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The Effectiveness of Using School Children in Sample and Data Collection

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ABSTRACT

This pilot work conducted between 1987 and 1989, indicated that school children, guided by their school teacher, were effective for collecting water samples and to a limited extent, the children were usefully involved in providing basic environment data. Instructions need to be unambiguously clear and the purpose for which the work will be used must be understood in order to ensure maximum cooperation from both staff and the children. The process is economic, saves time and effort and penetrates the community extensively. The key issues are centred on using school children as partners in research.

Some teachers found the involvement of the children on a practical level useful in the education process.

The technique was successfully used for a specific task in ten different schools in two districts in Zimbabwe and it was felt that it could be developed for general application when the limitations indicated are overcome.

Introduction

In planning an intensive water quality survey in two rural Districts of Zimbabwe one of the major problems was the practicality of reaching out to every water source in an area defined by the catchment area for a rural primary school's pupils. Field workers employed from the city might not have sufficient knowledge of the areas to scan it economically. Local field workers working under supervision still posed the problem of the practicality of having all the water samples in without losing their analytical value as samples. Zimbabwe has distinct wet and dry seasons and therefore the source of drinking water change. Samples need to be collected over short periods of time in order to account for seasonal influences.

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The primary task was to collect water and analyse it for fluoride and nitrate. The districts were chosen because of prior knowledge of the areas, that they had specific water related problems. The schools were randomly chosen in the areas of operation. There was no deliberate sampling strategy to justify the choice of the areas of operation. It was in trying to solve practical problems that the issue of school children became a separate parameter and it became imperative to consider it more closely.

The secondary task was to examine the children's health and to study the aggravations that arose from their living conditions. This necessitated the need for some data about their environment and a way had to be found to effectively obtain this information. The children themselves were used to provide this data. It therefore became necessary to look more closely at the concept of using school children as research partners.

Survey research methods are discussed by Babbie (1990) who stresses the need for clarity of purpose, ethics and the relevance of community based projects. Some of the problems related to working with Zimbabwean secondary school communities are dealt with by Murphree et al (1975) who makes particular reference to sample validity in a community that can change during the period of research. Evans et al (1980) worked with a population of 96 000 adults in the age group 25-69 and used door to door visitations by the research team. This seemed expensive and had limitations due to refusals and absence. Verma et al (1980) used trained field workers in India to record bodily measurements in an Indian rural community and obtained 78,9% of the target population with the other 21,1% not recorded for various reasons such as absenteeism.

Cullivan (1980) discussed the limitations of some statistical techniques of evaluating data without blurring the original purpose of the project.

Walker et al (1988) described a rigorous sampling technique for examining 7 735 men aged 40-59. The studies were carried out in Britain. This needs extensive expertise which could be difficult to set up in the rural communities where this project was carried out.

Liard et al worked in Tahiti with 6 981 school children and obtained 96,4% of the population target. In this case the children were the ones being examined for asthmatic conditions.

In Kenya, Griffin and Fast (1982) carried out a study involving 109 primary school children aged seven to 13, but again in this case the children were the subject of investigation.

In Zimbabwe, Mathe et al (1985) used qualified personnel to study an urban community using the house to house interview technique. Axton and Siebert (1982) worked with 150 children as case studies of convulsions cases brought to

Zimbabwean hospitals.

The key issue presented in this study is that children were partners in the study that concerned their community. The idea arose from the realisation that in the rural communities children of primary school age were already involved in the daily activities of survival and would be knowledgeable about their environment.

Some members of the research team attended rural primary schools in their childhood and used that experience to realise that schools were the practical administrative centres to work from and that using primary school children to collect water samples would offer a very penetrating facility to reach out to the water supplies in an area.

This innovation was to be tested by a separate follow up sampling by a team of qualified personnel from the Government Analyst's Laboratory in order to evaluate the effectiveness of using school children. The idea was that if children could provide samples and useful environmental data, this could not only save time but human and material resources as well.

Headmasters were the necessary link between the schools and the team. The headmasters in turn worked with their teachers to reach out to the children. Through the children, it was possible to reach out to most families and to their water sources. This offered a technique of scanning the area extensively. Activities were timed such that children could bring samples in the morning of the day the Government team was to collect them.

