User satisfaction with rural water drinking points in Woliso District, Central Ethiopia

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ABSTRACT

Access to safe drinking water is essential to healthy living. Thus, investment in rural drinking water points is increasing in Ethiopia. However, little is known about user satisfaction with rural drinking water points. Therefore, this study was undertaken to investigate determinants of the user’s satisfaction with rural drinking water points in Ethiopia by considering Woliso District (Woreda) as a case study. A semi-structured questionnaire was administered with 211 randomly selected households from six rural Kebeles (administrative areas), which were selected using a stratified sampling technique. Focus group discussions (FGD) and key interviews (KI) were also held along with observation. The quantitative data were analysed through descriptive statistics and binary logistic regression. The qualitative data were used to augment the results from the regression analysis. The results revealed that location of the water point, availability of guards, queueing time, service reliability, and distance significantly influence the satisfaction of users. Therefore, these significant factors should be addressed when planning water supply projects.

Key words | queueing time, rural drinking water points, user’s satisfaction, water point location

HIGHLIGHTS

- Conceptual contribution: Highlighting a variable (importance of guards at rural water points) that has never been or rarely assessed before.
- Practical contribution: Dealing with one of the essential areas (satisfaction with rural drinking water points) which is not given due attention in Sub-Saharan Africa.
- Methodological contribution: Identifying the factors in their level of dominance in explaining user satisfaction.

INTRODUCTION

Access to safe and sufficient water is essential to healthy living. However, one in three people or 2.2 billion people around the world lack safe drinking water and 4.2 billion people live without access to safe sanitation services (UNICEF & WHO 2019). In rural areas, 8 out of 10 people globally live without improved drinking water sources (WHO 2017a). On top of this, the 2019 United Nations World Water Development report notes that about 4 billion people, representing nearly two-thirds of the world population, experience severe water scarcity. The majority of these people live in developing countries.

Water issues in developing countries include scarcity of safe drinking water, poor infrastructure for improved water access, floods, droughts, and the contamination of rivers and large reservoirs. About 827,000 people in low- and middle-income countries die due to inadequate water,
sanitation, and hygiene each year, and this figure accounts for 60% of total diarrhoeal deaths (WHO 2017b). In many countries, pollution or rising sea levels are contaminating potable water sources. Water stress and lack of sanitation disproportionately affect women and children. These factors can affect their health, safety and opportunity to engage in economic activities. Millions of women spend many hours every day in collecting water. Their physical and financial burdens concerning water are often greater than those of men (WHO & UNICEF 2005). Children also spend their time in fetching water so that it affects their schooling time. Improving access to potable water reduces these problems.

To improve access to potable drinking water in developing countries, governments have often invested in, and subsidized, water supplies. Governments are attempting to improve access to safe water supply and sanitation facilities in order to achieve social and health benefits for low-income households that comprise a large majority of the rural population (Lammerink 1998; Whittington et al. 1998). This investment is important for improving health, education and livelihoods of the poor. Likewise, the Ethiopian government has been investing in potable drinking water over the last decade. Under GTP (Growth and Transformation Plan) II, the government has planned to achieve 85, 75 and 83% potable water coverage respectively in rural areas, urban areas and the country as a whole by the end of GTP II (2019/20). Towards achieving these goals, a lot of investment was made in the construction of potable water points. The midterm review of GTP II shows that potable water coverage has increased to 68.5% in rural areas, 54.7% in urban areas and an overall coverage of 65.7% (NPC 2018).

However, despite the importance of providing safe drinking water, little is known regarding user satisfaction with the rural drinking water points. Exploring user satisfaction with these services is an important means for improving the performance of drinking water points (Deichmann & Lall 2007), as users’ satisfaction indicates whether water points are appreciated and represent a relative improvement to alternative sources previously used by community members (Welle & Williams 2014). Furthermore, users’ satisfaction is a determinant for sustainability of water points primarily because users feel a higher sense of ownership, greater confidence in their ability to maintain the water system and promotes a better understanding of how the tariff is used, and also affects their willingness to pay for improvements. How far drinking water points satisfy users’ needs can be a key factor affecting the water points operation and maintenance (O&M) and thereby their sustainability (Welle & Williams 2014).

