Annexe: Effects of the latrines' coverage on the diarrhoea prevalence and mortality rate among the under 5 children

a. Objectives of the survey and protocol

During the first semester of 2011, an exhaustive survey has been conducted on the Hygiene & Sanitation situation of the families in 3 Woreda: Kindo Didaye, Daramalo and Ofa (exhaustive survey in 8 kebeles, corresponding to a total of 7.996 families; population of 41.907).

The objective of the survey was to **evaluate the latrine (whatever the type and the state) and access to safe water coverage, the knowledge of the parents on the importance of hand washing after defecation**. It aimed at correlating these indicators with two major indicators of the under 5 children health: the instant diarrhoea prevalence and the mortality rate. Also, communities within and out the project scope have been included for comparison purposes.

The questionnaire was voluntarily simple, as the survey had to be exhaustively conducted at the scale of the whole 8 kebeles. It was administered to all families through interviews conducted in the house of the family.

The main data collected in each household were:

1. The family size
2. The number of Under 5 children[1] (U5)
3. The presence of a latrine (to be observed)
4. Access to safe water
5. The number of under 5 children having a diarrhoea during the day of the survey (child to be seen)
6. The number of under 5 children who died during the previous year
7. When asking the question to one of the parent (possibly the mother): "what are the effective ways to prevent diarrhoea contamination"., we only registered if the parent quoted "hand washing after defecation" in her/his responses.

Surveyors have been selected and trained, and practical exercises on the administration of the questionnaire have been organised before conveying the survey. Also, random cross checking mechanisms were planned by project supervisors.

The results of the survey show that there is a real dynamic everywhere as regard to the use of latrines, even if the effects are not equal in the 3 Woreda's (and between the Kebeles within the same Woreda). **The global coverage for the 8 Kebeles has been measured at 79%** (6344 out of 7996 families), whatever the type of latrine. An important lesson is that the individual access to a latrine does not necessarily work as a protective factor against diarrhoea. But it is the level of collective coverage that has an impact, at least from a certain threshold (clearly visible in the chart: from above 70 and 80%). This is clearly highlighted by the survey. The analyse of the results also underlines an impact on the young children health, when both collective access to latrines and to safe water are met.

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[1] A simple trick was used to make sure that the children are well less than 5 years old: a child below 5 is not able to touch his/her ear with his/her opposite arm passing over the head; whereas after 5 years old, they can do it.

b. Presentation of the main results and analysis

A statistical analysis of the data collected allows establishing a comparison between different groups of U5, according to the incidence of diarrhoea among them versus their access to safe water and sanitation. To do so, we have presented the results observed in the different villages according to their position on an "access scale", separating the population of villages in several groups according to their global coverage. The first column shows the rate of collective access to a specific facility (water, latrine or both), then the number of under 5 (U5) living in the villages pertaining to the precedent category, than the number of U5 with an effective individual access, the incidence of diarrhoea and the number of reported deaths among the total group of children (with a calculation of the mortality rate for the U5).

U5MR = Under 5 Mortality Rate; which is calculated with the following formula: **U5MR** = $1 - e^{-(\mu \times t)}$

With: **μ** = $n /(U5 - n/2)$ (n being the number of death recorded during the last year) and **t** = 5 (years)

Access to safe water	U5	Access to water		Diarrhoea cases	Instant prevalence	Number of death last year	U5MR (‰)
[0-25%]	2132	77	4%	187	8,8%	82	172
[25-50%]	903	342	38%	97	10,7%	29	146
[50-75%]	1540	892	58%	115	7,5%	45	134
[75-100%]	2995	2863	96%	180	6,0%	80	123
Total	**7570**	**4174**	**55%**	**579**	**7,6%**	**236**	**142**

Access to latrine	U5	Access to a latrine		Diarrhoea cases	Instant prevalence	Number of death last year	U5MR
[25-50%]	620	207	33%	73	11,8%	29	204
[50-75%]	1990	1247	63%	202	10,2%	76	171
[75-100%]	4960	4503	91%	304	6,1%	131	122
Total	7570	5957	79%	579	7,6%	236	142

Both latrine and safe water	U5	Access to both a latrine and water		Diarrhoea cases	Instant prevalence	Number of death last year	U5MR
[0-25%]	2555	138	5%	253	9,9%	91	161
[25-50%]	1525	569	37%	112	7,3%	54	160
[50-75%]	982	606	62%	49	5,0%	30	140
[75-100%]	2508	2183	87%	165	6,6%	61	113
Total	7570	3496	46%	579	7,6%	236	142

