

Enhancing the Water Point Mapping: A WASH Approach

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Abstract

Strategic planning and appropriate development and management of water and sanitation services can be strongly supported by accurate and accessible data. If adequately exploited, these data might assist water managers with performance monitoring, benchmarking comparisons, policy progress evaluation, resources allocation, and decision making. A variety of tools and techniques are in place to collect such information. However, some methodological weaknesses arise when developing an instrument for routine data collection, particularly at local level: (i) comparability problems due to heterogeneity of data and sector-related indicators, (ii) inadequate combination of different information sources, and (iii) statistical validity of collected data.

The purpose of this study is to adopt an integrated water, sanitation and hygiene (WASH) approach for data collection at community level in rural low income settings, as an attempt to overcome previous shortcomings. The survey design takes the Water Point Mapping (WPM) as a starting point to record all available water sources at a particular location, and this information is then linked to data provided from a household-based survey. In order to demonstrate the applicability of the method, a case study is presented at Tiraque Valley (Cochabamba, Bolivia).

Keywords

data collection, data management; water point mapping, WASH, Bolivia

INTRODUCTION

Water and sanitation improvements can have significant effects on health population by reducing a variety of disease conditions, such as diarrhoea, intestinal helminths, guinea worm, and skin diseases. However, improving access to safe water and basic sanitation do not automatically result in improvements in health. The addition of hygiene education is required to see health impacts materialize. In consequence, global concern towards an integrated water, sanitation and hygiene approach (WASH) is rapidly increasing, and the provision of a reliable water supply and sanitation infrastructure with personal hygiene promotion for people worldwide has become a top priority on the international agenda. It is certainly a challenge for the Millennium Development Goals (MDGs), particularly for Target 10 of Goal 7, which explicitly deals with people who do not access safe drinking water and basic sanitation.

To attain this and other related targets it is vital that there is accessible, accurate and reliable data that is routinely collected and updated. Sector-related information might be used to support sound decision making, specifically to (i) measure progress and performance, (ii) promote increased investments in the sector, and (iii) allocate resources to deliver basic services where they are most needed. A variety of tools and techniques are in place to collect such information. However, some methodological problems arise when developing an instrument for routine data collection, and they should be effectively dealt with in order to avoid planning decisions based on false assumptions.

A key limitation when using information from different sources is that of comparability, and more often than not, to assess trends over time within countries or to compare data from different countries has remained elusive (WHO/UNICEF, 2006). As a first step against this comparability problem, the Joint Monitoring Programme for Water Supply and Sanitation (JMP) has formulated a set of harmonized survey questions (WHO/UNICEF, 2006). Its expanded use worldwide should provide reliable data to estimate drinking-water and sanitation coverage at national level and below

(Joint Monitoring Programme, 2010).

Another constraint is more related to the type of data required to evaluate the sector, since different information sources might be employed. It is believed that a focus on households is insufficient, since the presumption that sustainability issues of water supplies can be assessed at the dwelling appears to be over-simplistic. On the other hand, though an audit of the water point might provide insight into management-related aspects of the service, no reliable information can be obtained at this level with regards to domestic hygienic habits. The literature indicates that a methodology that combines both information sources has not yet been developed.

Finally, there is an issue with the statistical precision of the estimates made from collected data. In deciding the sample size for a survey, one is often faced with the need to balance precision against cost. At large-scale level, a cluster sampling design has proved a practical solution for most surveys, where the idea of taking a simple random sample would be almost impossible (Bennett *et al.*, 1991; Howard *et al.*, 2003, draft; United Nations Children's Fund, 2006). This approach, though, does not provide accurate information at local level; and consequent decision-making is often limited by substantial information gaps. As an alternative, water point mapping exercises have been successfully implemented to monitor the distribution and status of water supplies. Main strength is comprehensiveness with respect to the sample of water points audited, but the drawback from an integrated WASH perspective, however, is that the focus is only on water.

The purpose of this study is to adopt a new specific approach for WASH data collection at local level, as an attempt to overcome previous shortcomings. It takes the Water Point Mapping (WPM) as a starting point to record all available water sources at a particular location, which results in the need of covering almost the whole area of intervention. This information is then combined with data provided from a household-based survey, in which a representative sample of households is selected to assess sanitation and hygiene habits. In order to demonstrate the applicability of the method, it has been piloted at Tiraque Valley (Cochabamba, Bolivia) as initial case study.

METHOD

Mapping of water points has been in use by NGOs and agencies worldwide for over a decade. This methodology, originally designed and promoted by WaterAid, can be defined as an 'exercise whereby the geographical positions of all improved water points¹ in an area are gathered in addition to management, technical and demographical information' (WaterAid & ODI, 2005). WPM involves the presentation of these data in a spatial context, which enables a rapid visualization of the distribution and status of water supplies. A major advantage is that water point maps provide a clear message on who is and is not served; and particularly in rural areas, they are being used to highlight equity issues and schemes' functionality levels at and below the district level (WaterAid, 2010).