In the Ethiopian context, although the government has invested and continues to invest in rural drinking water points, the service is primarily suffering from non-functionality of the services. Different studies estimate that more than a third of the constructed water points are not functional at a given point in a year (ADF 2005; Anthonj et al. 2018; Gurmessa & Mekuriaw 2019). Different factors are responsible for the non-functionality of the water points, among which the level of user satisfaction is one of the major factors (Sutton et al. 2012; Gurmessa & Mekuriaw 2019). As indicated above, user satisfaction plays an important role in keeping the water points functional (sustainable) as users invest in terms of time and resources to maintain the water points as far as they are satisfied with the services that they get from the points. Sutton et al. (2012) pointed out that sustainability of a drinking water point depends largely on the degree to which users are satisfied with it to be willing to cover the costs of keeping it going. Thus, assessing users’ satisfaction with rural drinking water points has a far reaching effect for sustainability of rural drinking water points. Therefore, this study investigates determinants of users’ satisfaction with rural drinking water points in Ethiopia by considering the case study of Woliso Woreda, Oromia National Regional State.

RESEARCH METHODS

Description of the study area

Woliso Woreda (district), as shown in Figure 1, is found in South West Shoa Zone of Oromia National Regional State. It is divided into 37 peasant associations (Kebeles – the lowest administrative unit in Ethiopia composed of one or more villages) and Woliso town, the capital of the Woreda. The town is located 114 km west from the capital city of the country, Addis Ababa. The Woreda is the second largest Woreda in the Zone with a land area of 702.38 km² and it is located between the geographic coordinates of 8°16’N-9°2’N and 37°31’E-38°46’E. The highest and
the lowest elevations of the Woreda are 2,800 and 1,500 metres above sea level, respectively.

According to the water sector office of the Woreda (2015), the total population of the Woreda is 179,532 and of this number about 154,501 people do have access to potable water supplies. This shows that the coverage with water points is 86%. As per the office records, there are 393 drinking water points throughout the rural Kebeles of the Woreda.

Sample size and sampling technique

A multi-stage sampling design was employed to select Kebeles and users (represented by household heads). First, 6 rural Kebeles with relatively higher numbers of drinking water points, medium and lower numbers of drinking water points were selected after classifying all the 37 rural Kebeles of the study area into 3 strata (Kebeles containing higher, medium and lower numbers of drinking water points). Secondly, the users of the drinking water points were picked proportionally from each of the Kebeles through a simple random sampling technique.

The sample size of the study was decided following Godden’s (2004) determination formula which is given below:

\[
\hat{n} = \frac{Z^2pq}{d^2}
\]
where \( n \) is the desired sample size; \( Z \) stands for the standard score at 95% confidence level which is 1.96; \( p \) is the estimated target population proportion; \( q \) is 1-\( p \); and \( d \) is the confidence interval, expressed as a decimal, in this case 0.05. Substituting the values into the formula provided a sample size of 196. By assuming 7.5% for contingency, 211 users were selected for the survey.

In addition, two experts from the water sector office of the Woreda were selected for key interviews, and 3 focus group discussions (FGD) comprised of 6 household heads from each of the Kebeles were organized. The participants for the key interviews and focus group discussions were selected based on their knowledge and experience (participation in construction and subsequent management) of potable water points.

**Data source and collection instruments**

Both primary and secondary sources of data were used. A semi-structured questionnaire was used to collect quantitative data. This tool was used in particular to collect socioeconomic and water point related data (on the variables indicated below in Table 1) from users. The questionnaire was translated into the local language (Oromo language). The qualitative data were also collected from key informant interviews, focus group discussions and observation of the water points. Observation was employed to assess the functionality of sample rural drinking water points. The data collection was carried out with the full consent of the respondents. Upon making the purpose of the data collection (research purpose) clear, data were collected from the respondents with their full knowledge and agreement.

**Method of data analysis**

Descriptive statistics (frequency and percentage) and regression analysis were employed to analyse the data. Since the dependent variable is dichotomous (satisfied and not satisfied with the drinking water points), binary models (logit or probit) are used. For simplicity and easy interpretation, the researchers preferred a binary logistic regression model to predict the effects of independent variables on the dependent variable.

