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Bilharzia in a small irrigation community: an assessment of water and toilet usage

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SUMMARY

A questionnaire study was conducted in the Mushandike small scale irrigation schemes in Zimbabwe to investigate the following: 1) to establish whether field latrines are used or not; 2) to find out why people visit natural water bodies for bathing and laundry instead of using water from boreholes for these purposes; 3) to assess people's knowledge on the transmission and control of schistosomiasis.

Results of the study indicated that the field latrines are utilised and that the borehole water is not preferred for bathing and laundry because of its hardness and oily nature. The results further indicated that the community was aware of schistosomiasis but their knowledge on transmission and control of the disease was limited. Possible reasons for the observations made are discussed in the paper and recommendations emanating from the study are stated.

INTRODUCTION

There are approximately 65 small scale irrigation schemes in Zimbabwe. Their numbers are likely to increase because of the need to increase agricultural productivity to match the country's three pc population growth rate. Economic and social benefits resulting from establishment of irrigation schemes, are, in most cases, accompanied by an introduction of or increased transmission of water related diseases. Schistosomiasis is a disease associated with increased surface water and high population densities within a small area. It is an example of a disease whose transmission can be introduced or aggravated by the establishment of irrigation schemes.

The problem of schistosomiasis in irrigation schemes has long been realised in Zimbabwe. Efforts to reduce transmission and the resulting morbidity in humans to acceptable levels have been made.[1, 2] Unfortunately much of the efforts were directed at large irrigation schemes without paying much attention to small irrigation schemes.

In 1984 the first major attempt in Zimbabwe was made to control schistosomiasis in small holder irrigation schemes. Engineering measures aimed at discouraging snail colonisation and breeding, and environmental measures aimed at reducing the contamination of natural water bodies and reducing the human contact with natural water were incorporated into the design of Mushandike small scale irrigation scheme. Detailed[3,4,5] descriptions of the control measures have been made elsewhere.

The impact of the control measures on schistosomiasis transmission was monitored over five years using biological methods (parasitological, snail and cercariometric surveys). Incidence data based on parasitological surveys conducted at a local school indicated that transmission was still occurring in the schemes in spite of the control measures instituted. This was more apparent in Ashcroft village (Table I).

The factors (based on casual observations) accounting for the continued transmission of schistosomiasis in Mushandike were thought to be the use of infected water sources (natural streams, canals, dams) for laundry and bathing; and the lack of strict adherence to regular clearing of weeds from canals and night storage ponds so as to discourage snail colonisation and breeding.

The information available from the study could not establish the extent to which latrines constructed in the irrigation fields were reducing contamination of the surface water with faecal matter or urine. Furthermore, the extent to which protected water sources (boreholes) were used as opposed to natural water bodies was not clearly defined as information available was based on

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Table I: Incidence of ***S. haemotobium*** *infection measured in school children coming from different schemes a three monthly intervals; from July 1987 to July 1989. (Brackets indicate percentages).*

	Blanket treatment	Treatment of new arrivals and heavy cases						
Schemes	July 87 Oct 87	Oct 87 Jan 88	Jan 88 May 88	May 88 July 88	July 88 Oct 89	Oct 88 Jan 89	Jan 89 Apr 89	Apr 89 July 89
Misty Vale	7/74 (9,5)	2/61 (3,3)	1/57 (1,8)	4/61 (6,6)	3/59 (5,8)	3/52 (5,8)	4/55 (7,3)	3/50 (6,0)
Invicta	11/54 (20,4)	0/59 (0)	5/68 (7,4)	5/69 (7,2)	1/58 (3,4)	2/50 (4,0)	6/64 (9,4)	2/57 (3,5)
Ashcroft	10/25 (40)	1/52 (1,9)	7/53 (13,2)	14/46 (30,4)	3/32 (9,4)	9/33 (27,3)	17/40 (42,5)	9/28 (32,1)

casual observations. It was therefore decided to conduct a study which would provide more information concerning use of latrines and protected water sources and to find out the community's awareness of schistosomiasis. The specific objectives of the study were:

1. To establish whether toilets in the fields are used or not with a view of assessing their importance in the schistosomiasis control package at Mushandike.
2. To investigate the extent to which people in Mushandike use boreholes as compared to natural water bodies.
3. To assess people's knowledge of bilharzia.