The standard WPM method has been improved (enhanced Water Point Mapping, eWPM) with two complementary actions (Jiménez & Pérez-Foguet, 2008): i) basic water quality tests using portable water testing kits; and ii) assessment of seasonality issues through direct questions to users. On one

¹ The types of water points considered as improved are consistent with those accepted internationally by the WHO/UNICEF Joint Monitoring Programme (Joint Monitoring Programme (2010). Progress on Sanitation and Drinking-water: 2010 Update. *Joint Monitoring Programme for Water Supply and Sanitation*. Geneva / New York: WHO / UNICEF.), where definition of improved is technology-based. More specifically, an improved water point is a place with some improved facilities where water is drawn for various uses such as drinking, washing and cooking (Stoupy, O. and Sugden, S. (2003). Halving the Number of People without Access to Safe Water by 2015 – A Malawian Perspective. Part 2: New indicators for the millennium development goal. London: WaterAid.)

hand, water quality analysis has long been nearly absent from water coverage assessments, since regular water quality surveillance is beyond the means of local authorities in rural low-income settings. Instead, it is assumed that certain types of water supplies categorized as ‘improved’ are likely to provide water of better quality than traditional unimproved sources (Joint Monitoring Programme, 2000). This assumption, though, appears over-optimistic, and it has been shown that improved technologies do not always deliver safe water (Jiménez & Pérez-Foguet, 2008; Sutton, 2008). On the other hand, securing the maximum health benefits from investments in water supply depends on service reliability (Hunter et al., 2009), which draws attention to the issue of seasonality of drinking water sources. The eWPM methodology ultimately allows policy planners to estimate the coverage of year-round safe improved water points of a certain territory (Jiménez & Pérez-Foguet, 2008).

The approach adopted in this study incorporates two further improvements. First, being the original focus of WPM on improved water points, unimproved sources are also mapped in this exercise if they are accessed by villagers for domestic purposes. A thorough analysis of collected data will shed light on the suitability of indicators employed by the JMP (improved / unimproved water points) in terms of water safety. Second, and additionally to the mapping, sanitation service level and hygienic practices are evaluated through a cluster-sample household survey. This should provide adequate information for programme planners to define integrated sector-related and context-specific interventions. In the end, the framework proposed is reliant on a combination of survey instruments specially designed to collect information from these two sources: the water point and the household. Key features of the revised approach include (Table 1): i) exhaustive identification of communities in the area of intervention; ii) audit of all improved and unimproved drinking-water points accessed by villagers; and iii) selection of a sample size of households that is representative at municipality level (i.e. Tiraque) and below (in Bolivia, districts; since they represent the lowest administrative level). A step-by-step guidance follows.

Table 1. Basic steps in conducting a WASH survey

| | |
|--|---|
| Step 0: Preliminary tasks | 1.a. Definition of indicators and development of survey instruments 1.b. Training to field workers 1.c. Involvement of personnel from local authorities |
| Step 1: Visit to all communities in the area of intervention | 2.a. Meeting with local representatives (from water entities or similar) 2.b. Identification of available waterpoints (improved / unimproved) within the village boundaries (regardless functionality issues). |
| Step 2: Audit of improved / unimproved waterpoints | 4.a. Visit and audit of all listed waterpoints 4.b. Water sampling for basic quality analysis |
| Step 3: Household survey | 4.a. Random household selection at village level 4.b. Interview in each selected household |

Prior to starting field work, first stage consists of developing appropriate survey tools for an accurate assessment of the WASH status in the area of intervention. As previously outlined, the methodology combines water points and households as information sources, and a set of reliable and objective indicators has been accordingly defined as the foundation stone of the evaluation strategy (Table 2). To start with, inclusion of indicators considered by the JMP (Joint Monitoring Programme, 2010; WHO/UNICEF, 2006) is recommended as this will ensure harmonization and allow for comparison with data collected elsewhere. To rely, though, on a fixed set of indicators appears to be inappropriate, and involvement of local stakeholders is essential to ultimately adapt

the survey to each particular context.