**Specification of the model**

The dependent variable (user’s satisfaction with the rural drinking water point) is dichotomous with two values, 1 if

| Variable            | Variable type | Variable descriptions and unit of measurement                                      | Expected sign |
|---------------------|---------------|------------------------------------------------------------------------------------|---------------|
| Dependent (Satisfaction) | Dummy         | User’s satisfaction with the service they get from the water points, ‘1’ if satisfied; ‘0’ if not satisfied |               |
| Independent variables |               |                                                                                    |               |
| Quantity            | Continuous    | Daily water consumption from the water point in litres                             | +             |
| Distance            | Continuous    | User’s distance from the water points, measured by minutes by foot                  | –             |
| Queueing            | Continuous    | Average queueing (waiting) time at the water point measured by minutes              | –             |
| Conflict            | Dummy         | Occurrence of conflict at water point, ‘1’ if a user has encountered or observed conflict in the water points, otherwise ‘0’ | –             |
| Interruption (Reliability) | Continuous | Frequency of interruption of the water point services in a year due to mechanical failure | –             |
| Location            | Dummy         | The convenience of the location of the water point to the user, ‘1’ if convenient, ‘0’ if not | +             |
| Age                 | Continuous    | Age of the water point in years since construction                                  | –             |
| Contamination       | Dummy         | User’s perception of the possibility of contamination at the water point, ‘1’ if yes, ‘0’ if no | –             |
| Guard               | Dummy         | Availability of guard at the water points, ‘1’ if yes, ‘0’ if no                   | +             |

Table 1 | Factors affecting user’s satisfaction with the service
a user is satisfied and 0 if not satisfied. Based on Gujarati (2004), the model can take the following equation:

\[
P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1X_i)}}
\]

In the logistic distribution equation, \(P_i\) is the probability of user's satisfaction; \(X_i\) is a set of explanatory variables of the \(i^{th}\) user; \(\beta_0 + \beta_1\) are the parameters to be estimated.

When \(\beta_0 + \beta_1 X_i\) in Equation (1) is replaced by \(Z_i\), Equation (2) (the probability of user's satisfaction) is obtained:

\[
P_i = \frac{1}{1 + e^{-Z_i}} = \frac{e^{Z_i}}{1 + e^{Z_i}}
\]

The possibility of user's non-satisfaction \((1 - P_i)\) can be depicted in Equation (3) as follows:

\[
1 - P_i = \frac{1}{1 + e^{Z_i}}
\]

From the above two equations, the odds ratio in favour of user's satisfaction could thus be:

\[
\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i}
\]

The logit model uses logarithmic transformation to assume linearity of the outcome variable on the explanatory variables. The logit model could thus be expressed as:

\[
L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = Z_i = \beta_0 + \beta_1X_i
\]

If the disturbance term \(u_i\) is considered in the general logit model with a set of variables, the equation becomes:

\[
Z_i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots + \beta_nX_n + u_i
\]

\(X_1, X_2, \ldots, X_n\) are independent variables affecting user's satisfaction with rural drinking water points. These explanatory variables are listed in Table 2 below. The variables were selected based on previous empirical studies in the field.

### RESULTS AND DISCUSSION

#### Characteristics of the respondents and their access to the water points

From the total 211 respondents, about 71% were males, while 29% of them were females. The mean age was 43, while the maximum and minimum ages were 85 and 23, respectively. The majority of them (47%) were between 39 and 54 years of age. Sixty five per cent had attended formal education, whereas 29% were illiterate and 6% were exposed to some form of non-formal education. The average household size was 5, with a maximum and minimum size of 10 and 1, respectively.

With an average daily water consumption of 40 litres per day per household, on average users fetch water from the water points twice a day. The average per capita water consumption in the study area was 8.87 litres and this figure is 41% lower than the GTP II’s vision to supply water to rural areas at a rate of 15 litres consumption per day per person \(1/l/c/d\) within a 1.5 km radius at the end of the Program (2019/20). No more than 9% of users received 15 or more litres of water per day. The majority of users (45.5%) received between 5.1 and 10 litres per day, and 29.39% of users received less than 5 litres per day. These results show that users were receiving much less than the GTP envisaged water consumption per day per person. Similarly, 64.45% of users stated that the amount of water they were getting from the improved water sources (points) is not sufficient.

