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The European Union micro-projects program on water and sanitation and reduction in the incidence of some diseases prevalent in the rural communities of Imo state

Edmund E. Nkwocha[*1], Ralph O. Egejuru[2]

[1]Department of Environmental Technology, Federal University of Technology, Owerri, Imo State, Nigeria
[2]Department of Pathology, Federal Medical Center, Owerri, Imo State, Nigeria

***Corresponding author: eenkwocha@yahoo.com, ralphegejuru@yahoo.com**

Abstract

Many studies in the rural communities in Nigeria have revealed that the levels of water and sanitation services are generally unsatisfactory. This has led to high prevalence of many diseases associated with water scarcity and poor hygiene. This study examined the role of the European Union Micro-Projects Program in water and sanitation in the reduction of the incidence of some of these diseases in the rural areas of Imo State. Five hundred and forty subjects were randomly selected and interviewed in 15 rural communities that benefited from water and sanitation projects between 2003 and 2007. Impacts were evaluated in the areas of water supply and sanitation in terms of quality, quantity, incidence of diseases and their rate of reduction among the local population. Results showed considerable improvements in the quantity and quality of water supply (62%), sanitation (52%), as well as reduction in the incidence of diseases (40%). The success recorded in this externally funded program resulted from many factors, of which the most important was the adoption of the participatory development model by the donor agency in project execution.

Key words: diseases, donor agency, micro-projects, participation, sanitation, water.

Introduction

In January 2000, the Federal Government of Nigeria launched its National Policy on Water Supply and Sanitation with the aim of providing sufficient potable water and adequate sanitation to all Nigerians (Federal Government of Nigeria, 2000). At the local level, many State Governments and their Local Government Authorities (LGAs) complemented efforts of the federal government by creating different agencies (Water Boards, Rural Water Development Agencies, etc.) to provide water for the people. Despite these efforts, recent studies have revealed that water supply and sanitation services within the country still remain generally unsatisfactory (Igwe et al 2007, Onyenechere 2004, Okereke 2000, Uzoma 1996, Lawal 1997). In 2006 water supply coverage was 50 percent in urban areas, 20 percent in small towns and 10% in the rural areas (NBS, 2007a). Also, the World Health Organization and the United Nations Children and Education Fund Joint Monitoring Team (2007) reported that access to improved drinking water sources in Nigeria generally increased from 49% in 1990 to 60% in 2002 and decreased to 48% in 2006; it also increased from 33% in 2002 and decreased to 31% in 2006 in the rural areas. In the sanitation sector, access to sanitation decreased from 33% in 1990 to 30% in 2004, but slightly increased to 33% in 2006. In a separate report, the United Nations (2006) revealed that total water availability per capita in Nigeria decreased from 2514 cubic meters per year in 2000 to 2250 cubic meters per year in 2005. In recent times, a number of donor agencies have contributed in the provision of water supply and sanitation systems in Nigeria in general, and in Imo State in particular, where there are perceived gaps in access to these services. They have through different programs, engaged in the provision of water facilities in the rural areas. However, over the years, little attempts have been made to assess the general impacts of these projects on the living conditions of the people. This study aimed at assessing the role of water (boreholes) and sanitation projects financed by the European Union in the reduction of the incidence of some diseases prevalent in the rural communities of Imo State. The study was based on the assumption that improved drinking water may lead to improved health patterns in a population only when the people concerned practice improved personal hygiene.

Research Methodology

Study Area and Population

Imo State was one of the nine states of the Niger Delta Region that benefited from the European Union Micro-Projects Program which commenced in 2003 and lasted for five years. It lies between latitude 4^0 45' and 6^0 15' North, longitude 6^0 30' and 8^0 09' East. It is bordered on the North by Anambra State, on the South and West by Rivers State and on the East by Abia State, with a total population of 3,285,580 (NPC 2006). Between 2003 and 2007, a total of 88 water projects (modern boreholes with large water tanks) were executed in the state (Table 1). This study was carried out in 15 rural communities that benefited from the projects which included Ezuhu Nguru (Aboh), Amuzi (Ahiazu), Ezoke (Ehime), Amudi Obizi (Ezinihitte), Umuago Urualla (Ideato North), Aboh Ebikoro (Ikeduru), Owu (Ikeduru), Ibeme (Isiala Mbano), Umuocham Ntu (Ngor Okpala), Ugbele-Aka (Njaba), Amaokpara (Nkwerre), Amuzi-na-Dim (Nwangele), Amato Alike (Obowo), Etioha (Ohaji/Egbema) and Ugwuntu-Ihube (Okigwe). Two major criteria were used for the selection of these communities, namely, they are all