Table 2. List of core WASH indicators

| WASH Component | | Indicator |
|---------------------|--|---|
| Water Supply | Access to improved water sources ^{a,b,c} | % households with access to improved water supply |
| | One way distance to water source (km) ^{a,c} | Average time spent in fetching water |
| | Individual collecting water ^{a,c} | % households in which women shoulder the burden in collecting water |
| | Domestic water consumption ^a | Average rate of per capita domestic water consumption |
| | Operational status of water source ^b | % water sources operational |
| | Water quality (bacteriological contamination) ^b | % bacteriological acceptable water sources |
| | Seasonality of water resources ^b | % year-round water sources |
| | Operational status of water source ^b | % water sources operational |
| | Management system ^b | % facilities managed at local level |
| | Financial Control ^b | % water entities with financial control system in place |
| Sanitation | Access to and use of improved sanitation ^{a,c} | % households with access to improved sanitation |
| | Latrine sharing ^a | % households sharing improved sanitation facilities |
| | Latrine conditions ^a | % latrines maintained in acceptable conditions |
| Hygiene | Handwashing ^a | % child caregivers with appropriate handwashing behavior |
| | Point-of-use water treatment ^{a,c} | % households with adequate water treatment |
| | Disposal of children's stools ^{a,c} | % child caregivers correctly handling baby excreta |

Note: a = data from household survey; b = data from water point mapping; and c = JMP indicator.

Next preliminary task involves appropriate training to all field workers, including among others a thorough revision of questionnaires, use of databases, use of GPS equipment, basic water quality analysis (use of the portable water testing kit) and water sampling procedures. Finally, the joining of local officers belonging to the municipality is extremely important at this stage, because these officers will ensure a strong link between field staff and the local structures at community level.

Once the design of the survey is completed and staff adequately trained, the field activities in the survey can be planned. The first step is to draw up a program on a daily basis, in which all targeted villages are adequately scheduled. It makes sense to select the number of villages to be visited on practical grounds, for example, the number that can be completed in one full day's work. At village level, the aim of meeting representatives of the Water Committee (or similar) is twofold: i) to briefly introduce main survey goals, and ii) to develop a comprehensive list of available drinking-water points (either improved or not improved) accessed by villagers. In the area of intervention, though, main water technology is gravity-fed systems with household connections. The idea of auditing all private connections would be practically impossible, and as a more convenient solution for this survey, the distribution tank has been audited and taken as representative of the overall system.

Next step is to visit all listed water points / piped systems (regardless functionality issues). The audit of the source captures information related to the existence, functionality and management of the facility through a standardized checklist of key criteria; and includes among others i) GPS position, ii) water seasonality and reliability, iii) operational status, iv) number of standpipes / point connections, v) usability and acceptability, vi) ownership, vii) management issues, and viii) maintenance of the facility. A part from the audit form, a water sample is collected using the portable kit for water quality testing. Key parameters analysed are pH, conductivity, turbidity, faecal coliforms and disinfectant residual. The ideal target is to sample all functional waterpoints, although in piped schemes, the water sample is only obtained from the tank (when possible) and at least from one point of the network (located as far as possible from the tank).

In parallel with the water point mapping, another team of field staff undertakes the household survey. Ideally, a defined number of households would be selected randomly in each visited village. It is noted, however, that no comprehensive list of households in each community is available at the time the survey is conducted, so a complete random exercise is not achievable. In order to ensure that the sample is as representative as possible, methods which achieve near-random selection of households, preferably spread widely over the community, have been applied. At the dwelling, service level is captured through a structured household-based questionnaire administered to primary care-givers and direct observation. Issues covered are inter alia i) type of main drinking-water source, ii) domestic water consumption, iii) time spent in hauling water, iv) sanitary inspection of water containers, v) use of sanitation facilities, vi) latrine conditions, vii) disposal of children's stools, and viii) handwashing behaviour.

After field work, data collected using the GPS are downloaded and exported directly to GIS software, and collected data from all questionnaires are entered into the database. In the last stage, these data need to be validated, and various quality control procedures are applied to such datasets to ensure that the data reflects the true position as accurately as possible.

Sample size and precision

As previously mentioned, main goal of WPM is to develop a comprehensive record of all water points available at a particular geographic area. There is thus no need of sampling.

For the household survey, however, estimates are required at the overall municipality level and below². The basic sampling unit is the household, and because people usually live in clusters of households (i.e. villages), they have been used as the basis for sampling. The sample size is therefore determined based on a formula used for cluster-sample surveys (Bennett *et al.*, 1991; Howard *et al.*, 2003, draft; United Nations Children's Fund, 2009).

$$n = \frac{4p(1-p)D}{e^2} \quad \text{Eq. 1}$$

where:

n = required number of samples

p = assumed proportion of households giving a particular response for one given question. P = 0.5 as this value maximizes the likelihood of obtaining a sample that is representative of the true data distribution. This also provides a conservative estimation of the required sample size (i.e. larger that required).