Users live at an average distance of 14 minutes by foot from the water points. Assuming that an average person walks 4–5 kilometres per hour while carrying water, 73.9% of users are within the radius of 1.5 kilometres. In this aspect, the water points are accessible for the majority of users as envisaged by GTP II (within a radius of 1.5 kilometres). The rest, i.e., about 26.1%, did not have the privilege of accessing the water points within a radius of 1.5 kilometres.

It is not only distance (travel) from the water points that takes up the time of users but also the queueing at the water
points is another time consuming daily affair. On average, users queue for 33 minutes at the water points while waiting for their turn to fill the water containers. When the average travel and queueing time are combined, on average it takes 61 minutes (round trip plus queueing time) for a user to fetch water from the water point.

Users in the study area pay on average 4.48 Ethiopian Birr (ETB) per month for the water services. With this payment, 92% of users indicated that they do not have a problem in paying the tariff each month. With regard to the operational functionality of the water points, 62% of the users indicated that the water points that they use were functioning, whereas 38% of them reported that the water points they are using were not functioning at the time of data collection for this study.

Descriptive results

Since the study is about the satisfaction of users with the service that they get from the rural drinking water points (RDWPs), those users where their water points are non-functional were dropped from the analysis as measuring the level of satisfaction for the service that they do not get might distort results. Accordingly, the analysis below considers 130 users that had access to functioning water points. Among these respondents, 48.46% of the users indicated that they were satisfied with the services they get from the water points, whereas 51.54% of them reported that they were not satisfied.

As can be seen from Table 2 below, users’ average living distance from the drinking water points varies for both satisfied and unsatisfied users. The mean distance for the satisfied households is 11.8 minutes and this is lower than the mean distance for unsatisfied users (17.2 minutes). An independent sample t-test also shows that there is a statistically significant difference ($p < 0.01$) between the two groups of users with regard to distance from rural drinking water points. There is also a significance difference ($p < 0.1$) between satisfied and unsatisfied users with regard to the water fee that they were paying per month. Satisfied users paid an average of 4.86 Birr per month while unsatisfied users paid 4.72 Birr per month. The average age of the water point among the satisfied users was 5.22 years, whereas it was 5.09 years among unsatisfied users, however, the difference is statistically insignificant.

The mean average waiting (queueing) time at the drinking water points differs between the two groups (satisfied and unsatisfied users). The mean average waiting time of satisfied users (18.6 minutes) was lower than the average waiting time of unsatisfied users (32.6 minutes) and this difference is statistically significant ($p < 0.001$). Similarly, the t-test value (1.8517) with a $p$-value of 0.066 shows that there is an association between user satisfaction and interruption in the water point services. The average annual interruption in the water point services among satisfied

| Table 2 | Descriptive statistics of continuous variables that affect user satisfaction with rural drinking water points |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Independent variables                        | Satisfaction | N   | Mean | SD   | t-value | P-value |
| Age of the water point (years)               | yes           | 63  | 5.22 | 3.71 | – 0.2310 | 0.818  |
|                                            | no            | 67  | 5.09 | 2.80 |          |        |
| Distance from the water point (minutes)      | yes           | 63  | 11.8 | 6.9  | 2.6155** | 0.01   |
|                                            | no            | 67  | 17.2 | 15.1 |          |        |
| Queueing time (minutes)                      | yes           | 63  | 18.6 | 23.6 | 3.407****** | 0.001 |
|                                            | no            | 67  | 32.6 | 23.2 |          |        |
| Daily water consumption (litres)             | yes           | 63  | 36.43| 15.92| 0.1034 | 0.918  |
|                                            | no            | 67  | 36.72| 15.80|          |        |
| Interruption in the water point service (frequency) | yes   | 63  | 0.540| 0.91 | 1.8517**| 0.066  |
|                                            | no            | 67  | 1.54 | 4.18 |          |        |

***, ** and * indicate the level of significance at 1, 5 and 10%, respectively.
Source: Own survey data.
users was 0.54 while the average interruption among unsatisfied users was about three times this figure at 1.54 interruptions per year.