Table 1. Population, land area, density, and total number of water and sanitation projects executed in Imo state by localities between 2003 and 2008

S/N	Local Government Area (1)	No. of communities (1)	Population (1)	Area (KM^2) (1)	Population Density (People Per KM^2) (1)	Total No of Water and Sanitation projects (2)
1.	Aboh Mbaise	11	152187	185.30	821	04
2.	Ahiazu Mbaise	17	128608	111.20	1157	05
3.	Ehime Mbano	12	125950	139.70	902	04
4	Ezinihitte	15	11508	108.30	1122	06
5.	Ideato North	13	170106	172.40	987	01
6	Ideato South	15	111892	90.33	1239	01
7.	Ihitte Uboma	15	93547	104.50	895	02
8.	Ikeduru	14	141377	183.60	770	12
9.	Isiala Mbano	16	138618	203.30	682	07
10.	Isu	5	77424	31.30	2474	01
11.	Mbaitoli	13	195971	213.46	918	06
12.	Ngor Okpala	17	122249	635.73	192	01
13.	Njaba	7	108394	96.63	1122	04
14.	Nkwerre	6	70313	28.65	2454	03
15.	Nwangele	6	95768	72.35	1324	04
16.	Obowo	11	84882	97.80	868	01
17.	Oguta	16	114430	509.60	225	02
18.	Ohaji/Egbema	9	157029	958.01	164	01
19.	Okigwe	7	85685	337.60	254	02
20.	Onuimo	4	83595	69.40	1204	04
21.	Orlu	18	154366	154.60	998	05
22.	Orsu	9	120405	55.20	2181	03
23.	Oru East	9	109807	161.31	681	03
24.	Oru West	10	87149	73.13	1192	03
25.	Owerri Municipal	1	129245	24.88	1175	-
26.	Owerri North	13	219179	165.83	1322	03
27.	Owerri West	12	130362	305.18	427	-
	Total	265	3,285,580	5,289.49	621	88

Sources: (1) National Population Commission (2006), (2) European Union Micro-Projects Program Office, Owerri (2008)

located far away from major urban centers (>25km) and had no other sources of water supply aside rain water, ponds, streams and water vendors. A month before the completion of any of these projects, a workshop on water and sanitation was organized in each of these communities to sensitize and educate selected community representatives (women leaders, youths, housewives, members of project management committees), on the importance of water and sanitation in a rural setting. The workshop afforded the opportunity to create awareness among users on the benefits of their new projects and the health hazards posed by indiscriminate disposal of human wastes. This was complemented by a practical demonstration of how to construct a modern ventilated pit latrine.

Data Collection

Data used in this study were obtained from three major sources. The first was the socioeconomic data on the target population collected through the use of a structured questionnaire that contained multiple answers in which copies were directly administered to respondents in the communities that benefited from the water projects. They were interviewed in English or in local vernacular (Igbo) within a period of four weeks. Our subjects were mainly farmers (58%), traders (18%), full housewives (12%), civil servants (6%), retired people (3%) and students (3%) cutting across different age groups. The greater majority were women and children, making up to 82%, and men, the remaining 18%. The questionnaire contained pertinent questions such as age, sex, quantity of water fetched per day, daily water needs, quality of water, incidence of water-borne (typhoid, cholera, diarrhoea) and water-related diseases (malaria), impact on sanitation, among others. Respondents were also asked to list the diseases they suffered from in the past one year. A systematic random sampling method was adopted in which each respondent was interviewed in one out of every three families in each community. In all, a total of 540 subjects were interviewed. The second source of data was on water quality assessment. Data was obtained from analysis of water samples collected from each of the new boreholes in the 15 communities. Water samples were collected in the early hours of the day under aseptic conditions using 200ml screw-capped sterile bottles and transported within 3h in portable flasks equipped with ice bags as recommended by APHA (1995). Each of these samples was labeled and named after the source community. Water samples were collected both in the rainy and dry seasons and results were presented in ranges covering these two periods. A total of 30 samples were collected and analyzed. Bacteriological determination were subjected to serial dilution and plated in duplicates by the Pour Plate Method on plate count agar, OXOID England. The plates were incubated at 37 degrees Celsius for 24h for bacterial enumeration. The determination of concentration levels of iron, manganese, nitrates, sodium ions and other minerals was done using a Unicorn Solar Atomic Absorption Spectrophotometer (AAS). Our third source was the results of a socio-economic baseline study conducted by the Imo state Government in 2002 in all rural communities that benefited from micro-projects (including borehole projects) to ascertain the prevailing conditions prior to the execution of these projects. The baseline data formed the basis for comparison with data obtained from our study. These two different results were compared with the National Agency for Food, Drug Administration and Control (NAFDAC) (2001) and the World Health Organization (WHO) (2001) Standards for drinking water as shown in Table 2.

