Online Appendix For:
Expanding Access to Clean Water for the Rural Poor: Experimental Evidence from Malawi

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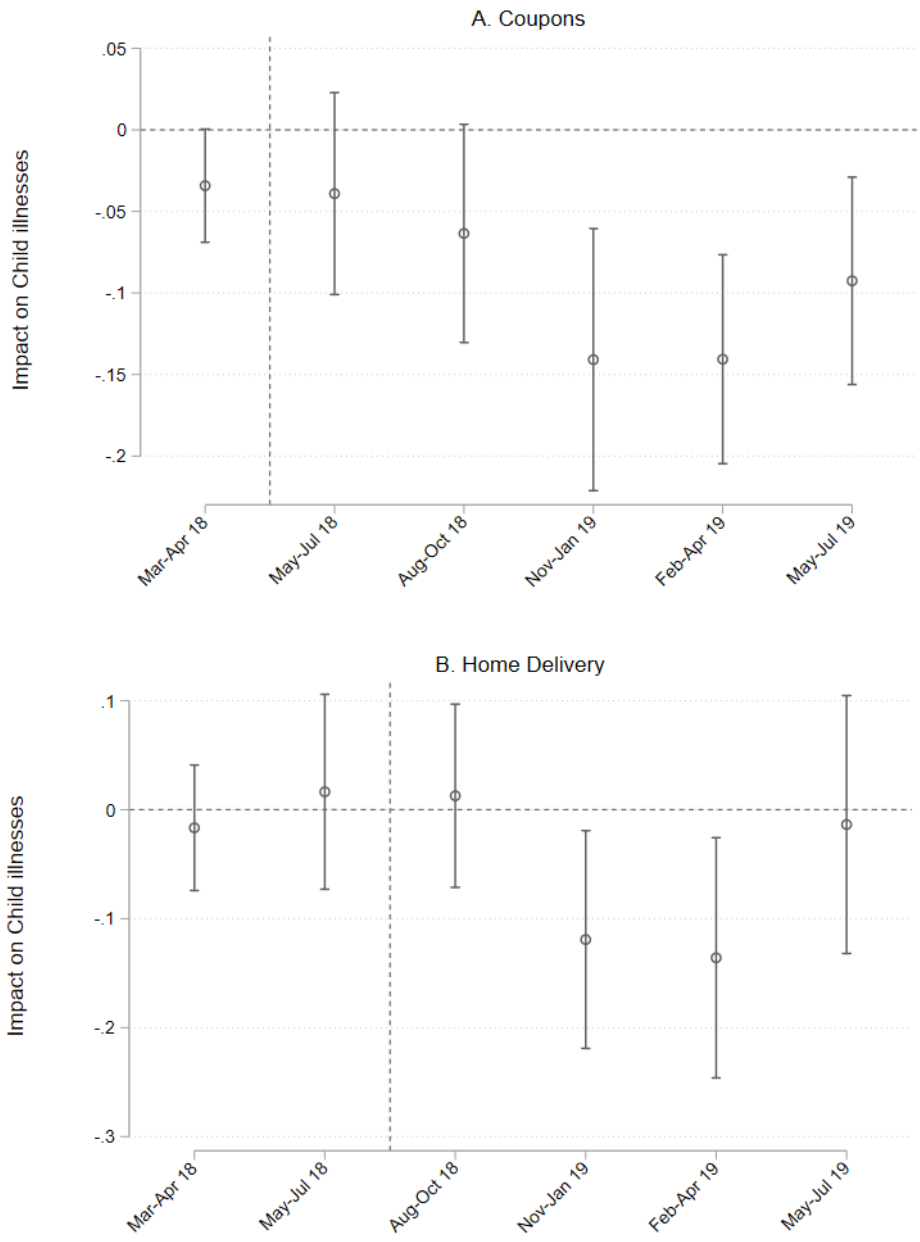
Appendix A