² The Government of Bolivia has recently endeavoured a series of administrative changes in the country, and the lowest administrative level has shifted from Sector to District. The survey was initially designed to achieve representative estimates at Sector level, but the analysis has been undertaken using the District as the valid administrative scale.

D = Design effect. D = 2 is appropriate given what can be expected in terms of homogeneity for household variables being studied. The mapping methodology entails comprehensive geographic representation and inclusion of all clusters (i.e. villages) as part of the survey design specifications. The risk of homogeneity therefore diminishes, allowing a smaller value for D than the value that would be required in a multi-stage cluster sampling survey.

e = standard error (acceptable precision expressed as a proportion). $e = \pm 0.05$ is typically used in similar surveys, based on the argument that lower precision would produce unreliable results while a higher precision would be too expensive as it would require a very large survey. The value $e = 0.05$ gives a confidence interval of 95%. This precision has been considered at municipality level. Estimates at sector / district level are assessed with lower precision; i.e. $e = \pm 0.10$

This results in a minimum sample size of 200 household per sector / district, while 800 households are required to cover the municipality of Tiraque. From Table 3 it can be seen that expected precision has been amply exceeded at municipality level, while it has not been achieved in some districts².

Table 3. Sample stratification, at district level

| Distrito | No. Water points / Piped Systems | No. Households | Total Population (no. HH) |
|-----------------|---|-----------------------|--------------------------------------|
| Distrito 1 | 3 | 25 | 185 |
| Distrito 1B | 7 | 103 | 497 |
| Distrito 2 | 37 | 174 | 682 |
| Distrito 3 | 19 | 103 | 482 |
| Distrito 4 | 33 | 228 | 650 |
| Distrito 5 | 24 | 176 | 690 |
| Distrito 6 | 19 | 103 | 347 |
| Distrito 7 | 12 | 74 | 166 |
| Distrito 8 | 12 | 85 | 229 |
| Distrito 9 | 39 | 193 | 786 |
| Distrito 10 | 33 | 159 | 452 |
| Tiraque | 239 | 1422 | 5166 |

DISCUSSION

In previous section, a simplified approach to survey design for WASH data collection has been presented. The aim of the discussion focuses on providing statistical validity of the methodology, and not on a deep analysis of WASH status at Tiraque Valley.

Estimating the standard error of a proportion and its design effect

The approach adopted for household data collection requires validation at both district and municipality level, in order to guarantee reliability of any outcome produced. To do this, estimates of proportions are calculated, together with standard errors of those estimates, so that confidence intervals can be assessed. All calculations described below are simple and can be easily carried out on a simple calculator (Bennett *et al.*, 1991).

The proportion p , for example, of households in the i^{th} district with access to improved sanitation is given by Equation 2. And in Tiraque, the proportion is estimated by Equation 3. It is noted that the latter is the straightforward ratio of the sample totals, which is not the same as the average of p_i 's.

$$p_i = \frac{y_i}{x_i} \quad \text{Eq. 2}$$

$$p = \frac{\sum y_i}{\sum x_i} \quad \text{Eq. 3}$$

where:

y_i = number of households in the i^{th} district with access to improved sanitation
 x_i = number of surveyed households in the i^{th} district

However, the number of households to be surveyed in each cluster (i.e. village) has not been specified in the methodology, thus being different within clusters. And clearly, clusters do not have same size. If these facts are ignored when estimating the proportions, it will lead to clusters being under or overrepresented. The solution is to weight the achieved responses, giving the more general formulae:

$$p = \frac{\sum w_i y_i}{\sum w_i x_i} \quad \text{Eq. 4}$$

where:

w_i = weight of cluster i (proportional to the population of the cluster)

The standard error, s , of p is estimated by:

$$s = \frac{c}{\sum w_i x_i} \times \sqrt{\frac{\sum w_i^2 y_i^2 - 2p \sum w_i^2 x_i y_i + p^2 \sum w_i^2 x_i^2}{c(c-1)}} \quad \text{Eq. 5}$$

where:

c = number of clusters

Finally, achieved results can be used to calculate design effects, for their use in future surveys. They are obtained by dividing standard error from previous equation by a hypothetical standard error calculated with the formula used (Equation 6) when the data are assumed to come from a simple random sample (Equation 6):

$$D = \sqrt{\frac{p(1-p)}{\sum x_i}} \quad \text{Eq. 6}$$

$$D = \frac{s^2_{Eq.5}}{s^2_{Eq.6}} \quad \text{Eq. 7}$$

Summary of aforementioned statistics (proportion, standard error and design effect) for three core survey variables, at Tiraque level and below, are presented in Table 4 (only few districts are shown). It can be seen, for example, that the 95% confidence interval for the true proportion of households that access to improved water points in Tiraque is $0.874 \pm (2 \times 0.018)$, i.e. 0.838 to 0.91. In case we ignore the design of the methodology and assume a simple random sample, the standard error (Equation 6) is 0.009, and estimated confidence interval ranges from 0.856 to 0.892 (which is 50% narrower than the correct value). The design effect for this variable is estimated as 4, thus

doubling the value initially considered for this survey.

