0.103)	(0.103)	(0.103)	(0.155)	(0.155)	(0.165)	(0.179)	(0.156)	(0.155)	(0.165)	(0.179)
Region 21	0.330	0.333	0.274	0.352*	0.336*	0.275	0.139	0.144	0.269	0.112	0.124	0.128	0.242	0.0911
	(0.207)	(0.207)	(0.207)	(0.198)	(0.195)	(0.194)	(0.218)	(0.220)	(0.231)	(0.253)	(0.218)	(0.219)	(0.231)	(0.253)
Region 30	-0.179	-0.178	-0.177	-0.150	-0.149	-0.141	-0.132	-0.118	-0.0404	-0.163	-0.138	-0.126	-0.0607	-0.165
	(0.128)	(0.128)	(0.129)	(0.113)	(0.113)	(0.115)	(0.157)	(0.157)	(0.166)	(0.179)	(0.158)	(0.158)	(0.167)	(0.181)
Region 31	-0.283	-0.281	-0.345	-0.171	-0.170	-0.210	0.157	0.171	0.131	-0.0478	0.144	0.156	0.0975	-0.0813
	(0.235)	(0.235)	(0.241)	(0.189)	(0.189)	(0.196)	(0.193)	(0.193)	(0.213)	(0.232)	(0.195)	(0.194)	(0.213)	(0.234)
Region 40	0.0181	0.0187	-0.00634	-0.0986	-0.0972	-0.105	-0.106	-0.0917	-0.0276	-0.174	-0.110	-0.0983	-0.0385	-0.174

	(0.141)	(0.141)	(0.140)	(0.111)	(0.111)	(0.109)	(0.157)	(0.157)	(0.168)	(0.180)	(0.157)	(0.157)	(0.168)	(0.180)
Region 41	-0.294	-0.293	-0.343*	-0.213	-0.210	-0.240	0.433**	0.447**	0.456**	0.434*	0.415**	0.426**	0.432**	0.407
	(0.189)	(0.190)	(0.195)	(0.174)	(0.174)	(0.178)	(0.202)	(0.202)	(0.216)	(0.249)	(0.203)	(0.203)	(0.217)	(0.250)
Survey Round 2							-0.287	-0.288	-0.222	-0.368	-0.277	-0.277	-0.214	-0.354
							(0.244)	(0.244)	(0.250)	(0.294)	(0.245)	(0.245)	(0.250)	(0.294)
Survey Round 3							-0.0326	-0.0253	-0.0811	-0.266	-0.0345	-0.0275	-0.0723	-0.257
							(0.299)	(0.299)	(0.300)	(0.323)	(0.301)	(0.300)	(0.302)	(0.327)
Survey Round 4							-0.575***	-0.571***	-0.606***	-0.706***	-0.492**	-0.488**	-0.522**	-0.594**
							(0.219)	(0.219)	(0.225)	(0.264)	(0.215)	(0.215)	(0.222)	(0.260)
Survey Round 5	-0.0402	-0.0402	-0.00451	0.0151	0.0166	0.0504	-0.257	-0.258	-0.291	-0.461*	-0.267	-0.268	-0.296	-0.459*
	(0.119)	(0.119)	(0.119)	(0.0878)	(0.0879)	(0.0886)	(0.203)	(0.203)	(0.207)	(0.247)	(0.200)	(0.200)	(0.205)	(0.243)
Survey Round 8	-0.358***	-0.357***	-0.419***	-0.292***	-0.289***	-0.268**	0.119	0.133	0.104	-0.291	0.106	0.119	0.115	-0.307
	(0.132)	(0.132)	(0.140)	(0.107)	(0.107)	(0.116)	(0.205)	(0.205)	(0.212)	(0.316)	(0.201)	(0.201)	(0.209)	(0.310)
Region 10*Survey Round 2							0.427*	0.433*	0.342	0.542*	0.415	0.420	0.335	0.529*
							(0.256)	(0.256)	(0.261)	(0.306)	(0.257)	(0.257)	(0.262)	(0.306)
Region 10*Survey Round 3							0.141	0.138	0.135	0.297	0.139	0.137	0.123	0.285