As indicated in Table 3, there is a statistically significant association ($\chi^2 = 32.099, p = 0.000$) between user satisfaction and the location of the water point. A higher proportion of users, i.e., 63.83% of users who had a conveniently located water point were satisfied with the services, and conversely 36.17% of users were not satisfied although they indicated that their respective water points are in a convenient location. The very large proportion of users (91.67%) who were unsatisfied indicated that the water points that they use are in an inconvenient location. Similarly, the availability of guards at the water points has a significant association ($\chi^2 > 18.782, p = 0.000$) with the satisfaction of users. While 64.47% of users who had guards at their respective water points were satisfied with the water point services, 35.53% of users who are dissatisfied with the services did not have guards at their respective water points. As shown in Table 3, the incidence of conflict at the water points and perception of possibility of contamination did not show a statistically significant association with satisfaction of users.

**Factors affecting users’ satisfaction with rural drinking water points**

Before examining the results further, the model was diagnosed for econometric assumptions. The model was tested for misspecification (omission of relevant variables) and the linear predicted value (_hat) is significant ($P = 0.000$) while the corresponding linear predicted value squared (_hatsq) is insignificant ($P = 0.946$) and this shows that the relevant variables have been included in the model and the functional form is correct, and thus the model has no problem with regard to omission of relevant variables. The model has also passed the test of multicollinearity with a VIF (variance inflation factor) value of less than 10 for all the variables with the condition index of less than 15 (the minimum threshold for detecting collinearity). Hosmer and Lemeshow’s goodness-of-fit statistics is insignificant with a $p$ value of 0.4839 and this shows that the model fits the data well.

As shown below in Table 4, the overall model with a chi-square value of 64.15 and a probability of $P < 0.000$ indicates that the set of explanatory variables have a significant effect on user satisfaction with the service. The variables in the model accounted for 35.62% (Pseudo R2) of the variation in user satisfaction. The regression estimation result shows that out of the eight variables considered in the regression, five factors were found to be statistically significant in influencing the satisfaction of users with the rural drinking water points in the study area. The coefficient of these variables is different from zero at 1, 5 and 10% levels of significance.

In order to see the relative importance of these variables, a dominance analysis was carried out following the procedure provided by Azen & Traxel (2009). Accordingly, location of the water points is found to be the most important (dominant) factor while distance is the least important of the significant explanatory variables. The detail is presented in Table 4.

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Table 3 | Descriptive statistics of dummy variables that affect user satisfaction with rural drinking water points

| Independent variables | Response          | Satisfaction (Frequency (%)) | Chi^2 test |
|-----------------------|-------------------|------------------------------|------------|
|                       |                   | Yes | No | Chi^2 | P-value |
| Convenience of the location of the water point | Convenient | 60 (63.83) | 34 (36.17) | 32.099**** | 0.000 |
|                       | Inconvenient | 3 (8.33) | 33 (91.67) |          |         |
| Availability of guard at the water point | Yes | 49 (64.47) | 27 (35.53) | 18.7816**** | 0.000 |
|                       | No | 14 (25.93) | 33 (74.07) |          |         |
| Incidence of conflict in the water points | Yes | 9 (50.00) | 9 (50.00) | 0.0198 | 0.888 |
|                       | No | 54 (48.21) | 58 (51.79) |          |         |
| Perception of possibility of contamination | Yes | 38 (55.07) | 31 (44.93) | 2.5731 | 0.109 |
|                       | No | 25 (40.98) | 36 (59.02) |          |         |

*** indicates the level of significance at 1%.

Source: Own survey data.
As indicated in Table 4, location of the water point, presence of guards at the water point, queueing time, service interruption (reliability) and distance from the user’s home to the water point are found to significantly influence satisfaction of users with the water point service. Whereas the frequency of travel to the water point per day to fetch water, age of the water point and the user’s perception of the possibility of contamination of the water were found to be insignificantly in determining the likelihood of satisfaction of households.