Figure A1: Example wall calendar with attached coupons

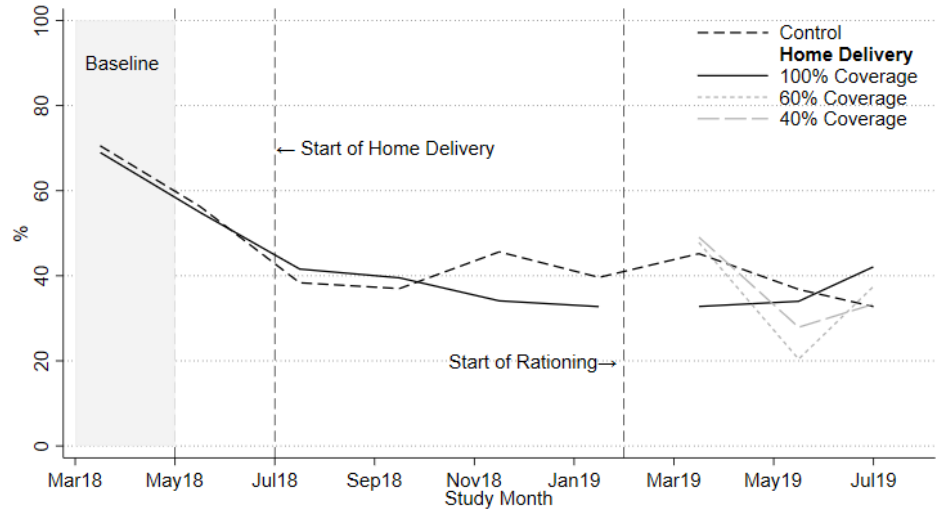
Notes: Households not sampled for coupons received an identical calendar, but without the coupons attached at the bottom.

Figure A2: Impact of water treatment subsidies interventions on child illness, by study quarter



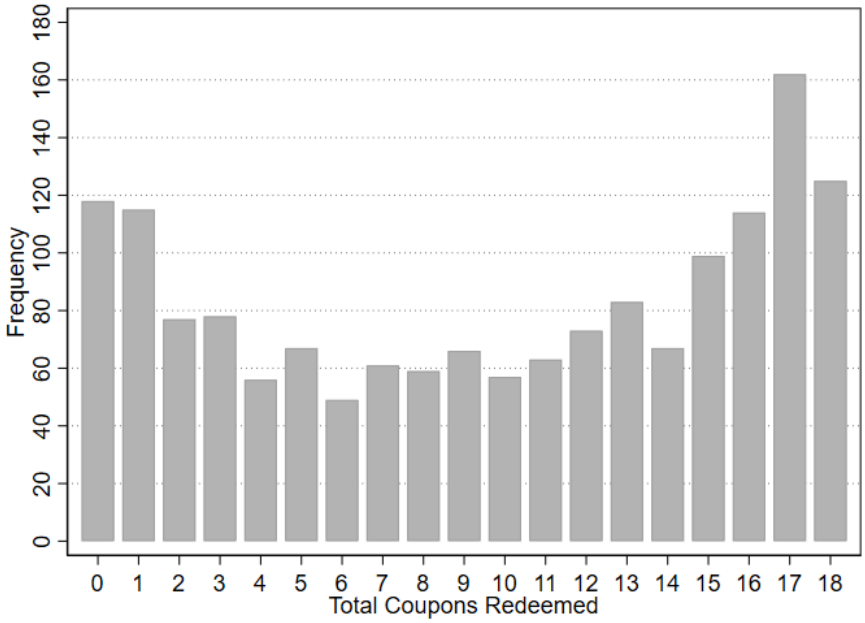
Notes: The vertical lines indicate the respective start date of the interventions. Coefficients were estimate by interacting treatment assignment with an indicator for each quarter. Panels A and B were estimated in separate regressions. Regressions control for month fixed-effects and child age; panel A also includes an indicator for Mwanza. Standard errors were clustered at the CHW level.