							(0.311)	(0.311)	(0.312)	(0.337)	(0.313)	(0.312)	(0.314)	(0.341)
Region 10*Survey Round 4							0.790***	0.790***	0.827***	0.914***	0.680***	0.679***	0.696***	0.744***
							(0.248)	(0.249)	(0.254)	(0.290)	(0.237)	(0.238)	(0.244)	(0.282)
Region 10*Survey Round 5							0.444*	0.448*	0.484**	0.679**	0.468**	0.472**	0.492**	0.635**
							(0.237)	(0.237)	(0.241)	(0.280)	(0.224)	(0.224)	(0.229)	(0.267)
Region 10*Survey Round 8							-0.275	-0.284	-0.194	-0.157	-0.213	-0.221	-0.146	-0.113
							(0.231)	(0.232)	(0.238)	(0.283)	(0.222)	(0.222)	(0.228)	(0.271)
Region 11*Survey Round 2							0.288	0.268	0.114	0.315	0.268	0.256	0.105	0.283
							(0.279)	(0.279)	(0.284)	(0.335)	(0.279)	(0.279)	(0.285)	(0.335)
Region 11*Survey Round 3							-0.135	-0.149	-0.256	-0.0113	-0.141	-0.148	-0.261	-0.0305
							(0.332)	(0.331)	(0.332)	(0.363)	(0.334)	(0.333)	(0.334)	(0.367)
Region 11*Survey Round 4							0.481*	0.465*	0.400	0.597*	0.433*	0.426	0.367	0.504
							(0.264)	(0.264)	(0.273)	(0.321)	(0.260)	(0.260)	(0.269)	(0.316)
Region 11*Survey Round 5	0.0760	0.0812	0.0498	-0.0301	-0.0233	-0.0376	0.198	0.197	0.107	0.346	0.188	0.193	0.114	0.317
	(0.180)	(0.180)	(0.177)	(0.154)	(0.154)	(0.151)	(0.255)	(0.255)	(0.261)	(0.305)	(0.250)	(0.250)	(0.256)	(0.299)
Region 11*Survey Round 8	0.200	0.209	0.196	0.101	0.106	0.0518	-0.368	-0.384	-0.467*	-0.449	-0.361	-0.369	-0.460*	-0.419
	(0.189)	(0.190)	(0.193)	(0.168)	(0.169)	(0.171)	(0.249)	(0.249)	(0.255)	(0.306)	(0.245)	(0.245)	(0.252)	(0.301)
Region 20*Survey Round 2							0.325	0.324	0.250	0.410	0.314	0.313	0.240	0.396
							(0.254)	(0.254)	(0.259)	(0.303)	(0.255)	(0.255)	(0.260)	(0.303)
Region 20*Survey Round 3							-0.000303	-0.00835	-0.00778	0.179	-0.00225	-0.00992	-0.0206	0.165
							(0.310)	(0.310)	(0.310)	(0.334)	(0.312)	(0.312)	(0.313)	(0.338)
Region 20*Survey Round 4							0.651***	0.646***	0.686***	0.804***	0.587**	0.583**	0.623***	0.715***
							(0.236)	(0.236)	(0.242)	(0.280)	(0.232)	(0.232)	(0.238)	(0.276)
Region 20*Survey Round 5	0.129	0.129	0.111	0.0502	0.0489	0.0351	0.415*	0.416*	0.453**	0.640**	0.424*	0.425*	0.460**	0.643**
	(0.144)	(0.144)	(0.143)	(0.118)	(0.119)	(0.117)	(0.223)	(0.223)	(0.226)	(0.265)	(0.219)	(0.219)	(0.223)	(0.261)

Region 20*Survey Round 8	0.194	0.193	0.210	0.137	0.135	0.113	-0.194	-0.206	-0.131	-0.0718	-0.159	-0.170	-0.110	-0.0281