From Table 4, it is observed that standard errors for these variables in all districts are not high, and in any case it is believed that resulting confidence intervals are ‘accurate’ enough for planning purposes. It might therefore be concluded that the methodology produces reliable estimates at the municipality level and below. Statistics also show that design effect decreases with risk of homogeneity, as might be expected.

Table 4. Estimated proportion, Standard Error and Design effect of WASH indicators

| | Access to water | | | Access to sanitation | | | Point-of-use water treatment | | |
|-------------|-----------------|-------------------|----------|----------------------|-------------------|----------|------------------------------|-------------------|----------|
| | <i>p</i> | <i>Std. Error</i> | <i>D</i> | <i>p</i> | <i>Std. Error</i> | <i>D</i> | <i>p</i> | <i>Std. Error</i> | <i>D</i> |
| Tiraque | 0.874 | 0.018 | 4 | 0.349 | 0.051 | 16 | 0.788 | 0.029 | 7 |
| Distrito 2 | 0.851 | 0.064 | 6 | 0.391 | 0.114 | 8 | 0.725 | 0.051 | 2 |
| Distrito 5 | 0.977 | 0.017 | 2 | 0.358 | 0.106 | 8 | 0.965 | 0.017 | 1 |
| Distrito 8 | 0.817 | 0.107 | 6 | 0.012 | 0.010 | 1 | 0.870 | 0.061 | 3 |
| Distrito 10 | 0.766 | 0.065 | 4 | 0.121 | 0.041 | 3 | 0.721 | 0.046 | 2 |

Results

In this section there is no attempt to deeply discuss WASH issues at Tiraque Valley. We have rather aimed to present a set of survey outputs to demonstrate that the approach adopted in this study produces relevant sector data, which adequately exploited might be employed by policy planners to support decision-making. Much like the previous section, though, the analysis focuses on three core indicators (results of other survey variables are not shown here).

To begin, water point maps (Figure 1) are powerful visual instruments for displaying information and enable non-technical audiences to easily describe patterns and trends (Henninger & Snel, 2002) (Henninger and Snel 2002). Similarly, thematic maps (Figures 5b, 6b, 7b) assist in the analysis of WASH-related issues, and provide decision-makers with a valuable planning tool to rapidly identify those clusters in which to focus their efforts for maximum impact (Henninger, 1998), thus improving efficiency and accountability.

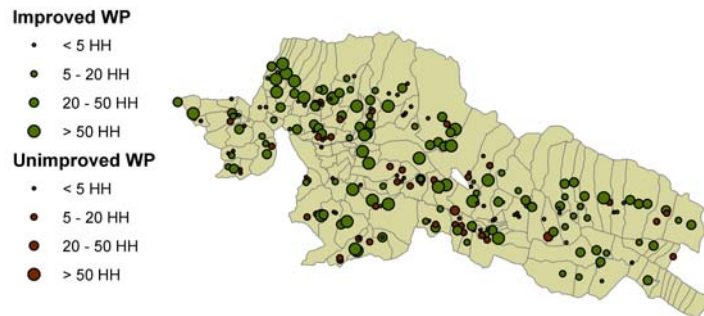


Figure 1. Distribution of water points, at community level

The map in Figure 1, for example, shows the spatial distribution of water sources, and it is observed that almost all communities at Tiraque have their own improved water point. More specifically, 60% of audited sources are improved, and gravity-fed piped systems accounts for the highest proportion (roughly nine out of ten of the improved facilities). The most common unimproved

technology is unprotected spring (85%).