Tests of statistical significance on incidence of diarrhoea have been applied on 2 groups of Under 5, using a quantitative class distribution based on the rate of access (for instance the group G1 in the water line is made from the addition of the [0-25%], [25-50%] [50-75%] subgroups in the corresponding above chart, with an actual rate of access calculated at 14%).

	rate	U5	Diarrhoea prev.	p-value
Water	G1 = 14%	3035	9.4%	p< 0.001
	G2 = 83%	4535	6.5%	
Latrines	G1 = 56%	2610	10.5%	p< 0.001
	G2 = 90%	4960	6.1%	
Both	G1 = 17%	4080	8.9%	p< 0.001
	G2 = 80%	3490	6.1%	

All comparisons appear to be highly significant (p-value), confirming that the different groups tested are not similar: **the incidence of diarrhoea is significantly lower in the groups with a better access to water, latrines or a combined one, with roughly the same level of confidence. What is interesting to note is the result observed for latrines, where there is a difference between the 2 groups in spite of a relatively high level of collective coverage in the G1 (56%).**

This result is to be compared with a previous survey focusing on the individual access to latrine conducted in 2008 in Daramalo, set out below:

|	Access to latrine	No access to latrine
Number of U5	427	550
Reported diarrhoea cases	37	56
Prevalence	8.7%	10.2%

*The test is not significant (p<0.3). It seems that **the presence of latrine does not have any statistically measurable impact on diarrhoea prevalence**. May be the size of the sample is not big enough to highlight a difference between the two populations. To confirm this, we can apply the same test on the population of children with an access to water only versus the population on children with a combined access (i.e. water + latrines).*

	Under 5	Reported cases	Prevalence
Only access to water	**325**	**27**	**8.3%**
Only access to latrine	**187**	**23**	12.3%
Combined access	**240**	**14**	**5.8%**
No access at all	**225**	**29**	12.9%

The test does not show any significant difference between the 2 samples (p>0.3). *In other words, an additional access to a latrine does not have any <u>measurable</u> additional effect on diarrhoea prevalence as opposed to a simple access to safe water.*

In other words, **what those surveys seem to highlight is the fact that the individual access to a latrine does not necessarily work as a protective factor against diarrhoea whereas the level of collective coverage does, at least from a certain threshold (80-90% as per the survey).** Taking all the results of the survey and grouping the villages by range of 10% coverage, this statement appears clearly in the following chart (which only takes the access to latrine factor), with a clear threshold around 75%:


Evolution of the diarrhoea prevalences versus the latrines' coverage
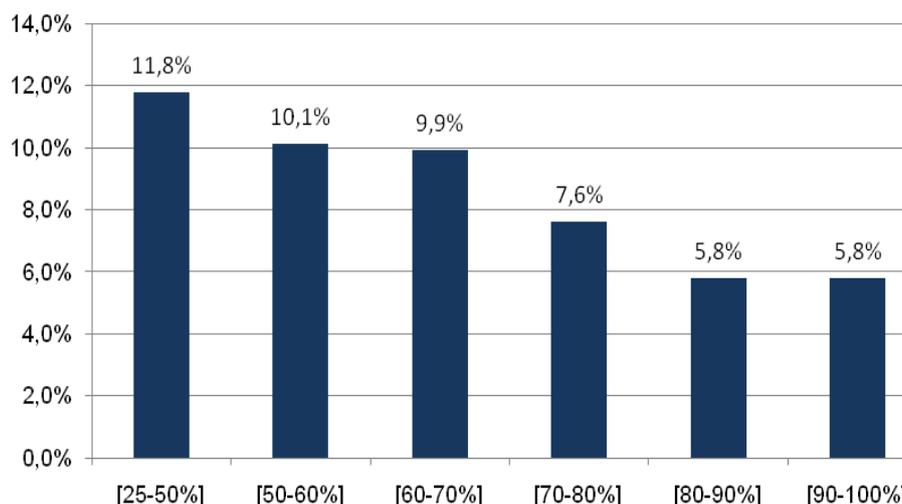
Another angle of analysis might be the **relationship between the rate of access and the child mortality**.

	rate	n	Mortality rate.	Confidence interval
Water	G1 = 14%	3035	170‰	[145-195]
	G2 = 83%	4535	130‰	[110-150]
Latrines	G1 = 56%	2610	180‰	[150-210]
	G2 = 90%	4960	120‰	[100-140]
Both	G1 = 17%	4080	160‰	[140-180]
	G2 = 80%	3490	130‰	[95-145]