Table 2. NAFDAC and WHO drinking water standards

Parameters	NAFDAC	WHO	
		Highest desirable level	Maximum permissible level
Turbidity mg/l	-	5	25
Total Dissolved Solid µs/l	500	500	1500
Temperature (^{0}C)	-	-	40
Electrical Conductivity µs/l	-	-	-
pH	6.5 – 8.5	7.0 – 8.5	6.5 – 9.2
Total Alkalinity	100	80	120
Hardness	-	100	500
Chloride mg/l	200	200	400
Nitrate mg/l	-	45	100
Potassium mg/l	10	10	45
Calcium mg/l	75	75	200
Iron mg/l	-	0.03	0.10
Sulfite mg/l	200	200	400
Magnesium mg/l	30	0.5	0.1
E.coli	-	-	-
Zinc mg/l	5	5	15

Source: Adapted from NAFDAC (2001) and WHO (2001)

Table 3. Increased margins of household water supply

Communities	Mean Household Water Demand (liters) in 2002 (1)	Mean Household Consumption Before project in 2002 (liters) (1)	Mean Household Consumption after project in 2007 (liters) (2)	% increase in water supply in 2007 (2)
Ezuhu Nguru	1132	577	873	51.3
Amuzi	1051	538	852	58.4
Ezoke	1137	565	847	49.9
Amudi Obizi	995	473	899	90.1
Umuago Urualla	1031	508	705	38.8
Abo Ebikoro	950	411	710	72.7
Owu	986	462	735	59.1
Ibeme	1052	501	799	59.5
Umuocham Ntu	1004	506	851	68.2
Ugbele Aka	1163	511	838	63.9
Amaokpara	997	495	753	52.1
Amuzi-na-Dim	1009	492	802	63.0
Amato Alika	972	433	720	66.3
Etioha	1080	420	711	69.3
Ugwuntu Ihube	988	391	649	65.9
Mean	1037	486	782.9	61.9
SD	-8	-7	-1	-4

Sources: (1) Baseline Data Survey conducted by Imo State Government in 2002, (2) Field Survey in 2007

Statistical Analysis

In the primary analysis, univariate statistics were used to present data on the variables studied (mean, range, standard deviation, liters, etc.). While the mean water demand was calculated based on the total quantity requirements of respondents divided by their number, the mean water supply was obtained by measuring the total quantity actually supplied to each respondent divided by the sample size. These results were then factored with maximum permissible variation of 20% as suggested by Duggal (2006). The same method was used in 2002 during the Baseline Data Survey as earlier mentioned. Categorical variables and percentages were presented as summary statistics for daily water needs, distance from sources etc. In the secondary analyses, logistic regression was used to assess relationships between water supply, incidence of diseases and sanitation levels. The limit of statistical significance was set at 95% confidence level ($p < 0.05$). The data was analyzed using SPSS version 13.0 (SPSS; Chicago, IL; USA).

Results

Increase in Household Water Supply relative to demand

In most of the communities surveyed, there was a considerable percentage increase in the quantity of water supply relative to total household needs after the execution of the water projects. Table 3 shows that the highest percentage increase in water supply was recorded at Amuzi Obizi with over 90% among subjects, while the least was recorded at Umuago Urualla with slightly over 38%. Other communities that recorded high increase in water supply include Aboh Ebikoro (72.2%), Umuocham Ntu (68.2%), Ugbele Aka (63.9%), Amuzi-Na-Dim (63%), Amato Alike (63.3%), Etioha (69.3%) and Ugwuntu Ihube (65.9%). The low percentage increase in water supply at Umuago Urualla (38.8%) and Ezeoke (49.9%) was as a result of difficult terrain which reduced accessibility to water supply among subjects.