Figure A3: Share of children with illness in previous 4 weeks, over time (Home Delivery Compared to Control)



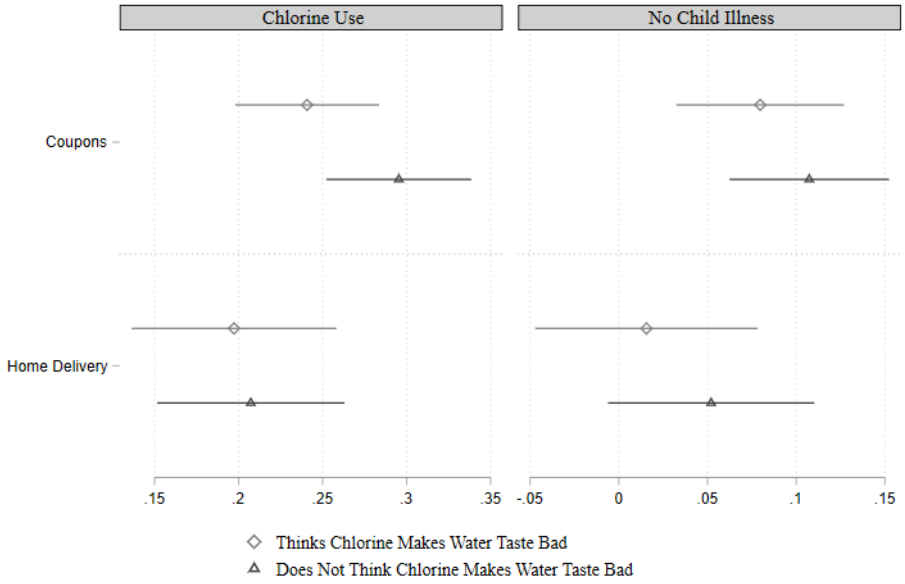
Notes: Lines plot share of children under 10 years old from surveyed households that had at least one of the three illnesses we measure (diarrhea, fever, or vomiting) over 18 months. Time points are averaged across two months to reduce noise (e.g., May and June 2018). An average of 267 households were surveyed each month.

Figure A4: Distribution of coupon redemption over 18 months



Notes: Y-axis is number of households. The x-axis is the number of coupons redeemed. There was a maximum of 18 months of coupon redemption for each household. About 15% of households did not receive their coupons until the first month had already passed and thus could redeem a maximum of 17.

Figure A5: Heterogeneity in effect sizes, by whether household thinks WaterGuard makes water taste bad



Notes: Estimates are from separate regressions that subset on households based on whether they agreed or strongly agreed that WaterGuard makes water taste bad during the baseline survey. Regressions include indicators for Coupon and Home Delivery assignment. Child illness was measured within the previous month for children under 10 years old. The illness effects sizes are the absolute value of the any illness coefficients (positive means less illness). Points represent the effect size relative to the control group and error bars are 95% confidence intervals. Standard errors are clustered at the CHW level in Neno, and the household level in Mwanza. For Coupons, the p-value for the difference in effect sizes is 0.066 for chlorine use and 0.408 for child illness. For Home Delivery, the differences in effect sizes are not significantly different from zero (p=0.826 for chlorine use and p=0.226 for child illness).

Table A1: CHW characteristics and differences between arms

	Mean (std. dev)	WASH vs. Control (std. error)	Free Delivery vs. Control (std. error)
Age	37.0	0.174	-.22
	(8.70)	(1.00)	(1.09)
Female	0.652	0.024	0.027
	(0.476)	(0.056)	(0.064)
Completed primary school	0.652	-.03	-.11
	(0.476)	(0.055)	(0.065)
Number of children	4.28	-.43	-.01
	(2.13)	(0.267)	(0.296)
Number of households in catchment area	26.8	-.73	-.39
	(10.2)	(1.27)	(1.42)
Hours per week on CHW activities	10.5	0.173	1.40
	(4.69)	(0.492)	(0.739)
Other job in addition to CHW	0.753	0.055	0.022
	(0.431)	(0.053)	(0.062)
CHW primary source of income	0.433	-.01	-.08
	(0.496)	(0.060)	(0.068)
Senior CHW	0.126	0.001	0.001
	(0.333)	(0.038)	(0.044)
Share of HHs using chlorine at baseline	0.051	0.010	0.011
	(0.126)	(0.013)	(0.015)