MATERIALS AND METHODS

Study area and population: The study was conducted in Mushandike Resettlement Irrigation Scheme which is located about 25 km south-west of Masvingo town (Figure I). Until 1984 this area, which comprises 600 ha of farmland, was owned by 10 commercial farmers. Much of the land (400 ha) was bought by government from the commercial farmers and approximately 350 peasant families from neighbouring communal areas (Chivi, Zaka, Nyajena) were settled in the area. The resettlement process was staggered over a five year period (1986–1990) as the reconstruction of the irrigation system had to be done in order to incorporate the engineering and environmental control measures for schistosomiasis.

At present there are a total of 336 households in the Mushandike irrigation blocks. The estimated population is 2 352. Water for domestic use is obtained from boreholes. Each village has one borehole and in general one borehole serves 40 families. Most of the households have family Blair latrine units. In the fields there are Blair latrines shared among four families. The cleaning responsibility rests with the users.

There is all year round irrigation with similar crops grown on all the blocks so as to effect good water management. Cotton and maize are grown in summer while wheat, beans and vegetables are grown in winter. The source of irrigation water is Mushandike dam which supplies all the irrigation block through a 32 km main canal.

Data collection techniques: A questionnaire comprising three distinct sections relating to (a) toilet usage, b) water usage, and c) knowledge of bilharzia was developed. The questionnaire was pretested in a village (Avondale) similar to the study villages and slightly altered for acceptability, comprehension and ease of administration.

Subjects and actual data collection: The questionnaire was directed to all female heads of families in the following villages: Misty Vale, Invicta, Ashcroft, Umshandike, Treber and Chikore. Female heads were preferred to their male counterparts because they do most of the water related activities and they are easily accessible.

All the respondents were interviewed orally. Three officers conducted the interviews in the Shona language. The study was completed within six days.

Data processing and analysis: The raw data from the field was coded and recorded on a master sheet. Open ended questions were coded into distinct groups and transferred onto an IBM Personal Computer. Analysis was done suing the Epi Info Programme.