Table 4. Evolution of Sources of water supply in sampled communities

Communities	Sources before water project in 2002 (1)	Sources after water project in 2007 (2)
Ezuhu Nguru	rain water, pond	borehole, rain water
Amuzi	rain water, pond	borehole
Ezoke	rain water, stream	borehole, rain water
Amudi Obizi	rain water, pond	borehole
Umuago Urualla	rain water, water vendors	borehole, rain water
Abo Ebikoro	rain water, stream	borehole
Owu	rain water, stream	borehole
Ibeme	rain water, pond	borehole, rain water
Umuocham Ntu	rain water, pond	borehole
Ugbele Aka	rain water, water vendors	borehole, rain water
Amaokpara	rain water, pond	borehole, rain water
Amuzi-na-Dim	rain water, stream	borehole
Amato Alika	rain water, stream	borehole
Etioha	rain water, stream water, rain water pond	borehole
Ugwuntu Ihube		borehole

Sources: (1) Baseline Data Survey conducted by Imo State Government in 2002, (2) Field Survey in 2007

Improvement in the quality of water supply

Table 4 shows that before the execution of the water projects 46.7% of the subjects sourced their water from rain water and ponds; 40% from rain water and streams and 13.3% from rain water and water vendors. However, after the execution of the projects, 68% of the subjects sourced their water only from the new boreholes, while 38% depended on these facilities and rain water. A comparative analysis of results of laboratory analysis of water samples on rain water, pond water and stream water (2002) and those on the new borehole water projects (2007) show considerable improvement on water quality as shown in Table 5. These results show that the level of turbidity in all the water samples including those collected from the new borehole projects were below the WHO maximum permissible limits of 25NTU. Water samples from the new boreholes like those of rain water showed no variation in taste and odor quite unlike those of pond water whose odor was highly objectionable. The levels of total dissolved solids (TDS) in pond and stream water samples were high (138-309 µs/m) but still remained less than the desirable levels of NAFDAC and the WHO. The TDS of borehole water samples and those of rain water were low and therefore pose no treat to the health of the local population. The level of hardness was equally low in all the samples. Concerning the chemical parameters analyzed, water samples from the new boreholes and those of rain water showed acceptable levels of nitrates, calcium, chlorides, zinc, iron, potassium, calcium, magnesium, and lead, while those of stream and pond waters showed high levels of iron, magnesium, and zinc although they did not exceed NAFDAC and WHO maximum permissible limits. The levels of sodium in all the samples including those from the new boreholes were within the acceptable limits. Exceptions were the samples from the boreholes at Umuago Urualla and Amaokpara which indicated high levels of iron (1.8mg/l) and sodium (3mg/l) respectively. Biochemical tests for identification of isolates revealed that the coliforms were *E. coli* and Aerobacter aerogenes. The most probable numbers of *E. coli* per 100 ml of stream and pond water samples were 153 and 158 respectively. This corresponded with the high level of BOD recorded in these samples which actually indicated the presence of micro-organisms in them. However, they were absent in water samples from the new boreholes and rain water.

Decrease in the incidence of water-borne and water-related diseases

The incidence of water-borne and water-related diseases in these communities were as high as 69% and 64% respectively prior to the execution of the projects as indicated in the baseline data of 2002. As water was fetched from unhygienic sources and stored in the most unhygienic manner, some diseases such as diarrhea (13%), cholera (2%), typhoid (7%) and malaria (100%), were highly prevalent. The presence of *E. coli* in water samples from ponds and river show that these natural sources are liable to contamination with dangerous intestinal pathogens which cause various diseases of public health importance. While these diseases were most common among the most vulnerable groups (children, aged), only typhoid, hepatitis and malaria were common among adults. Our study revealed a considerable reduction in the incidence of these diseases among subjects after the execution of the water projects. For example, diarrhoea was reduced to 4%, cholera (0%), typhoid (3%) and malaria (78%). Also, based on the 2002 baseline data, our results show a significant reduction in the level of water-borne diseases in the area: Amuzi (33%), Ibeme (38%) Amaokpara (32%) Owu (31%), Ugbele Aka (32%), Etioha (37%) and Umuago Urualla (41%). Among these communities, Umuago Urualla and Ezeoke recorded the highest number of disease victims with 48 and 45 cases respectively, while Owu and Amuzi-Na-Dim recorded the least of 31 cases each respectively.