Notes: Standard deviation of the mean and standard error of the difference in parentheses. Share of households that used chlorine is the share of households assigned to the CHW whose drinking water tested positive for chlorine residual at baseline. Around 4 households per CHWs were sampled at baseline. N=442 CHWs.

Table A2: Balance between groups at baseline

VARIABLES	(1) Positive Chlorine Test	(2) CHW Visit in Last 4 Weeks	(3) Any Child Illness	(4) Number of Illnesses
Coupon	-0.034*	-0.026	-0.047	-0.049
	(0.021)	(0.037)	(0.036)	(0.075)
Coupon X Mwanza	0.024		0.010	0.037
	(0.028)		(0.049)	(0.102)
WASH	-0.024	-0.006	-0.017	-0.045
	(0.018)	(0.043)	(0.032)	(0.064)
Coupon X WASH	0.063**	0.019	0.018	-0.068
	(0.025)	(0.047)	(0.043)	(0.089)
Home Delivery	-0.037	-0.058	-0.019	0.016
	(0.023)	(0.061)	(0.048)	(0.103)
Home Delivery x Rationing	0.046**	-0.005	-0.014	-0.149
	(0.023)	(0.060)	(0.051)	(0.109)
Mwanza	-0.018		0.115***	0.212***
	(0.021)		(0.035)	(0.069)
Child Age (Years)			-0.003	-0.029***
			(0.004)	(0.008)
Observations	2,212	1,869	3,626	3,626
Pooled Coupon Effect	0.004	-0.013	-0.035**	-0.072**
P-value Pooled Coupon Effect	0.717	0.562	0.044	0.038
P-value of joint F-test	0.071	0.684	0.622	0.102
Neno Control Group Mean	0.067	0.647	0.713	1.116
Number of Clusters	863	436	874	874

Notes: Data source: Baseline surveys conducted between March and April 2018. Column 3 outcome is at the child level. Child illness was measured within the previous month for children under 10 years old. Column 4 shows marginal effects from a Poisson regression of the count of illnesses reported (0 to 3) with standard errors estimated using the delta method. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. F-test jointly tests whether the following coefficients are equal to zero: Coupons, WASH Training, Coupons X WASH Training, Home Delivery, Home Delivery X Rationing, and Coupons X Mwanza. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Health outcomes: breakdown by illness (children under 10)

VARIABLES	(1) Diarrhea	(2) Fever	(3) Vomit	(4) Cough
Coupon	-0.017	-0.062**	-0.014	-0.066**
	(0.017)	(0.028)	(0.016)	(0.031)
Coupon X Mwanza	-0.077***	-0.004	-0.018	0.017
	(0.028)	(0.044)	(0.028)	(0.047)
WASH	0.007	0.025	0.004	0.016
	(0.017)	(0.028)	(0.016)	(0.027)
Coupon X WASH	0.005	-0.043	-0.024	-0.030
	(0.023)	(0.034)	(0.021)	(0.038)
Home Delivery	-0.015	-0.025	-0.019	-0.053
	(0.018)	(0.029)	(0.017)	(0.034)
Home Delivery X Rationing	0.023	0.024	0.004	0.048
	(0.023)	(0.031)	(0.018)	(0.039)
Mwanza	0.080***	0.068**	0.060***	0.068**
	(0.022)	(0.033)	(0.021)	(0.033)
Child Age (Years)	-0.036***	-0.012***	-0.006***	-0.022***
	(0.002)	(0.003)	(0.002)	(0.003)
Observations	6,628	6,625	6,629	6,629
Month FE	Yes	Yes	Yes	Yes
Pooled Coupon Effect	-.032***	-.083***	-.029***	-.077***
P-value Pooled Coupon Effect	0.001	<0.001	0.002	<0.001
P-value of Coupons vs. HD	0.656	0.021	0.575	0.447
Neno Control Group Mean	0.124	0.359	0.107	0.464
Number of clusters	845	844	845	845