**Convenience of location**

As expected, the convenience of the water point location to users is found to be a significant factor that positively affects the satisfaction of users with the water point service, with an odds ratio of 13.92561 and a p-value of 0.000. The odds ratio result indicates that the likelihood of satisfaction with a convenient location is 13.92 higher than where there is an inconvenient location. The marginal effect of this variable is 0.4430, implying that the probability of user satisfaction with a convenient location is higher by 43.30% as compared to users with an inconvenient location. The result of this study is consistent with empirical studies of Abebe et al. (2015) and Bhandari & Grant (2007) that found an inconvenient location decreased the satisfaction of users. Other studies also reported that location is an important determinant factor of user satisfaction because of its implication for the distance to the water point and the time to collect water (WB & IFPRI 2010; Masa-nyiwa et al. 2014). It has to be noted that location might not necessarily refer to proximity and time taken to travel, but it is also linked with the social and location specific attributes of the water source regardless of its nearness to the user’s home. In a study conducted in Tanzania, Mwamaso (2015) linked the location of the source with isolated areas, where some locations were perceived insecure for women and children in particular. They further reported that water location near to cemeteries might not be in a convenient location as it might hamper women’s access to the water outlet, especially during evening to night-time, for security reasons. In this current study, it was found that housewives and children were the most likely household members to fetch water at 73.08% and 26.15%, respectively. There was only one case where a husband was reported to fetch water frequently. Given such a burden (of fetching water) on women, who are quite busy with household chores, the appropriate location of water points that can save time and energy, and at the same time provide them with a sense of security is crucial. The burden also rests on children who spend their time in fetching water, and this in turn affects their schooling time. Hence, a convenient location in terms of both distance and security plays an important role in influencing the satisfaction of users.

| Variables                  | Odds ratio | Std. error | P > [z] | Standardized domin. stat | Rank (relative importance) | Marginal effect (dy/dx) |
|----------------------------|------------|------------|---------|--------------------------|---------------------------|-------------------------|
| Location (Convenient)      | 13.92561   | 10.05253   | 0.000*** | 0.4321                   | 1                         | 0.4430179               |
| Guard (Yes)                | 2.980215   | 1.497678   | 0.030*** | 0.1819                   | 2                         | 0.1751036               |
| Queueing                   | 0.9776426  | 0.010592   | 0.037*** | 0.1289                   | 3                         | −0.0032587              |
| Interruption (Reliability) | 0.728761   | 0.1243687  | 0.064**  | 0.1045                   | 4                         | −0.0456                 |
| Distance                   | 0.9528467  | 0.0248862  | 0.064**  | 0.0905                   | 5                         | −0.006961               |

Logistic regression statistics

- **LR chi²(6) = 64.15**
- **Log likelihood = −57.971957**
- **Hosmer-Lemeshow chi² = 7.50**
- **_hat coef 0.9962685**: $P > z = 0.000$
- **_hat sq coef −0.0068119**: $P > z = 0.946$

Mean VIF = 1.29 (minimum 1.09 and maximum 1.67, and condition index ranging between 1.000 and 13.8889)

***, ** and *indicate the level of significance at 1, 5 and 10% respectively.

Source: Own survey data.
Presence of guards at the water points

The presence of guards at the water points is another important factor found to be statistically significant ($p < 0.05$) that boosts the satisfaction of users with the rural drinking water points with an odds ratio of 2.98. The marginal effect of the variable is positive with a magnitude of 0.175, and this implies that the probability of satisfaction among users increases by 17.5% when the water points do have guards. The issue of guards is a neglected aspect in the study of sustainability of water points and user satisfaction. This study demonstrated that influence of guards on user satisfaction. The plausible reasons might be that guards might protect the water points from livestock, keep order in queues, report breakdowns and other water point related issues to the water users’ committees on time, and provide security for women and children.

Queueing time

Average queueing (waiting) time at the water point is also found to be a negative and statistically significant factor that affects user satisfaction. This variable has an odds ratio, $p$-value, and marginal effect of 0.978, 0.037, and $-$0.0033, respectively. The odds ratio of 0.978 of average waiting time at the water point shows that the probability of satisfaction decreases by 0.978 for a one minute increment in the average waiting time at the water points. The marginal effect of $-$0.0033 for the average waiting time at the water point also indicates that the probability of satisfaction decreases by 0.33% with a one minute increment in the average waiting time at the water point. This study is similar to previous works of Belachew (2014) and Abebe et al. (2013) which found that an increase in the average queueing time at the water source decreased the satisfaction of households. Long queueing times at the water points would have several implications. The crowding due to the long queue lines might be a cause of conflict; the longer users wait for their turn might result in a higher probability of conflict occurrence. It was also revealed in focus group discussions that conflicts usually occur during the queueing time, particularly at the water points where the number of households using drinking water from the same water points is high. This in turn leads to dissatisfaction among users as conflict creates disorder and temporal interruption in fetching water. In addition, the longer users stay at the water points while waiting their turn, the more time is lost that would have been spent in other household and economic activities, and this in turn could lead into user dissatisfaction (with the water points that have long queue lines). One of the researchers also noticed at the time of data collection that the queuing time at the water point was long when compared to unimproved water sources.