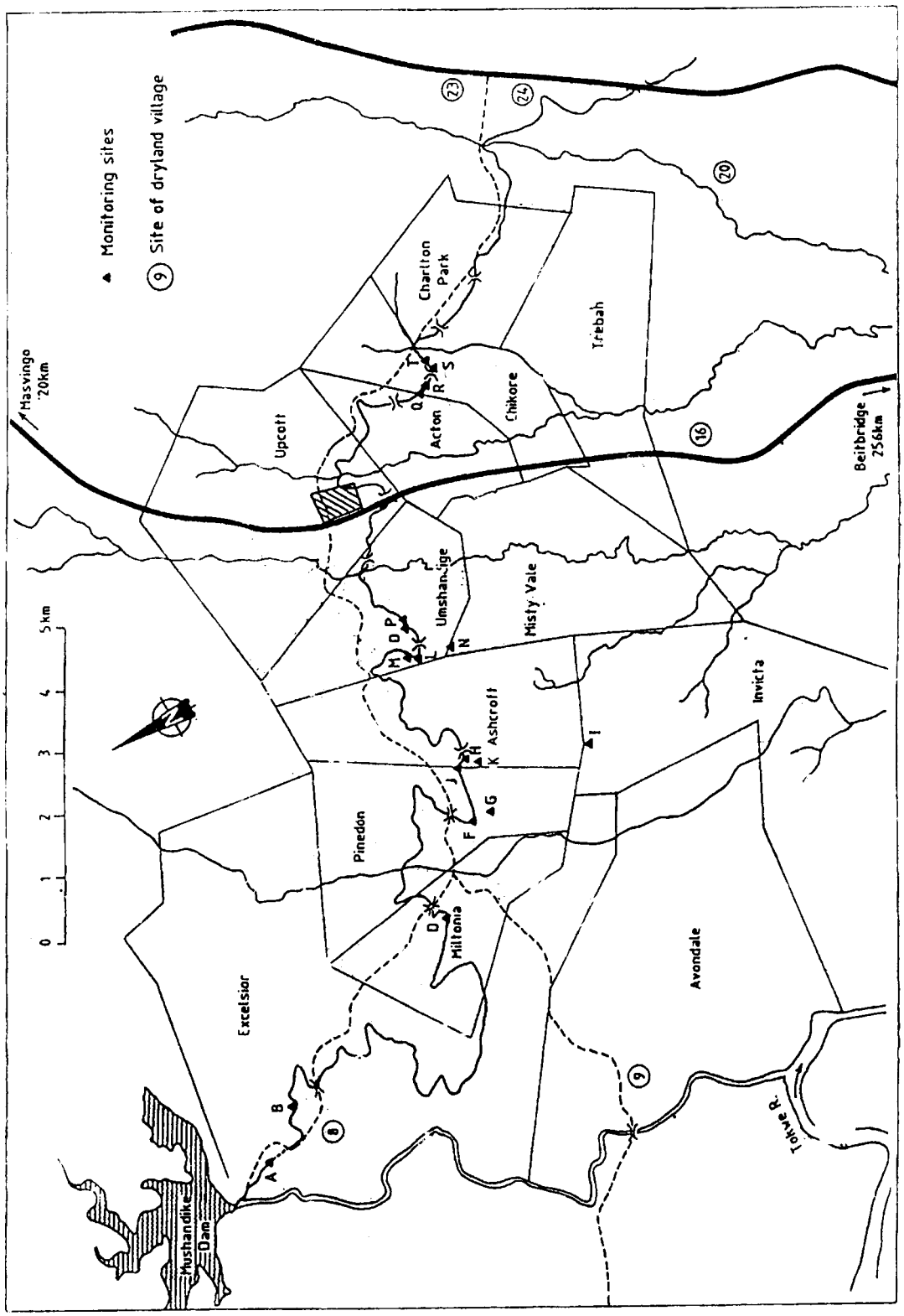

Figure I: Mushandike Irrigation Scheme: General plan.

RESULTS

Coverage: A total of 207 female heads of families were interviewed. The survey coverage for the various villages is shown in Table II.

Table II: Showing coverage of KAP questionnaire administered in six villages in the study area.

Village	Number of households	Number of respondents	pc coverage
Ashcroft	53	34	64
Invicta	59	43	73
Misty Vale	40	28	75
Treber	32	26	81
Umshandike	58	33	57
Chikore	*	43	—

Note: asterisk (*) means number of households could not be established because the population is fluid.

There was good coverage in Invicta (73 pc), Misty Vale (75 pc) and Treber (81 pc); and rather low coverage for Umshandike (57 pc) and Ashcroft (64 pc). It is not possible to establish the coverage rate for Chikore since the actual resident population in the village is not known. The labour force numbers fluctuate considerably. Nevertheless most of the people found on the farm on the day of the interviews agreed to participate in the study.

Use of field toilets: The results obtained from questions pertaining to use of toilets in the field are presented in Table III. One hundred pc of the respondents from each of the villages except Misty Vale (88 pc) claimed that they used latrines whilst in the fields. The general opinion on appropriateness of numbers and distribution of latrines in the fields was very high (greater than 80 pc) for all villages except Invicta (72 pc) and Umshandike (69 pc) (Table III).

Table III: Usage of field toilets in different villages of the study area. (Brackets indicate percentages.)

Village	Total number of respondents	Respondents who claim to use field toilets	Respondents who thought toilets were optimally spaced
Ashcroft	34	34 (100)	31 (91)
Invicta	43	43 (100)	31 (72)
Misty Vale	27	24 (88)	22 (81)
Treber	25	25 (100)	20 (80)
Umshandike	32	32 (100)	22 (69)

In all the villages children between the age of two and five years were reported to be not using the field latrines for fear of falling into the pits. The mothers claimed that these children defaecated on pieces of paper which they three into the latrine. However, observations made around the latrines indicated that this claim was questionable as chunks of faeces were seen littered around the latrines.

Table IV: Reasons given for preference of natural water to borehole water for washing clothes. (Brackets indicate percentages.)

Village	Total number of respondents	Borehole water does not foam	Borehole water is oily	Borehole head is heavy	No washing slabs at borehole site
Ashcroft	28	8 (29)	15 (54)	3 (11)	0 (0)
Chikore	43	20 (47)	13 (30)	3 (7)	6 (14)
Invicta	40	15 (38)	22 (55)	4 (10)	1 (3)
Misty Vale	26	4 (15)	17 (65)	4 (15)	2 (8)
Treber	24	17 (71)	2 (8)	2 (8)	3 (13)
Umshandike	31	22 (71)	3 (10)	3 (10)	3 (13)
Total	192	86 (45)	72 (38)	19 (10)	15 (6)

Table V: Reasons given for preference of natural water to borehole water for bathing. (Brackets indicate percentages.)