Notes: Data are from follow-up surveys conducted on a rolling basis between May 2018 and July 2019. The order in which households were surveyed was randomized, with stratification at the CHW level. Households were sampled to be surveyed twice, with an average gap of 6.4 months between the two follow-ups. Child illness was measured within the previous month for children under 10 years old. The results restricting the sample to under 5 years old are shown in B4. The pooled coupon effect is the weighted average of the effect in the three arms with coupons: Neno WASH, Neno no WASH, and Mwanza. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. HD stands for Home Delivery.p<0.01, ** p<0.05, * p<0.1.

Table A4: Association between beliefs about water cleanliness and child illness (Control group)

VARIABLES	(1) Any Child Illness	(2) Any Child Illness	(3) Any Child Illness	(4) Any Child Illness	(5) Any Child Illness	(6) Any Child Illness
Water always safe	-0.084***	-0.077***	-0.071***			
	(0.015)	(0.015)	(0.016)			
Mwanza		0.075***	0.076***		0.085***	0.085***
		(0.018)	(0.019)		(0.018)	(0.019)
Age			0.001			0.001
			(0.001)			(0.001)
Education: Primary 1-4			0.024			0.013
			(0.032)			(0.032)
Education: Primary 5-8			0.015			0.002
			(0.027)			(0.027)
Education: Secondary+			0.009			-0.001
			(0.023)			(0.024)
Wealth Index			-0.011***			-0.010***
			(0.004)			(0.004)
Household Size			0.009*			0.008*
			(0.005)			(0.005)
Child Age			-0.009			-0.008
			(0.006)			(0.006)
Protected Source				-0.092***	-0.092***	-0.080***
				(0.016)	(0.016)	(0.017)
Constant	0.586***	0.566***	0.491***	0.606***	0.587***	0.516***
	(0.011)	(0.012)	(0.038)	(0.014)	(0.014)	(0.039)
Observations	4,183	4,183	4,106	4,177	4,177	4,106

Notes: 'Water Always Safe' is from a survey question asking respondents how often their primary water source is safe to drink. Protected source includes piped water, public tap, borehole with handpump, protected well, and protected spring. Child illness was measured for children under 10 years old using caretaker reports of diarrhea, vomiting, and fever in the previous 4-weeks. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Testing for differential attrition across study arms

VARIABLES	(1) Number of Follow-up Visits
Coupon	0.027
	(0.034)
Coupon X Mwanza	-0.026
	(0.047)
WASH	0.022
	(0.030)
Coupon X WASH	-0.008
	(0.041)
Home Delivery	-0.024
	(0.045)
Home Delivery X Rationing	0.034
	(0.045)
Mwanza	0.054
	(0.034)
Observations	2,307
Pooled Coupon Effect	0.029
P-value Pooled Coupon Effect	0.291
P-value of Coupons vs. HD	0.131
Neno Control Group Mean	1.646
Number of clusters	874

Notes: Estimates are from a poisson regression model that regresses the number of follow-up visits for each household on treatment assignment. Most households had the potential for 2 follow-up visits, but 73 randomly selected households had 3 follow-up visits due to extra resources remaining after the 2 first follow-up waves were completed. A cluster is a CHW catchment's area in Neno and a household in Mwanza. HD stands for Home Delivery.