Service interruption (un/reliability)

Service interruption measured the frequency of disruption of the water services due to mechanical failure per year. In this aspect, service interruption per year was found to be statistically significant but negatively affecting user satisfaction with an odds ratio, $p$-value and marginal effect of 0.729, 0.064 and $-$0.0456, respectively. The odds ratio of service interruption shows that the probability of satisfaction decreases by 0.729 times for one unit increment in the frequency of the interruption of the water services in a year. In other words, the probability of user satisfaction decreases by 4.56 per cent when the number of water service interruptions increases by one per year. This result is obvious in that any breakdown at the water points hampers users from getting an adequate amount of water at a time. When the incidence of breakdown increases, it lowers user satisfaction.

Distance from water point

The distance of users from the water points is another important factor found to affect user satisfaction. Similar to the waiting time, distance is found to be a negative and statistically significant factor that affects the satisfaction of users of the rural water scheme services. The odds ratio of the variable is 0.953 with a $p$-value of 0.064, and this indicates that user satisfaction decreases by 0.953 units with an increment of distance between the user’s house and the water point of one minute. The marginal effect of $-$0.0070, in other words, indicates that the probability of user satisfaction decreases by 0.70% as the distance increases by one minute. Similar findings were reported by Abebe et al. (2013) and Belachew (2014). They reported that an increase in the distance of the water point from the user’s home
decreases the satisfaction of users. One of the probable reasons is that having to go a longer distance takes more energy and time. Because of the time taken to travel coupled with the queueing time, a longer distance might also compete with household chores of women and school time of children, who are the most likely members of the household to fetch water as noticed in the study area.

CONCLUSION

Despite investment in the provision of safe drinking water points, little is known about user satisfaction with rural drinking water points in Ethiopia. With this observation, this study investigated the factors that affect user satisfaction with rural drinking water points in six rural Kebeles of Woliso district. It was found that 48.46% of the users indicated that they were satisfied, whereas 51.54% of them reported that they were not satisfied with the water points they were using. It was also found that location of the water point, availability of guards, queueing time, service reliability, and distance between the user’s house and the water point significantly influence the satisfaction of users.

Location is a dominant factor that could be interpreted in terms of distance, security and other communal attributes of a rural drinking water point. In addition, hiring guards for the water points also contributes to the satisfaction of users. Although neglected in other studies, guards are particularly crucial in safeguarding the water points from livestock, keeping order in queues, and reporting interruptions, breakdowns and other water point related issues to the water users’ committees on time. A long queueing time at the water points, on the other hand, might cause conflict, and consumes the time of women and children, and this in turn leads to user dissatisfaction. It is therefore crucial to envisage queues when installing water points and thus the water discharge volume should be commensurate with the number of the possible users, and if not, mechanisms that minimize queues should be put in place. Service interruption as a sign of unreliability, and distance between the user’s home and water point are also notable concerns for users of rural drinking water points. Recurrent breakdowns of the water points hampers users from getting an adequate amount of water at a time. When the incidence of breakdowns increases, it apparently lowers user satisfaction. Similarly, distance of the water point from the user’s home influences satisfaction. On top of the time and energy demand of distant water points, a longer distance to walk also competes with the household chores of women and the school time of children, who are the most likely to fetch water as noticed in the study area. It is therefore essential to address the issue of location and distance when physically installing the water points, and put mechanisms in place to maintain service reliability, ensure shorter queues and safeguard the water points with guards.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

REFERENCES

Abebe, T., Techane, B. & Girma, G. 2015 Rural water supply management and sustainability: the case of Adama Area, Ethiopia. *Journal of Water Resource and Protection* 5 (2), 208–221. doi:10.4236/jwarp.2013.52022.

ADF (African Development Fund) 2005 Ethiopia: Rural Water Supply and Sanitation Program. Appraisal Report. African Development Fund, BP 323, Tunis, Tunisia.