Consultations were made with the Chief Education officer who concurred that the idea would not only be practical but that properly run, the idea could be used as a vehicle for education as well. The discussions led on to the hypothesis that primary school children can be used in collecting basic environmental data. A questionnaire was designed to test the hypothesis in the rural area.The data obtained through this survey was used to test the effectiveness of using school children to provide basic environmental data. The questionnaire and competition questions have been appendixed in their original form (Appendix 1 and 2).

Water is of such important concern for rural communities and teacher communicated this so effectively that there was good cause for cooperation.

To our knowledge, the involvement of primary school children in sample collection and subsequent involvement in collecting environmental data has not been previously documented in Zimbabwe.

Objectives

The objectives of this study were therefore to:

a) examine the effectiveness of using school children for collection of water

samples for chemical analysis and provide basic environmental data.

b) obtain information about the attitudes of the community to issues of water supply and sanitation facilities using school children.

The Study Areas

The choice of Gokwe and Chimanimani for the work presented was mainly for practical reasons in that they were both typical rural communities where the Government team was already working on another project. In both cases there was prior knowledge of the general areas of interest arising from previous work at Government and direct contact with people from the respective areas. In Gokwe, the specific areas were chosen for road accessibility and in Chimanimani the Hot Springs is an area known for problems related to water and occurrence of severe dental fluorosis.

a) Chimanimani district

The area has about 17 000 people of which 44,3% are below the age of 15 years, according to national census data. The study area has a tarred road that services well developed irrigation schemes further south. The schools involved are about 10 kilometres apart along the road and each school has a total of about 600 pupils.The study area itself lies in a rain shadow and is relatively dry with an average annual rainfall of 488,6mm. The area is known for its hot springs which continually produce large quantities of water at a temperature of about 50°C. The area is currently being redeveloped as a tourist resort and has many villages and shops in the vicinity.The population of the area is generally supported by subsistence agriculture.

b) Gokwe District

The population in Gokwe in growing fast due to continued resettlement that started some thirty years ago. The population is now approaching 230 000. It is the largest district in Zimbabwe and is comparatively poorly developed with few services and a limited road network. It is also an area where the population is supported by subsistence agriculture.

Sampling

After choosing the districts and the schools for reasons stated in the introduction the following argument was used in order to justify the treatment of these schools as samples:

a) In the Chimanimani District, there were schools that had been established for a long time and some others that were relatively new. Their progress and status depends on the headmasters, teachers and the community around. There were approximately 600 children per primary school. Each child, on the average, came from a family of seven people. This meant that by using school children there was access to the water used by about 4 000 people.

b) In Gokwe, a resettlement programme has been going on from around 1960. People from many parts of the country have merged to form new communities, some more established than others. The schools are equally in a dynamic state of growth and change. This left access to children of varied backgrounds and teachers in this region were also from different backgrounds, some qualified and others in training.

c) In Chimanimani, there had been other research projects carried out in the area, and people were familiar with research personnel but in Gokwe this level of participation was new.

d) The team only looked at the children in rural areas where the need and the problem was evident. The communities were generally involved in subsistence farming in both Gokwe and Chimanimani.

Materials and Methods

The Government team endeavoured to consult every conceivable level of authority in both districts. In Chimanimani it was possible to communicate in the form of a meeting, but in Gokwe, the level of organisation required the team to deal with the various levels of authority separately.

When the initial consultation process was complete, future communication was done through the office of the headmaster only.

All written communication was in English but the teachers were requested to reinforce ideas verbally in shona and on the occasions that the team spoke to children, communication was in Shona. The children wrote their answers in English and the essay competition was conducted in English. The essay was really inserted to stimulate the children who were free even to draw pictures in order to tell their story.

In order to carry out the survey of all drinking water sources in their two study areas, all school children in Grades 4 to 7 (ages 11-15 years) were requested to collect water directly from the source where their family gets drinking water. They were to label the 100ml bottles which were collected and shipped to the laboratory for chemical analysis by the Government team. Suitable labels were

suppiled so that each child could give details of location and type of source. Each school was also requested to map their area for the major sources of drinking water for subsequent identification during follow up work by the Government team. This strategy served to identify water sources in the area where the school's children came from and to identify the specific areas where fluoride and nitrate appeared to be of unacceptably high levels in drinking water.

Using the results from above, the Government team resampled in the same study areas using the same sampling points identified by the school children. This allowed a cross check on the accuracy of the sampling done by the children.