Village	Total number of respondents	Borehole head too heavy	No bathrooms	Borehole water leaves body pale	Natural water bodies are accessible
Ashcroft	28	2 (7)	2 (7)	20 (71)	3 (11)
Chikore	43	1 (2)	15 (35)	18 (42)	6 (14)
Invicta	41	1 (2)	2 (5)	30 (73)	5 (12)
Misty Vale	27	4 (15)	4 (15)	12 (44)	5 (19)
Treber	22	0 (0)	4 (18)	13 (59)	5 (23)
Umshandike	31	0 (0)	2 (7)	16 (52)	10 (31)
Total	192	8 (4)	29 (15)	109 (57)	34 (18)

Table VI: Comparison of relative distance of the different water sources from the villages. Numbers in the table indicate respondents who though the stated water sources were relatively closer to the villages than other sources. (Brackets indicate percentages.)

Village	Total Number	Borehole	Canal	Stream	Dam
Ashcroft	34	23 (68)	11 (32)	0 (0)	0 (0)
Chikore	43	40 (93)	3 (7)	0 (0)	0 (0)
Invicta	40	34 (85)	4 (10)	0 (0)	2 (5)
Misty vale	27	25 (93)	1 (4)	1 (4)	0 (0)
Treber	25	25 (100)	0 (0)	0 (0)	0 (0)
Umshandike	32	29 (91)	3 (9)	0 (0)	0 (0)
Total	201	176 (88)	22 (11)	1 (0,5)	2 (0,9)

Table VII: Knowledge of causes, symptoms and prevention of schistosomiasis. (Brackets indicate percentages.)

Village	Getting in contact with infected water causes schistosomiasis	Respondents who mentioned correct symptoms of schistosomiasis	Respondents with an idea on how to prevent schistosomiasis transmission
Ashcroft	24/33 (73)	28/34 (82)	13/34 (38)
Chikore	21/38 (55)	34/43 (79)	19/37 (51)
Invicta	40/41 (73)	38/43 (88)	22/41 (54)
Misty Vale	23/27 (85)	22/27 (81)	15/27 (56)
Treber	15/25 (60)	24/25 (96)	13/25 (52)
Umshandike	26/32 (81)	28/32 (88)	20/32 (63)
Total	139/196 (71)	174/204 (85)	102/196 (52)

Key:Correct symptoms *— blood in urine.*
— blood in stool.
— hepato splenomegaly.
— dysuria.

Idea on prevention of bilharzia *— stay away from contaminated/stagnant water.*
— boil natural water before using it.

Preference of natural water to borehole water: In all the villages natural water was preferred to borehole water for laundering. The reasons given for the preference of natural water to borehole water were mainly the oily nature and hardness of borehole water (Table IV). Borehole water is usually oily because of the lubrication grease used on some parts of the pump and the hardness is because of the calcium contained in the water. Respondents to the questionnaire complained that the hard water finished their soap quickly especially when solid soap was used for laundering. The oily nature of borehole water was reported as causing stains on white garments during washing. Other reasons given were that the borehole pump is too heavy and the absence of washing slabs but these were given very small proportions (10 pc and six pc) of the total number of respondents.

For bathing most of the respondents said they preferred water from natural water bodies to borehole water because borehole water left their bodies pale after bathing. The range of answers supporting this idea was from 42 pc for Chikore to 73 pc for Invicta with a mean of 56,9 pc of the overall population (Table V). Overall, the second most popular reason (given by 18 pc of the respondents) for preferring natural water for bathing was avoidance of long queues. Very few respondents (less than four pc in each village) considered weight of the borehole pump as an important factor influencing people's preference for natural water.

Relative distance of water sources from villages: Table VI shows that in all villages boreholes were considered to be much closer to the villages than natural water bodies. Canals were ranked second in their closeness to the villages, particularly in Ashcroft and Invicta where 32 pc and 10 pc of the respondents respectively, concurred on the opinion that the stream and dams were far from villages.