The results are quite similar to what was observed for the diarrhoea incidence: the population of under 5 benefiting from a quantitatively higher access to water and sanitation facilities presents a mortality rate significantly lower. Although less pronounced, this tendency is also quite visible in the following chart done with the whole results:

Evolution of the child mortality rate (U5MR) versus the access to both a latrine and safe water
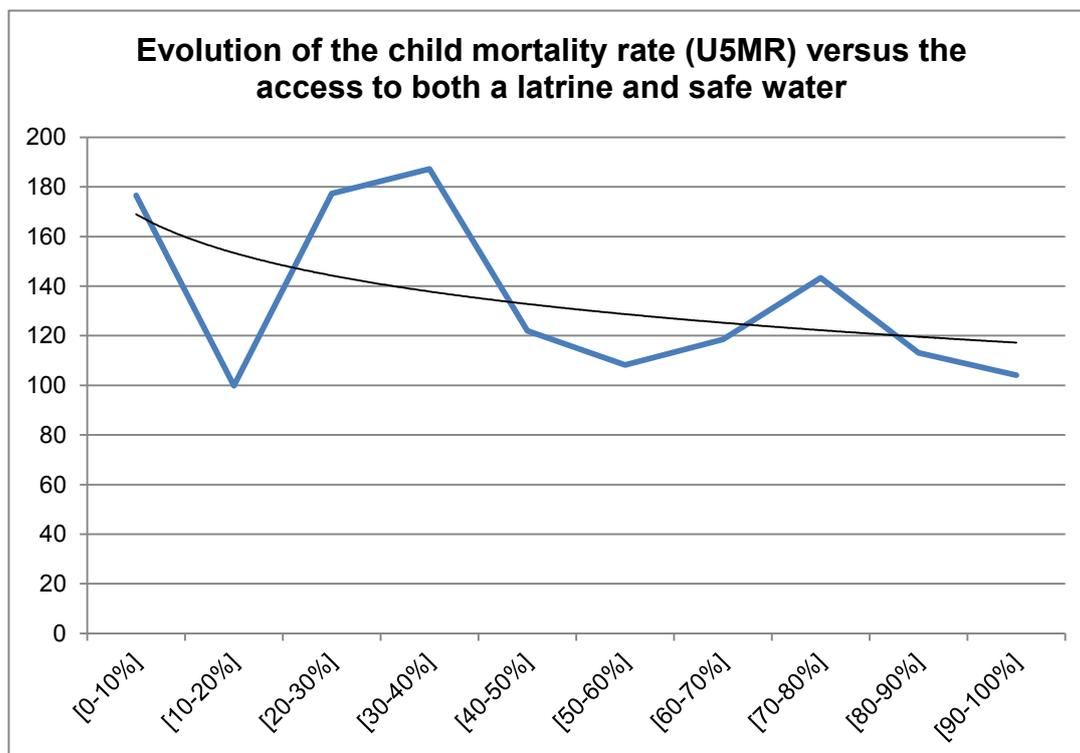
Finally, a last analysis considers the **main variable (incidence of diarrhoea) according to the factor exposure to the project activities**. The comparison will only consider the group without any exposure to the group <u>fully exposed</u> (complete geographical coverage). There is, as expected, a highly significant difference between the 2 groups (p<0.01), in the sense of a smaller rate of diarrhoea among the U5 of the fully exposed group. The impact on mortality rate, although showing a declining trend, does not reach the level of signification.

	Houses	U5	Knowledge parents (rate)	U5 having a latrine		U5 water		U5 Diarr		U5 Death	
no	2797	2882	23%	2097	73%	424	15%	245	8,5%	103	161
partial	1283	1234	23%	930	75%	673	55%	104	8,4%	31	117
covered	3916	3454	31%	2930	85%	3077	89%	230	**6,7%**	102	135
Gran total	**7996**	**7570**	**27%**	**5957**	**79%**	**4174**	**55%**	**579**	**7,6%**	**236**	**142**

It also shows that the latrine coverage has considerably increased in all places, even beyond the project intervention area. These results tend to show that the presence of the project allows increasing this ratio by 16% (85% versus 73%). On the knowledge factor, the results were somewhat disappointing with on average 27% of the parents quoting the hand washing after defecation as an effective way to prevent diarrhoea contamination. The project seems however to have a clear effect on the knowledge with a + 35% increase. As regard to the access to safe water, the impact of the project is logically much more visible.
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