Table A6: Balance between groups on baseline characteristics of attriters

VARIABLES	(1) Positive Chlorine Test	(2) CHW Visit in Last 4 Weeks	(3) Any Child Illness
Coupon	-0.027	-0.045	-0.085
	(0.030)	(0.091)	(0.067)
Coupon X Mwanza	0.005		-0.054
	(0.053)		(0.099)
WASH	0.010	-0.015	-0.053
	(0.032)	(0.074)	(0.057)
Coupon X WASH	0.047	0.039	0.037
	(0.041)	(0.110)	(0.083)
Home Delivery	-0.044*	-0.153	-0.036
	(0.025)	(0.098)	(0.078)
Home Delivery X Rationing	0.044**	0.122	-0.035
	(0.020)	(0.092)	(0.079)
Mwanza	0.017		0.108*
	(0.042)		(0.065)
Child Age (Years)			-0.001
			(0.008)
Observations	608	540	982
Pooled Coupon Effect	-0.002	-0.019	-0.074**
P-value Pooled Coupon Effect	0.933	0.708	0.037
P-value of joint F-test	0.002	0.715	0.325
Neno Control Group Mean	0.048	0.623	0.752
Number of Clusters	408	315	416

Notes: Regressions use baseline data from households that have fewer than 2 follow-up visits. Column 3 outcome is at the child level. Child illness was measured within the previous month for children under 10 years old and the regression controls for child's age. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. F-test jointly tests whether the following coefficients are equal to zero: Coupons, WASH Training, Coupons X WASH Training, Home Delivery, Home Delivery X Rationing, and Coupons X Mwanza.

Table A7: Lower bound Coupon and Home Delivery treatment effects (sensitivity to attrition)

VARIABLES	(1) Chlorine Use: No Attrition	(2) Chlorine Use: With Attrition	(3) Any Child Illness: No Attrition	(4) Any Child Illness: With Attrition
Coupon	0.248***	0.188***	-0.087***	-0.010
	(0.018)	(0.016)	(0.019)	(0.017)
Coupon X Mwanza	0.072**	0.070**	0.005	0.013
	(0.034)	(0.030)	(0.039)	(0.036)
Home Delivery	0.189***	0.146***	-0.040	0.028
	(0.025)	(0.022)	(0.026)	(0.025)
Mwanza	-0.017	-0.018	0.057**	0.049**
	(0.012)	(0.012)	(0.028)	(0.025)
Child Age (Years)			-0.036***	-0.033***
			(0.003)	(0.003)
Observations	3,614	4,313	5,827	6,922
Month FE	Yes	Yes	Yes	Yes
Pooled Coupon Effect	0.265***	0.204***	-0.086***	-0.007
P-value Pooled Coupon Effect	<0.001	<0.001	<0.001	.636
P-value of Coupons vs. HD	0.039	0.079	0.047	0.106
Neno Control Group Mean	0.038	0.054	0.441	0.417
Number of Clusters	847	874	844	874

Notes: Estimates are based on the same regression equations as Table **??** but without the rationing arm and without month fixed effects. The sample without attrition includes all households for which outcome data was collected. The sample with attrition adds synthetic observations for all households with a baseline survey that did not have follow-up data in one or both follow-up waves. Observations in the control arm with missing surveys were assumed to have a chlorinated water rate twice as high as that of the control group with surveys (imputed treatment rate of 10%), but only half the infection rate (imputed infection rate of 28%). Observations from the treatment arms (Coupons and Home Delivery) were all assumed to have no chlorine in their water (imputed treatment rate of 0%) and the average infection rate at baseline (imputed infection rate of 68%). We exclude the WASH treatment from this exercise for simplicity since it had not effect. Columns 3 and 4 adjust for child age. A cluster is a CHW catchment's area in Neno and a household in Mwanza.

Appendix B: Robustness Checks

Table B1: Robustness to coding water treatment variable (coding no water as missing)

VARIABLES	(1) Positive Chlorine Test
Coupon	0.264***
	(0.028)
Coupon X Mwanza	0.076*
	(0.041)
WASH	0.006
	(0.015)
Coupon X WASH	-0.008
	(0.036)
Home Delivery	0.199***
	(0.027)
Home Delivery X Rationing	0.007
	(0.043)
Mwanza	-0.023
	(0.015)
Observations	3,635
Month FE	Yes
Pooled Coupon Effect	0.279***
P-value of Pooled Coupon Effect	0
P-value of Coupons vs. HD	0.033
Neno Control Group Mean	0.04
Number of clusters	837

Notes: Analysis is identical to column 1 of Table **??**, but households with no drinking water reserve were excluded rather than coded as not having treated water. This excludes about 5% of observations.