Schistosomiasis knowledge: It is evident from Table VII that the greater proportion of individuals interviewed were more knowledgeable on the symptoms of schistosomiasis than on the causes of the disease, and preventive measures that can be taken.

It is however, notable that respondents from Chikore village were comparatively less knowledgeable on all three aspects of the disease than respondents from the rest of the villages. Overall, the percentage of respondents who knew the symptoms of schistosomiasis was 85 pc while percentages of those who knew the causes and preventive measures for the disease were 71 pc and 52 pc respectively.

DISCUSSION

On the strength of the high survey coverage rates (Table I) the results of this study can be considered to be a fairly accurate assessment of the level of bilharzia awareness, water usage and field toilets usage by people staying in Mushandike Irrigation Resettlement area. It should also be noted that in answering the questions, female heads of families tended to speak for themselves as well as for the rest of the family members.

Use of field toilets: Results presented in Table III suggest that the toilets constructed in the fields are well utilised. The ratio of latrines to users (four family members per toilet) and the layout of the toilets in the fields, which is in such a way that people are much closer to a toilet than from the bush bordering their fields, are probably the main factors promoting latrine usage. Invicta and Umshandike, however, have a different layout of field latrines. The toilets for these villages are in a straight line across the fields, thus giving more access to people with fields close to the line of toilets and making the bush more convenient (distance wise) to those with fields far off.

Indeed, a few of the individuals with easier access to the bush admitted that either themselves or members of their families defaecated in the bush if it was more conveniently situated than the toilet. Others avoided the latrines because they were not well looked after. These findings clearly show that presence of toilets *per se* does not guarantee their use. Convenience of the users and issues concerning cleaning of the latrines have to be considered first, in all attempts to reduce faecal contamination of the environmental through provision of field latrines.

Water use: This study clearly showed that borehole water has limited domestic use particularly when other alternative natural water sources are accessible. The "undesirability" of borehole water for laundry and bathing purposes for reasons shown in Figure II and Figure III is made more clear by the fact that people walk for longer distances to natural water bodies leaving boreholes which are generally much closer to the villages. The role of factors like privacy, absence of washing slabs and occasional breakdown of borehole pumps which were not investigated in this study should however not be underestimated, as they also make the

CONTRAINDICATIONS, PRECAUTIONS AND ADVERSE REACTIONS:

Fluconazole is contraindicated to patients with known sensitivity to the drug or to related compounds. Use in pregnancy should be avoided. Use in nursing mothers is not recommended. Use in children below the age of 16 years is not recommended unless antifungal treatment is imperative.

Careful monitoring of prothrombin time in patients receiving coumarin-type anticoagulants is recommended.

Fluconazole and oral sulphonylureas may be co-administered to diabetic patients but the possibility of a hypoglycemic episode should be borne in mind.

During concomitant administration of fluconazole and phenytoin, phenytoin levels should be moni

In patients receiving concomitant rifampicin, an increase of the fluconazole dose should be considered.

Cyclosporin plasma concentration monitoring in patients receiving fluconazole is recommended.

Patients who are receiving high doses of theophylline or who are otherwise at increased risk of theophylline toxicity should be observed for signs of toxicity while receiving fluconazole.

Adverse reactions include nausea, abdominal pain, diarrhoea, flatulence and rash. In some patients, particularly those with serious underlying diseases such as AIDS and cancer, changes in renal and hematological functions test results and hepatic abnormalities have been observed during treatment with fluconazole and comparative agents, but the clinical significance and relationship to treatment is uncertain.

In rare cases, as with other azoles, anaphylaxis has been reported.

DOSAGE AND ADMINISTRATION:

Oral absorption of fluconazole is rapid and almost complete, the daily dose is the same for oral and intravenous administration.