The knowledge, attitudes and practices survey was undertaken by requesting the children to complete questionnaires that needed them to give data about themselves, their drinking water source, their families and their sanitary facilities. Teachers supervised the completion of the questionnaires and explained any difficult concepts. The Government team checked on how instructions were delivered by discussing with some of the children chosen randomly.

An essay competition was included in order to stimulate the children and to enable the schools to be rewarded with token book prizes for participation. Teachers used the essays as education tools for their environmental lessons (Appendix 2).

Results

These results concentrate on the effectiveness of using school children in the collection of samples and basic environmental data.

Table 1 shows the comparison of fluoride results for samples collected by school children and samples collected by the Government team for those points that could be identified without ambiguity during the follow up. The numerical difference between the two values is shown in the column marked "difference". It was not possible to compare every result as there were limitations brought about by the practicality of following every sample and the fact that in the case of nitrate the method itself could not be reproduced.

There had been some fears that the children would not bring good samples for a variety of reasons ranging from misunderstanding to deliberate naughty behaviour. Table 1 represents a wide variety of samples correlated and shows that the samples were valid.

Table 2 summarises the most common feelings of the children about their water. These feelings were summarised from the open statement in the questionnaire which simply requested the children to "tell us more about your water", (last

question in the questionnaire). This line of questioning can produce a large delivery of answers which are informative but written in a form that can be laborious to process and interpret. The children had some problems in expressing themselves but their perceptions about their problems were clear. The evaluator needs to be sympathetic to their presentations. This part consumed time. The value of the ideas in Table 2 lies in the fact that the children expressed them individually.

Table 3 shows the children's perceptions of improvements in water supply and sanitation in 10 years time.These perceptions were summarised from the essays written by the children and assessed by ten members of staff at the Government Analyst Laboratory. The ideas are realistic and it would have been useful to sample some ideas from older people living in the same areas but this was only realised on looking back. It might also have been useful to inquire from planners of district development projects and assess further the clarity of the children's responses.

Table 4 (a) and (b) shows some of the responses to questions about sanitation facilities in the two districts. Processing this part was easy because the answers were really just binary responses (yes or no) and these were handled by computer.

Table 1: Comparison of Fluoride levels in Water Samples Taken by Children and Those Taken by the Government Analyst's Laboratory (units in mg per litre).

SCHOOL	SAMPLE POINT	CHILDREN'S SAMPLE	TEAM SAMPLE	DEFERENCE
Umbe	Borehole	6.36ppmF	6.20ppmF	+0.16
Gwebo	Borehole	9.68	9.80	+0.88
	Borehole	9.80	10.00	-0.20
Zanda	Well	0.62	0.84	-0.22
	Well	0.50	0.72	-0.22
Goredema	Borehole	8.00	9.40	-1.40
	Borehole	9.20	10.00	-0.80
Mvumba	Borehole	7.32	7.80	-0.48
	Well	0.44	0.46	0.02
Nenohwe	Borehole	0.74	0.68	+0.06
	Spring (Rupiza)	4.40	4.60	-0.20
	Odzi river	0.12	0.08	+0.04
Chaseyama	Borehole	0.74	0.86	-0.12
	Borehole	0.92	0.46	+0.46
Chakohwa	Canal	0.10	0.06	+0.04
	Hot spring	6.00	5.80	+0.20
Hot spring	Hot spring	6.20	5.80	+0.40
	Hot spring	5.80	5.60	+0.20
Nematamba	Borehole	1.54	1.76	-0.22
	Borehole	1.94	0.74	+1.20
	Borehole	1.68	2.20	-0.52

The difference is random and only 10% of the results show a difference of more than 10% between the Government results and the results from water sampled by school children. This shows that children sampled properly. The minor random variations can easily be a feature of the chemical analysis technique applied.

Table 2: Most Common Feelings of Children About Their Water Supply

DESCRIPTION OF THE PROBLEM	FREQUENCY
The water is not clean.....	24.4%
The water is shared with animals.....	22.2%
Some people, including the sick,	

wash and contaminate the water	15.8%
The water is not enough for community and schools.....	14.5%
Water is needed for building and gardens	3.9%
Water is too far	3.9%
Others.....	15.3%

Table 3: Children's Perceptions of Improvements in Water Supply and Sanitation in 10 years Time