	(0.154)	(0.154)	(0.154)	(0.133)	(0.133)	(0.133)	(0.217)	(0.217)	(0.223)	(0.266)	(0.213)	(0.213)	(0.219)	(0.262)
Region 21*Survey Round 2							0.440	0.459	0.321	0.535	0.435	0.453	0.323	0.527
							(0.307)	(0.307)	(0.322)	(0.370)	(0.306)	(0.307)	(0.322)	(0.370)
Region 21*Survey Round 3							-0.0278	-0.0268	-0.146	0.0347	-0.0204	-0.0199	-0.148	0.0330
							(0.379)	(0.379)	(0.384)	(0.406)	(0.380)	(0.380)	(0.385)	(0.408)
Region 21*Survey Round 4							0.951***	0.940***	0.839**	0.930**	0.870***	0.861***	0.754**	0.809**
							(0.326)	(0.325)	(0.332)	(0.371)	(0.323)	(0.322)	(0.329)	(0.367)
Region 21*Survey Round 5	-0.519*	-0.520*	-0.545*	-0.590*	-0.572*	-0.574*	0.0834	0.0947	-0.0181	0.215	0.0974	0.107	-0.00807	0.220
	(0.312)	(0.312)	(0.313)	(0.302)	(0.300)	(0.299)	(0.348)	(0.348)	(0.355)	(0.391)	(0.346)	(0.347)	(0.353)	(0.389)
Region 21*Survey Round 8	-0.0884	-0.0905	-0.0137	-0.154	-0.134	-0.0584	-0.175	-0.172	-0.274	-0.292	-0.147	-0.144	-0.237	-0.208
	(0.269)	(0.269)	(0.275)	(0.253)	(0.251)	(0.256)	(0.301)	(0.302)	(0.310)	(0.360)	(0.294)	(0.295)	(0.304)	(0.351)
Region 30*Survey Round 2							0.419*	0.419*	0.307	0.390	0.404	0.405	0.300	0.375
							(0.253)	(0.253)	(0.259)	(0.302)	(0.254)	(0.254)	(0.260)	(0.303)
Region 30*Survey Round 3							0.163	0.155	0.155	0.288	0.158	0.150	0.140	0.269
							(0.312)	(0.312)	(0.312)	(0.336)	(0.314)	(0.313)	(0.314)	(0.340)
Region 30*Survey Round 4							0.679***	0.675***	0.645***	0.676**	0.629***	0.626***	0.595**	0.603**
							(0.243)	(0.243)	(0.249)	(0.286)	(0.236)	(0.237)	(0.243)	(0.280)
Region 30*Survey Round 5	0.0665	0.0663	0.0524	0.00949	0.00814	-0.0133	0.383	0.384	0.371	0.526*	0.421*	0.422*	0.397*	0.540**
	(0.167)	(0.167)	(0.167)	(0.136)	(0.136)	(0.136)	(0.236)	(0.236)	(0.238)	(0.276)	(0.229)	(0.229)	(0.232)	(0.269)
Region 30*Survey Round 8	0.382**	0.382**	0.435***	0.275*	0.275*	0.283**	0.0143	0.00513	0.0365	0.0749	0.0204	0.0122	0.0211	0.0831
	(0.165)	(0.165)	(0.166)	(0.142)	(0.142)	(0.142)	(0.221)	(0.221)	(0.226)	(0.269)	(0.216)	(0.217)	(0.222)	(0.264)
Region 31*Survey Round 2							0.605**	0.604**	0.563*	0.611*	0.590**	0.589**	0.561*	0.615*
							(0.283)	(0.283)	(0.295)	(0.346)	(0.284)	(0.284)	(0.295)	(0.346)
Region 31*Survey Round 3							0.145	0.139	0.200	0.404	0.150	0.144	0.207	0.422