Anthonj, C., Fleming, L., Cronk, R., Godfrey, S., Ambelu, A., Bevan, J., Sozzi, E. & Bartram, J. 2018 Improving monitoring and water point functionality in Rural Ethiopia. *Water* 10, 1591. doi:10.3390/w10111591.

Azen, R. & Traxel, N. 2009 Using dominance analysis to determine predictor importance in logistic regression. *Journal of Educational and Behavioural Statistics* 34 (3), 319–347. https://doi.org/10.3102/107699860932754.

Belachew, M. 2014 Assessment of Drinking Water Quality and Determinants of Household Potable Water Consumption in Simada District, Ethiopia. MA Thesis. Available from: http://soilandwater.bee.cornell.edu/publications/Meseret_MPS_2012.pdf.

Bhandari, B. & Grant, M. 2007 User satisfaction and sustainability of drinking water schemes in rural communities of Nepal. *Sustainability: Science, Practice and Policy* 5 (1), 12–20. doi:10.1080/15487735.2007.11907988.

Deichmann, U. & Lall, S. 2007 Citizen feedback and delivery of urban services. *World Development* 35 (4), doi:10.1016/j. worlddev.2006.06.007.

Godden, B. 2004 Sample size formulas. *Journal of Statistics* 3, 66.
Gujarati, D. N. 2004 Basic Econometrics, 4th edn. The McGraw-Hill Companies, New York, USA.

Gurmessa, B. & Mekuriaw, A. 2019 What determines the operational sustainability of rural drinking water points in Ethiopia? The case of Woliso Woreda. Journal of Water, Sanitation and Hygiene for Development 9 (4), 743–753. https://doi.org/10.2166/washdev.2019.067.

Lammerink, M. 1998 Community managed rural water supply: experiences from participatory action research in Kenya, Cameroon, Nepal, Pakistan, Guatemala and Colombia. Community Development Journal 33 (4). doi:10.1093/cdj/33.4.342.

Masanyiwa, Z. S., Niehof, A. & Termeer, C. J. A. M. 2014 Users' perspectives on decentralized rural water services in Tanzania. Gender, Place and Culture, A Journal of Feminist Geography 22, 2015 (7). https://doi.org/10.1080/0966369X.2014.917283.

Mwamaso, A. 2015 Measuring and mapping citizens' access to rural water supply in Tanzania. MA Thesis, Faculty of Geo-Information Science and Earth Observation, University of Twente, The Netherlands.

NPC 2018 The Second Growth and Transformation Plan (GTP II). Midterm Review Report. The FDRE, Addis Ababa, Ethiopia.

Sutton, S., Butterworth, J. & Mekonta, L. 2012 A Hidden Resource: Household-led Rural Water Supply in Ethiopia. IRC International Water and Sanitation Centre, The Netherlands.

UNICEF (United Nations Children’s Fund) & WHO (World Health Organization) 2009 Progress on Household Drinking Water, Sanitation and Hygiene 2000–2009. Special Focus on Inequalities. New York, USA.

WB (World Bank) & IFPRI (International Food Policy Research Institute) 2010 Gender and Governance in Rural Services: Insights from India, Ghana and Ethiopia. The International Bank for Reconstruction and Development/The World Bank, Washington, DC.

Welle, K. & Williams, J. 2014 Monitoring and Addressing Governance Factors Affecting Rural Water Supply Sustainability. Global Water Initiative East Africa, Kampala, Uganda.

Whittington, D., Davis, J. & McCelland, E. 1998 Implementing a demand driven approach to community water supply planning: a case study of Lugazi, Uganda. Water International 23 (3), 134–145. doi: 10.1080/02508069808686760.

WHO (World Health Organization) & UNICEF (United Nations Children’s Fund) 2005 Water for Life: Making it Happen. Decade for Action 2005–2015. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva, Switzerland.

WHO (World Health Organization) & UNICEF (United Nations Children’s Fund) 2017a Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines. World Health Organization (WHO) and the United Nations Children’s Fund (UNICEF), Geneva. Licence: CC BY-NC-SA 3.0 IGO.

WHO (World Health Organization) & UNICEF (United Nations Children’s Fund) 2017b Annual Report. WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. Switzerland, Geneva.

First received 31 March 2020; accepted in revised form 14 September 2020. Available online 23 September 2020.