Improved sanitation among rural families

Our study also revealed that after the completion of the projects, 52% of the heads of households among our subjects reported that they have already provided their families with the improved latrine, which is simple to build, highly affordable and suitable for rural areas especially where water is scarce. While there was improved sanitation among 52% of the subjects, 25% of them had plans to provide their families with these facilities in the nearest future while the remaining 23% preferred to be using their old pit latrines for lack of resources. Observations showed that the general dimensions for these latrines were 3.5 meters deep with an effective average volume of $3.05m^3$, equivalent to twenty years use by a family of six (Morgan, 1990).

Table 5. Results of laboratory analysis of water samples from various sources in the study area

Parameters	A	B	C	D
	Rain water (Range)	Pond water (Range)	River water (Range)	Borehole water (Range)
Turbidity	4 -6	6.3 – 8.6	6.5 – 9.9	3.6 – 3.8
Hardness mg/l ($CaCO_3$)	10.8 – 24.6	12.02 – 15.54	12.0 – 17.88	10 - 11
Total Alkalinity	3.5 – 4.2	10.6 – 12.8	12.0 – 15.0	10 – 12
Electrical Conductivity µs/m	3.2 – 4.0	13 – 15	4.0 – 28.0	6.0 – 18.0
Total Dissolved Solids µs/m	15.7 – 16.8	203.2 – 308.7	138 – 196.0	17 – 22
pH	6.5 – 6.6	6.3 – 6.8	6.5 – 6.75	7.53 – 7.58
Chloride ion mg/l	8.5 – 10.0	6.8 – 10.6	10.68 – 17.73	36 – 45
Sulfide ion mg/l	10 – 12.0			
Nitrate ion mg/l	25 – 32	270 – 600	8.5 – 160.0	5.1 – 7.5
Mg^+ mg/l	0.1 – 0.11	40.1 – 41.9	42.3 – 44.8	0.1 – 0.3
Ca^+ mg/l	Nil	78.1 – 88.1	69.0 – 73.3	8.9 – 25.7
Zinc ion mg/l	00 – 0.11	7.18 – 10.1	0.65 – 0.80	Nil
Lead ion mg/l	Nil	0.01 – 0.04	0.01 – 0.5	Nil
BOD mg/l	0.1 – 0.2	2.2 – 3.5	2.0 – 3.7	0.1 – 1.2
E.coli	Nil	High	High	Nil
Potassium ion mg/l	Nil	0 - 4	2 – 5	0.2 – 0.6
Temperature ^{0}C	28^{0}C	27^{0}C	27^{0}C	26^{0}C
Iron ion mg/l	00 – 0.1	1.2 – 1.8	0.01 – 0.05	Nil
Sodium ion mg/l	0.6 – 0.0	0.4 – 0.6	0.3 – 0.9	0.1 – 0.3

Source: (1) A, B, C: Results of the Imo State Rural Baseline Survey in 2002. (2) D: Results of Field Survey in 2007