Table B2: Impacts on WaterGuard adoption and child health (controlling for outcomes at baseline)

VARIABLES	(1) Positive Chlorine Test	(2) Self-Reported Chlorine Use	(3) Gave Water-Guard Away	(4) Any Child Illness	(5) Number of Illnesses
Coupon	0.258***	0.298***	0.120***	-0.065**	-0.077*
	(0.027)	(0.033)	(0.020)	(0.029)	(0.042)
Coupon X Mwanza	0.062	0.047	0.036	-0.015	-0.060
	(0.040)	(0.044)	(0.031)	(0.045)	(0.065)
WASH	0.009	0.023	-0.016*	0.010	0.020
	(0.015)	(0.015)	(0.009)	(0.028)	(0.040)
Coupon X WASH	-0.019	-0.013	0.058**	-0.032	-0.067
	(0.035)	(0.040)	(0.027)	(0.037)	(0.058)
Home Delivery	0.194***	0.226***	0.004	-0.025	-0.045
	(0.026)	(0.026)	(0.012)	(0.030)	(0.045)
Home Delivery X Rationing	0.000	0.035	0.010	0.039	0.035
	(0.041)	(0.043)	(0.018)	(0.035)	(0.056)
Mwanza	-0.022	-0.004	-0.018*	0.055*	0.110**
	(0.015)	(0.017)	(0.010)	(0.033)	(0.043)
Child Age (Years)				-0.035***	-0.058***
				(0.003)	(0.005)
Positive Chlorine Test (Baseline)	0.070*	0.043	-0.028	-0.064**	-0.079
	(0.037)	(0.037)	(0.021)	(0.029)	(0.055)
Any Illness (Baseline)				0.145***	
				(0.015)	
Number of Illnesses (Baseline)					0.154***
					(0.012)
Observations	3,793	3,576	3,893	6,107	6,107
Controls	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
Pooled Coupon Effect	0.264***	0.303***	0.155***	-0.083***	-0.121***
P-value Pooled Coupon Effect	<0.001	<0.001	<0.001	<0.001	<0.001
P-value of Coupons vs. HD	0.044	0.009	<0.001	0.018	0.11
Neno Control Group Mean	0.038	0.034	0.013	0.438	0.591
Number of clusters	847	841	848	844	844

Notes: Baseline controls indicate that we control for the dependent variable at baseline. Data are from follow-up surveys conducted on a rolling basis between May 2018 and July 2019. The order in which households were surveyed was randomized, with stratification at the CHW level. Households were sampled to be surveyed twice, with an average gap of 6.4 months between the two follow-ups. Child illness was measured within the previous month for children under 10 years old. We analyzed child illness at the household level rather than the child level in this table (columns 4 and 5) because we cannot link data across survey waves at the child level. Any child illness (column 4) indicates the share of children in the household that had any of the illnesses we measure (diarrhea, vomiting, and fever), and was constructed from caretaker reports. Column 5 shows marginal effects from a Poisson regression of the count of illnesses reported (0 to 3) with standard errors estimated using the delta method. All child health regressions control for number of children in the household. The pooled coupon effect is the weighted average of the effect in the three arms with coupons: Neno WASH, Neno no WASH, and Mwanza. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. *** p<0.01, ** p<0.05, * p<0.1.