Building ventilated latrines	21.0%
Piped water/purified water in tanks	12.7%
Construction of better homes (bigger, stronger protected, electrified with toilet)	12.6%
Protect wells/more wells	8.5%
Boil drinking water form unprotected sources	7.4%
Construct more boreholes	6.3%
Digging of rubbish pits	6.3%
Provision of better nutrition	4.2%
Provision of better hospital care	4.2%
Building of dams	4.2%
Separate water for animals	3.2%
More education (on water and sanitation)	3.2%
Others	6.2%

Table 4 a) : Facilities Used by Children of Chimanimani and Gokwe to Pass Excreta

LOCATION	DISTRICT		TOTAL
	CHIMANIMANI	GOKWE	
	No(%)	No(%)	
Bush	432 (44.4)	492 (72.8)	915
Pit latrine	478 (50.2)	171 (25.3)	649
Ventilated latrine	51 (5.4)	13 (1.9)	64
TOTAL	952	676	1 628

Table 4 (b) : Answers to the Question Whether or Not the Family Owns a Latrine

FAMILIES	DISTRICT CHIMANIMANI No (%)	GOKWE No (%)	TOTAL
With latrine	560 (58,6)	158 (23,5)	718
Without latrine	395 (41,4)	514 (76,5)	909
TOTAL	955	672	1 627

Some of the data obtained through the children was that from 97,6% of the children who answered the question "where do you go to the toilet?" 56,2% stated that they used the bush. However, more children in Gokwe use the bush (72,8%) than children in Chimanimani (44,4%). The results confirmed the results of the question on whether the family owned a toilet or not in that of the 1 627 answers, 44,1% stated that their family owned a latrine. 76,2% of the children stated that they went to the toilet about two to three times a day.

The teachers needed to explain the concepts of measurements in litres and distances in kilometres. This may be a question of cultural experiences in the rural communities where these terms are not the daily way of expressing these quantities and may not be a valid way of assessing the children's ability to supply other information.

With the limitations just stated the data obtained was that most families use less than 100 litres a day (75,5%) with the majority of the families using between 40 and 100 litres a day. The most common container used for water collection is a 20 litre tin (87,5%).

The average family size was between seven and eight people and the children stated that 15 litres of water was for drinking and 20 litres for cooking. On the average each child stated that 2,3 litres of water per day was used for drinking by each child in these hot regions.

Discussion

The subject of research (water supply) was clearly of primary concern to the community and after initial consultation the team found no negative interference from the various levels of authority.

The most important observation was that it took one week for a team of one driver and four trained personnel from the Government team to scan an area in one district.The same work was done by the schools in one day and the process improved when the schools got more practice.The children could be used to penetrate the community more effectively and in the two study areas they were fast,

their involvement cost effective.

There were some problems that needed to be overcome. Teachers needed to be absolutely clear about the purpose of the data and how crucial their role was. Interference from teachers could distort and bias the process significantly. Some examples included occasions when the team arrived on the day of collection to find that the children had not been asked to collect the water, or as in one case they had collected the samples too early. At one school children were instructed to use other containers to collect the samples and this affected the nitrate results. An essay competition was included in the project in order to introduce some motivation but some teachers took the competition more seriously than was anticipated and over-assisted their pupils. At one school one class gave the same solution to their water problem.

Some problems arose from language difficulties in areas where the word "dam" could mean anything form a pond to larger water reservoirs, and "river" could also mean a seasonal stream. There were also limitations in expressing measurements of volume and distances and teachers needed to help more closely.

The questionnaire itself had shortfalls that had not been evident to the team, which had little previous experience in designing one. A typical example was ambiguity in questions like: "Where do you go to the toilet?". In addition the anticipated answers like "bush" or "pit latrine" there were some unexpected answers like: "to the north-east of our village". This sort of problem could have been overcome by a set of possible answers.

Some information could be checked by randomly asking older people who knew the area's history well and understood the problems affecting the community, but access to them would have needed more elaborate arrangements.

The technique can be improved by effective communication with teachers at the start of the project. It would be advantageous to do the work quickly with the same team of teachers to avoid explaining things repeatedly.

The question of language needs to be resolved in a separate survey because Grade Seven children wanted the opportunity to practice their English while the lower grades found problems of expression and would have done better in vernacular (Shona in these areas).

Some of the problems in the questionnaire were evident in the pre-test made, but instead of changing the questionnaire, the team went and explained to the teachers what was intended.Experience now shows that the questionnaire should have been changed, not rationalised.

The value of these results lies in the fact that where instructions were clear, the children were effective in samples collection and limitations in their use in collecting environmental data lie mainly in communication related problems.