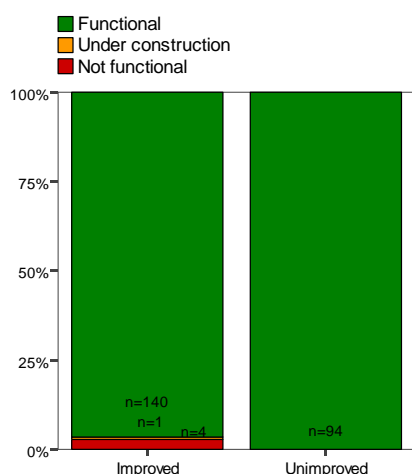


Figure 2. Operational status of water points

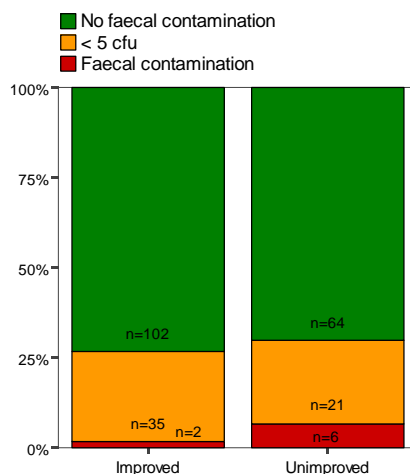


Figure 3. Microbiological contamination of sources

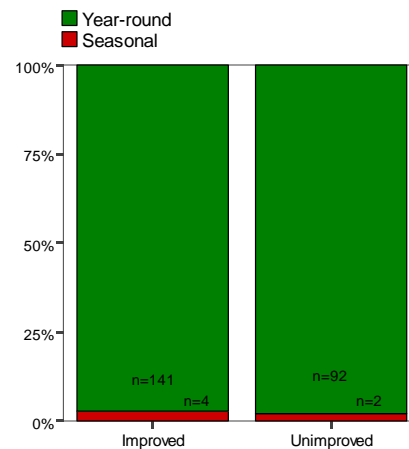


Figure 4. Seasonality issues of water resources

Data analysis at the water source might also focus on validating the suitability of indicators employed by JMP when defining “access to water”. It is gleaned from graphs 2 - 4 that there are only small variations in relation to functionality, water quality, and seasonality when water points are categorized as improved / unimproved. In addition, and contrary to what might be expected, it can be seen that neither bacteriological contamination nor seasonality are relevant issues in the area of intervention.

In decision-making, another key aspect is that any assessment tool needs to be applied at the appropriate scale. This is main reason why estimates have been produced at both district and municipality scales, as one relevant outcome of the adopted methodology. For example, at the regional level, one single coverage value might be sufficient to describe the municipality of Tiraque and to compare it with other municipalities; but this value says nothing about local variations, and estimates at the lowest administrative scale are required for local service planning.

Table 5 presents data from household survey for core water, sanitation and hygiene indicators at municipality level and below. It is observed that access to improved water sources is high, averaging 88% for the whole survey. And regional differences are not significant, being lowest values around 80%. In contrast, the actual coverage of improved sanitation is alarming (32%); and additionally, there are marked regional variations. It is seen that adequate sanitation is least acute in Distrito 1B (69%), while north-western and south-eastern districts present the lowest values (< 20%). Finally, adequate domestic hygiene (considering point-of-use water treatment as a proxy) averages 78%, but again with regional variation from one district to another. These data might be also visualized using graphs and maps, as shown in Figures 5 – 7. Although both alternatives present same data, thematic maps allow the spatial identification of the neediest, which enhances the analysis of WASH issues and provide a practical way for planners and managers to target public priorities.

Finally, it is noted that standard statistical packages can also be used to assess relationship between survey variables. It is gleaned from Figure 8 that there is significant association between access to improved water supplies with access to basic sanitation. In contrast, no significant reduction association was observed with point-of-use water treatment (Figure 9).

Table 5. Access to water, sanitation and hygiene, at district level

| | | Water Supply | | Sanitation | | Hygiene | | Total |
|-------------------|-------|--------------|-----------|------------|-----------|------------------------------|--------------------|-------|
| | | Improved | Unimprov. | Improved | Unimprov. | Point-of-use water treatment | No water treatment | |
| Distrito 1 | Count | 21 | 4 | 12 | 13 | 16 | 9 | 25 |
| (3 communities) | % | 84 | 16 | 48 | 52 | 64 | 36 | |
| Distrito 1-B | Count | 94 | 9 | 71 | 32 | 85 | 18 | 103 |
| (10 communities) | % | 91 | 9 | 69 | 31 | 83 | 17 | |
| Distrito 2 | Count | 143 | 31 | 71 | 103 | 123 | 51 | 174 |
| (13 communities) | % | 82 | 18 | 41 | 59 | 71 | 29 | |
| Distrito 3 | Count | 83 | 20 | 44 | 59 | 82 | 21 | 103 |
| (7 communities) | % | 81 | 19 | 43 | 57 | 80 | 20 | |
| Distrito 4 | Count | 206 | 22 | 73 | 155 | 164 | 64 | 228 |
| (15 communities) | % | 90 | 10 | 32 | 68 | 72 | 28 | |
| Distrito 5 | Count | 167 | 9 | 56 | 120 | 168 | 8 | 176 |
| (13 communities) | % | 95 | 5 | 32 | 68 | 95 | 5 | |
| Distrito 6 | Count | 84 | 19 | 12 | 91 | 80 | 23 | 103 |
| (14 communities) | % | 82 | 18 | 12 | 88 | 78 | 22 | |
| Distrito 7 | Count | 73 | 1 | 13 | 61 | 49 | 25 | 74 |
| (7 communities) | % | 99 | 1 | 18 | 82 | 66 | 34 | |
| Distrito 8 | Count | 73 | 12 | 1 | 84 | 72 | 13 | 85 |
| (10 communities) | % | 86 | 14 | 1 | 99 | 85 | 15 | |
| Distrito 9 | Count | 173 | 19 | 84 | 109 | 157 | 36 | 193 |
| (15 communities) | % | 90 | 10 | 44 | 56 | 81 | 19 | |
| Distrito 10 | Count | 128 | 31 | 16 | 143 | 118 | 41 | 159 |
| (10 communities) | % | 81 | 19 | 10 | 90 | 74 | 26 | |
| Total | Count | 1245 | 177 | 453 | 970 | 1114 | 309 | 1422 |
| (117 communities) | % | 88 | 12 | 32 | 68 | 78 | 22 | |