Indication		Day 1	Once Daily Therapy	Minimum duration of Therapy
1) (a)	Cryptococcal meningitis	400mg	200-400mg	6 - 8 weeks also dependent on clinical and mycological response.
(b)	For prevention of relapse of cryptococcal meningitis		200mg	indefinitely
2)	Candidemia, disseminated candidiasis	400mg	200mg	Dependent on clinical response.
3)	Oropharyngeal candidiasis	50mg	50mg	7 - 14 days.
4)	Vaginal candidiasis	150mg single oral dose		
5)	For the prevention of fungal infections in patients with malignancy.	50mg	50mg	Give while patient is at risk as a consequence of cytotoxic chemotherapy or radiotherapy.
6)	Dermatomycoses either	50mg	50mg	14 - 28 days
	or	150mg	150mg once weekly	2 - 4 weeks

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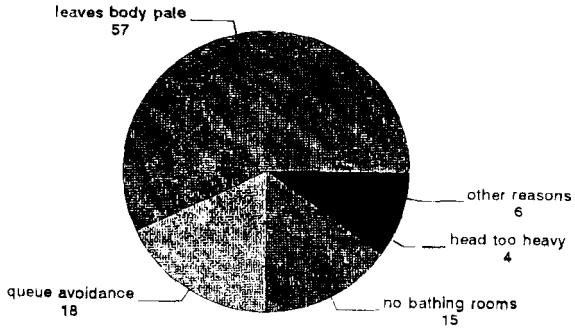
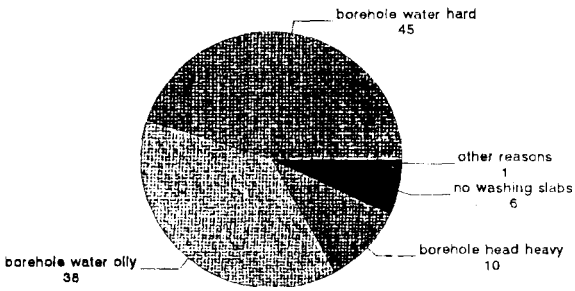
natural water bodies more attractive. Thus, any attempt to protect a population against water related diseases through provision of safe water supplies should ensure that the natural water bodies are less attractive alternative sources of water.

Figure II: Reasons given for preference of natural water to borehole water for bathing.



****All figures represent percentages*

Figure III: Reasons given for preference of natural water to borehole water for washing clothes.



****All figures represent percentages*

Schistosomiasis knowledge: No intensive schistosomiasis health education campaign apart from short talks given during stool and urine collection was launched in the study area. The study population was however found to be fairly knowledgeable about symptoms and causes of schistosomiasis. This was probably due to the presence of the monitoring team in the study areas. The short talks on the life cycle of schistosome parasites given by the team before collection of urine and stool specimens for schistosomiasis diagnosis must have had an educational impact on the study population. Snail surveys conducted in the study area also made part of the population realise the importance of snails in the transmission of the disease as occasionally some members of the community asked what the team members were doing in the water bodies.

Conclusion: This study indicated that latrines in the Mushandike fields are well used in cases where the number of available latrines and their distribution within the fields are such that people find latrines more convenient than the bush. Borehole water is shunned for bathing and laundry activities because of its hardness and oily nature. However, the community does not fully understand how transmission of schistosomiasis takes place.

Recommendations: 1. There is a need for a more effective health education campaign so that the community can fully appreciate the link between the life cycle of the schistosomes and the transmission of the disease.

2. At Mushandike, the provision of field toilets is considered a success as they seem to be well used. We recommend that the layout of the toilets in schemes similar to Mushandike should be such that individuals are always closer to toilets than the bush. The siting of toilets across the fields, in a straight line is discouraged on the basis of the study findings.

3. Additional toilets have to be constructed in Invicta and Umshandike where the latrines form an array across the middle of the field block.

4. There is need to increase the number of boreholes in the study area so as to reduce pressure on the already existing boreholes. The official recommendations for Zimbabwe one pump per 20 households should be adhered to.[6] Attention must also be paid towards maintenance of the boreholes in order to avoid the occasional breakdowns of the boreholes. This could be done through training of local people on maintenance of boreholes.

5. The most appropriate recommendation concerning water supply is the provision of piped water to each household since the households are grouped together, a situation that augers well with a reticulated water system. However, because of the present financial constraints resulting from crop failure due to drought, we recommend provision of safe water to a central point in the villages through a tap. The water could be drawn from the main canal and subjected to cheap purification techniques e.g. sand filters. This will make natural water bodies less attractive.

6. Washing slabs, bathrooms and toilets sited close to the boreholes should be seriously considered as factors contributing to increased use of the borehole water. In the event of bringing piped water to a central point, the need for additional boreholes would not be there.

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