							(0.353)	(0.353)	(0.358)	(0.382)	(0.355)	(0.354)	(0.360)	(0.386)
Region 31*Survey Round 4							0.279	0.275	0.319	0.409	0.313	0.309	0.351	0.423
							(0.333)	(0.334)	(0.345)	(0.383)	(0.306)	(0.306)	(0.319)	(0.356)
Region 31*Survey Round 5	0.0710	0.0706	0.0671	0.0153	0.0131	0.0103	0.0146	0.0149	0.0723	0.264	0.131	0.132	0.199	0.376
	(0.290)	(0.290)	(0.295)	(0.250)	(0.250)	(0.253)	(0.288)	(0.288)	(0.295)	(0.338)	(0.291)	(0.291)	(0.299)	(0.341)
Region 31*Survey Round 8	0.324	0.323	0.388	0.161	0.159	0.174	-0.407	-0.419	-0.289	-0.339	-0.371	-0.381	-0.265	-0.256
	(0.283)	(0.283)	(0.288)	(0.238)	(0.238)	(0.243)	(0.275)	(0.276)	(0.287)	(0.337)	(0.270)	(0.270)	(0.282)	(0.333)
Region 40*Survey Round 2							0.401	0.401	0.336	0.464	0.393	0.393	0.338	0.459
							(0.261)	(0.261)	(0.266)	(0.308)	(0.262)	(0.262)	(0.266)	(0.309)
Region 40*Survey Round 3							0.282	0.274	0.261	0.404	0.287	0.280	0.261	0.411
							(0.317)	(0.316)	(0.317)	(0.342)	(0.318)	(0.318)	(0.319)	(0.346)
Region 40*Survey							0.825***	0.821***	0.787***	0.822***	0.641***	0.638***	0.623**	0.674**

Round 4							(0.252)	(0.252)	(0.259)	(0.296)	(0.238)	(0.238)	(0.245)	(0.282)
Region 40*Survey	0.157	0.156	0.139	0.000719	-0.000762	0.00330	0.615***	0.616***	0.604**	0.762***	0.424*	0.425*	0.433*	0.657**
Round 5	(0.181)	(0.182)	(0.182)	(0.135)	(0.135)	(0.136)	(0.237)	(0.237)	(0.242)	(0.278)	(0.226)	(0.225)	(0.231)	(0.266)
Region 40*Survey	0.162	0.162	0.194	0.229	0.228	0.231	-0.0335	-0.0436	-0.0139	0.0210	-0.0307	-0.0402	-0.0200	0.0386
Round 8	(0.187)	(0.187)	(0.186)	(0.149)	(0.149)	(0.147)	(0.227)	(0.228)	(0.235)	(0.279)	(0.219)	(0.219)	(0.227)	(0.268)
Region 41*Survey	0.331	0.330	0.329	0.200	0.196	0.199								
Round 5	(0.239)	(0.239)	(0.238)	(0.217)	(0.217)	(0.216)								
Region 41*Survey	1.006***	1.009***	0.968***	0.859***	0.862***	0.805***								
Round 8	(0.254)	(0.254)	(0.256)	(0.231)	(0.231)	(0.234)								
Constant	-0.869***	-0.869***	-0.742***	-0.670***	-0.671***	-0.634***	-1.005***	-1.018***	-1.166***	-0.957***	-1.049***	-1.060***	-1.194***	-1.024***
	(0.139)	(0.139)	(0.199)	(0.0854)	(0.0854)	(0.161)	(0.164)	(0.164)	(0.194)	(0.218)	(0.162)	(0.161)	(0.191)	(0.214)
Observations	2,915	2,915	2,911	3,544	3,544	3,535	7,646	7,646	7,498	6,294	8,273	8,273	8,120	6,813
R-squared	0.048	0.048	0.072	0.038	0.038	0.059	0.041	0.042	0.053	0.058	0.037	0.038	0.049	0.053