Table B3: Robustness of diarrhea results to different recall duration

VARIABLES	(1) Diarrhea Case in Last 4 Weeks	(2) Diarrhea Case in Last 14 Days	(3) Diarrhea Case in Last 7 Days
Coupon	-0.017	-0.026*	-0.018
	(0.017)	(0.015)	(0.014)
Coupon X Mwanza	-0.077***	-0.053**	-0.047**
	(0.028)	(0.025)	(0.022)
WASH	0.007	-0.010	0.001
	(0.017)	(0.015)	(0.013)
Coupon X WASH	0.005	0.009	-0.002
	(0.023)	(0.019)	(0.017)
Home Delivery	-0.015	-0.026	-0.016
	(0.018)	(0.016)	(0.015)
Home Delivery X Rationing	0.023	0.025	0.001
	(0.023)	(0.021)	(0.017)
Mwanza	0.080***	0.052***	0.042**
	(0.022)	(0.020)	(0.018)
Child Age (Years)	-0.036***	-0.027***	-0.021***
	(0.002)	(0.002)	(0.002)
Observations	6,628	6,628	6,628
Month FE	Yes	Yes	Yes
Pooled Coupon Effect	-0.032***	-0.033***	-0.03***
P-value Pooled Coupon Effect	0.001	<0.001	<0.001
P-value of Coupons vs. HD	0.656	0.969	0.916
Neno Control Group Mean	0.124	0.106	0.08
Number of clusters	845	845	845

Notes: Child diarrhea was measured within the previous month for children under 10 years old (column 1). When a case was reported, a follow-up question asked if the case was ongoing and, if not, then how many days ago the case ended. We use these questions to identify diarrhea cases in the previous 14 days and previous 7 days. The pooled coupon effect is the weighted average of the effect in the three arms with coupons: Neno WASH, Neno no WASH, and Mwanza. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. *** p<0.01, ** p<0.05, * p<0.1

Table B4: Health outcomes: breakdown by illness (children under 5)

VARIABLES	(1) Diarrhea	(2) Fever	(3) Vomit	(4) Cough
Coupon	-0.028	-0.059*	0.004	-0.052
	(0.022)	(0.030)	(0.019)	(0.034)
Coupon X Mwanza	-0.107***	-0.012	-0.059*	0.012
	(0.037)	(0.050)	(0.034)	(0.052)
WASH	0.011	0.023	0.012	0.028
	(0.023)	(0.030)	(0.019)	(0.031)
Coupon X WASH	0.014	-0.049	-0.037	-0.042
	(0.031)	(0.037)	(0.024)	(0.043)
Home Delivery	-0.013	-0.019	0.002	-0.054
	(0.024)	(0.033)	(0.021)	(0.039)
Home Delivery X Rationing	0.024	0.019	0.003	0.070
	(0.033)	(0.041)	(0.022)	(0.047)
Mwanza	0.113***	0.079**	0.098***	0.078**
	(0.030)	(0.037)	(0.026)	(0.037)
Child Age (Years)	-0.051***	0.005	-0.004	-0.015**
	(0.004)	(0.005)	(0.004)	(0.006)
Observations	4,495	4,493	4,497	4,497
Month FE	Yes	Yes	Yes	Yes
Pooled Coupon Effect	-.045***	-.084***	-.026**	-.068***
P-value Pooled Coupon Effect	0.001	<0.001	0.019	<0.001
P-value of Coupons vs. HD	0.889	0.028	0.421	0.878
Neno Control Group Mean	0.164	0.388	0.108	0.483
Number of clusters	819	818	819	819

Notes: Data are from follow-up surveys conducted on a rolling basis between May 2018 and July 2019. The order in which households were surveyed was randomized, with stratification at the CHW level. Households were sampled to be surveyed twice, with an average gap of 6.4 months between the two follow-ups. Child illness was measured within the previous month for children from caretaker reports. The pooled coupon effect is the weighted average of the effect in the three arms with coupons: Neno WASH, Neno no WASH, and Mwanza. Standard errors clustered at the cluster level in parentheses. A cluster is a CHW catchment's area in Neno and a household in Mwanza. *** p<0.01, ** p<0.05, * p<0.1.