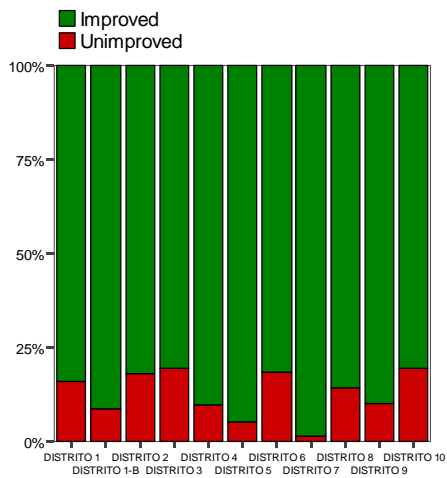


Figure 5. Access to water

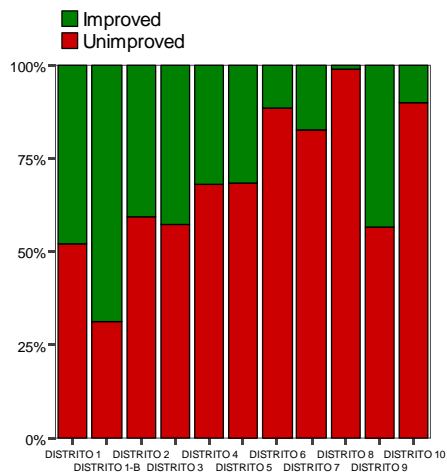
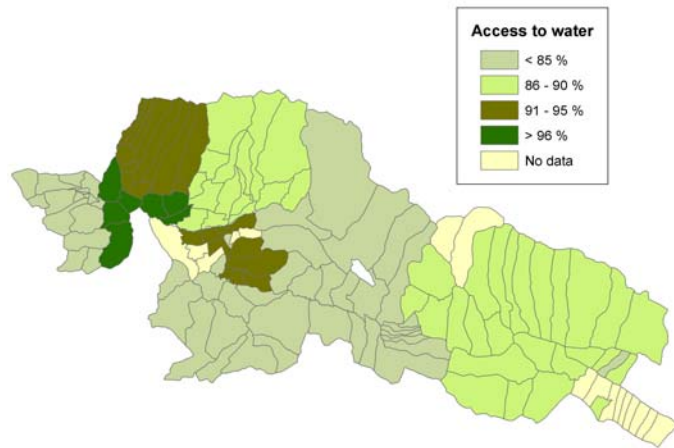