Conclusion

School children can definitely participate effectively in sample collection and can be used for data collection in any well organised research programme. The method described worked well enough to provide the data that was needed for a water quality survey and for the assessment of the prevalence of dental fluorosis.

The general conclusion is that the technique needs to be studied and developed for other research for other research activities.

The key issue is that the technique worked in the case of collecting water for chemical examination and that it was possible to scan the study areas effectively.The teachers were key players who needed to be clear of what needed to be done.

The technique was fast and economic and left the children with some knowledge about their environment. The teachers found some teaching tools in the process.

In collecting basic environmental data the children could still do the work but there was need to ensure clarity of the questions and some explanation of specific issues such as distances, volumes and opinions but when the ideas were clear, the data was useful. It must be borne in mind that in this case both the teachers and the research team had no prior experience of the task and some experimentation was in progress, hence some of the limitations could be overcome with time and practice.

The concept needs to be refined for other similar applications, particularly remote areas where mobility is critically difficult.

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References

Axton and Siebert (1982 "Etiology of Convulsions in Zimbabwe Children Three Months to Eight Years Old" in *Central African Journal of Medicine*, Vol 28 No 10: 246-249.

Babbie E (1990) *Survey Research Methods*, 2nd Edition, Wodsworth Publishing.

Culliman T R (1980) "Teaching Concepts in Epidemiology" in *Journal of Epidemiology and Community Health* Vol 34: 201-203.

Evans D, Hibbard B, Jones J, Landsman J and Sweetman (1980) "Enumeration and Definition of Population and Initial Acceptance Rates" in *Journal of Epidemiology and Community Health* Vol 34:9-13.

Griffin L and Fast M (1982) "A preliminary study on poly-parasitism and size of school children in Kenya" in *Central African Journal of Medicine.*

Liard R, Chansin R, Neukirch F, Levallois M and Leproux Ph (1988) "Prevalence of asthma among teenagers attending school in Tahiti" in *Journal of Epidemiology and Community Health* Vol 42.

Mather S, Motovo H L and Mossop R T (1982) "Nutritional Status of an Urban Community in Zimbabwe" in *Central African Journal of Medicine* Vol 31 No 3.

Murphree M W, Cheater G, Dorsey B J, and Mothobi B D (1975) *Education Race and Employment in Rhodesia*, ARTCA Publications.

Verma B L, Kumar A and Srivastava R N (1980) "Gowth profile of pre-school Children in an Indian Rural Community " in *Journal of Epidemiology and Community Helath* Vol 34.

Walker M, Shaper A G and Wannamethee G (1988) "Height and Social Class in Middle Aged British Men in *Journal of Epidemiology and Community Health*, Vol 42:299-303.

Appendix 1

GOVERNMENT ANALYST'S LABORATOY
P O BOX 8042 CAUSEWAY, HARARE
WATER QUALITY SURVEY 1988

Identification

Your Identity Number .....
Your Full Name .....
Name of School .....
Name of Village .....
Type of Source: eg Well, river, borehole, dam .....
Date of Sampling.....
Name of District.....
Identity of Sampling point: (Your Teacher will help) .....

Questionnaire

1. How old are you?.....
2. How long have you lived in your present home? .....
3. Who collects water for your family? .....
4. How many litres of water are collected per day? .....
5. What do they use to collect the water? .....
6. How many times do they collect water?.....
7. With the help of your teacher, find out how many litres of water are collected each time?.....
8. How many people at home use this water? .....
9. How much water, each day, is used for drinking?.....
10. How much water, each day, is used for cooking? .....
11. How much water, each day, do you yourself drink?.....
12. Where do you go to the toilet?.....
13. Where do other member of the family go? .....
14. How many times a day do you go?.....
15. Does your family own a toilet? .....
16. How far is the drinking water source from the nearest toilet? (give answer in meters).....
17. How is your water source protected? .....
18. Tel us more about your source (maximum of five lines).....

Appendix 2

GOVERNMENT ANALYST'S LABORATOY
P O BOX 8042 CAUSEWAY, HARARE
WATER QUALITY SURVEY 1988
COMPETITION

Section A

Imagine you are in the year 2000 AD, describe your home, where you get water and where you go to the toilet.

Section B

Imagine you are today the Village Development Officer in charge of water and sanitation.

What advice would you give to your community on how to improve their health?

Use pictures to help you tell your story