Figure 6. Access to sanitation

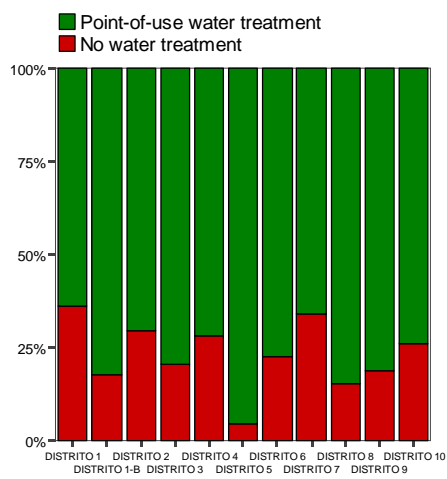
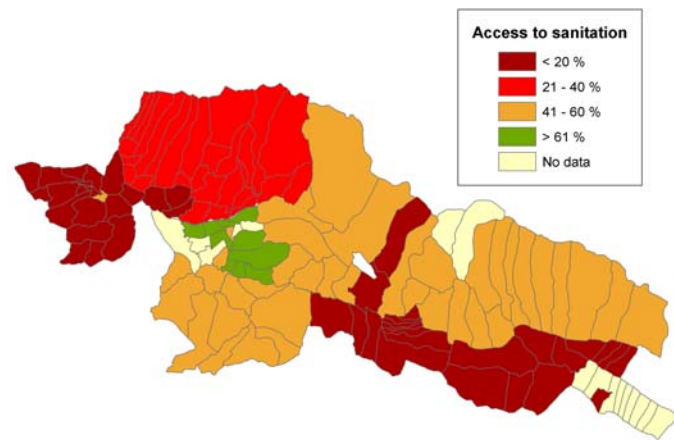
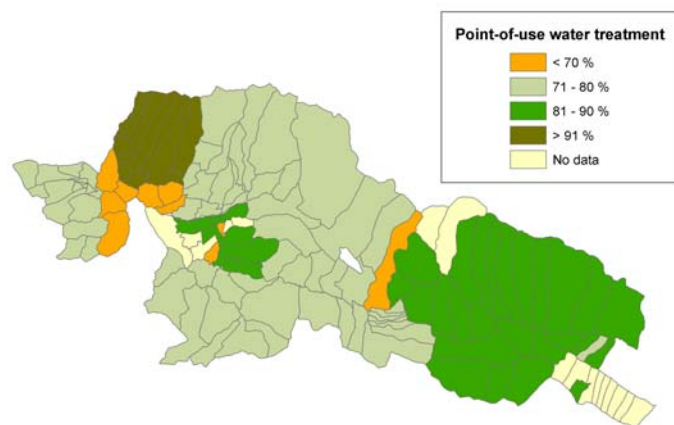


Figure 7. Point-of-use water treatment



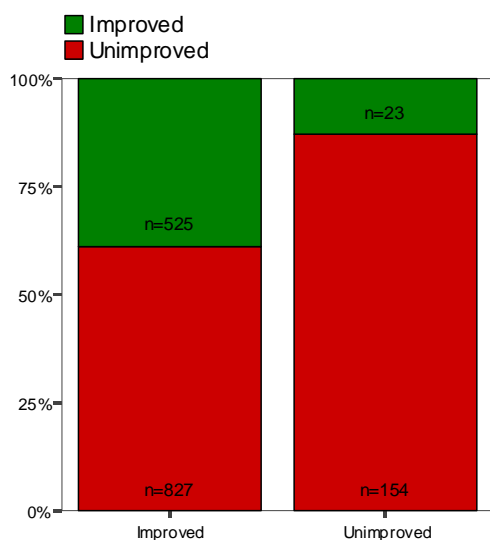


Figure 8. Relation between access to water and basic sanitation

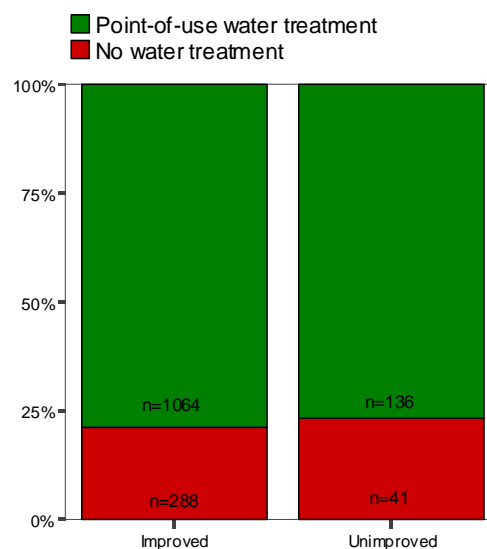


Figure 9. Relation between access to water and point-of-use water treatment

CONCLUSIONS

A simplified approach to survey design for WASH data collection is presented in this paper. Main goal is not a deep analysis of WASH indicators at a particular location. We have rather aimed to provide a step-by-step guidance to plan a survey in a way which will produce reasonably representative estimates with adequate precision without investing large amount of resources.

Major findings follow:

- It is now accepted that water supply, sanitation and hygiene promotion should be integrated and form the three foundation stones of water and sanitation projects. Therefore, an integrated WASH approach for data collection should provide decision-makers with greater diagnostic power, which would allow them to design context-specific interventions.
- The methodology presented here offers an improvement on other similar methodologies. The approach adopted i) includes indicators considered by the JMP to allow for comparison with data collected elsewhere, ii) combines data from two different information sources (water points and households) to provide a more precise picture of sector constraints and challenges, and iii) produces representative estimates at local level, which are required to support sound policy-making.
- Achieved results can be disseminated and presented in a number of different ways, such as tables, graphs and maps. Final choice is not a trivial issue since this might influence data interpretation. For the purpose of resource allocation, targeting the neediest through maps compares favourably, since they are easily understood by non-technical stakeholders.

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