Discussion

Rural water and sanitation problem in Imo State is characterized by acute water shortage which forced people to consume water from unhygienic sources such as streams and ponds (Chima 1989, Briscoe and Ferranti 2005, Gleick 2002) and in most cases did not boiled it before use (United Nations 2001, Triche 2002, Ume 2006). This habit has led to the multiplication of water-borne diseases coupled with their attendant social distress (Booth and Cutting 1985, Agbo-nlahor 2002). The Imo State baseline data in 2002 indicated that average mortality rate among infants and children in the studied communities were 69 and 108 per 1000 live births respectively as against the South-East regional averages of 66 and 103 (NBS 2007b) in this rural environment where health systems are both inadequate and regressive (NDHS 2003). The logic enshrined in the model employed by the present European Union Micro-Water Projects Program was that these Community-Driven Projects (CDPs) will not only help in providing the much needed potable water but will also help in improving the living conditions of the target population (Streeton 2003, Churchill 2005). The average water supply in these communities increased from 15% in 2002 to an average value of 62% in 2007. Two reasons accounted for this phenomenal improvement in water supply, namely, proper location of the projects which increased accessibility to water source, and increased water storage capacities in the families of subjects (more drums, water tanks, jerry cans…). Also, water was made available for an average time of seven hours a day during which families fetched water at will. The availability of potable water with a reduction in distance and time (Table 6), coupled with improved sanitation practices helped in reducing the incidence of infant and child mortality attributable to diseases associated with water to minimal levels as earlier noted. These reductions were as a result of the provision of regular and potable water supply from the new water projects which helped to improve the general health of the subjects. This significant achievement was possible through the involvement of communities in planning, execution, management, operation and maintenance of their facilities. Part of the success of this strategy was the creation of the Community Project Management Committees (CPMCs) in each of the beneficiary communities. These local structures played essential role in ensuring the success and sustainability of the projects. Members of these committees, often numbering 6 to 12, were men and women of proven integrity (retired lawyers, teachers, traders, farmers, etc) collectively chosen by community members by open selection. These committees adopted participatory strategies to sustain their projects, instead of out right sale of water to community members (water was obtained free of charge in all the communities studied). These strategies included contributions in cash and in kind from generous donors, voluntary labor for project maintenance and operation, fund raising/lunching activities during festive periods, annual levies on adult males both at home and in Diaspora, women "August Meetings", etc. Some communities also went the extra mile to establish productive ventures such as block molding industries (Ibeme, Ezeoke Amuzi), production of packaged water of 5ml for sale in urban areas (Amuzi-Na-dim, Ugbele Aka, Ezuhu Nguru) while others embarked on the construction of town halls (Ezeoke, Amuzi) and civic centers (Etioha, Ibeme) to enable the organization of social functions to generate revenue. Part of the proceeds was channeled to cover operation and maintenance costs of water projects. In fact, improved accessibility to water sources had led to average daily gains of about 58% in time (as shown in Table 6), which was invested in agriculture (increase in farm size up to 18%), and other economic activities such as cooperative societies (Owu, Ibeme, Etioha), petty trading (12% of subjects especially in Amudi Obizi, Umuocham Ntu, Amato Alike) and construction activities as more water was made available. On the sanitation sector, there was improvement in hygienic and sanitary practices among subjects. Many families provided themselves with improved ventilated pit latrines, others upgraded their traditional pit latrines while the use of WCs was encouraged for those who could afford them. Other important health interventions by the donor agency included systematic awareness and containment campaigns on the spread of water-borne and water-related diseases, HIV/AIDS and other sexually transmitted diseases. Emphasis was also

Table 6. Reduction in Average distance and time spent in water collection

Communities	Average Distance Traveled Before Project in 2002 (Km) (1)	Average Distance Traveled After Project in 2007 (Km) (2)	Average Time spent Before project in 2002 (Hrs) (1)	Average Time spent After project in 2007 (Hrs) (2)	% of Average Daytime spent Before Project in 2002 (1)	% of Average Daytime spent After project in 2007 (2)
Ezuhu Nguru	4	0.3	1.58	0.47	13.2	3.92
Amuzi	3	0.4	1.32	0.53	11.00	4.42
Ezoke	5	0.5	2.15	0.48	17.90	4.00
Amudi Obizi	3	0.5	1.11	0.43	9.25	3.58
Umuago Urualla	3	1.0	1.24	0.56	10.30	4.67
Abo Ebikoro	4	0.4	1.43	0.48	11.90	4.00
Owu	3	0.2	1.15	0.42	9.58	3.50
Ibeme	3	0.3	1.18	0.45	9.83	3.75
Umuocham Ntu	4	0.5	1.42	0.51	11.80	4.25
Ugbele Aka	3	0.3	1.23	0.48	10.25	4.00
Amaokpara	3	1.2	2.10	0.51	17.50	4.25
Amuzi-na-Dim	5	0.3	2.18	0.47	18.20	3.92
Amato Alika	4	0.2	1.47	0.48	12.25	4.00
Etioha	5	0.4	2.20	0.53	18.33	4.42
Ugwuntu Ihube	3	0.3	1.16	0.48	9.67	4.00
Mean	3.6	0.45	1.53	0.48	12.73	4.05
SD	1.0	0.10	0.25	0.08	0.01	0.27

Sources: (1) Baseline Data Survey conducted by Imo State Government in 2002, (2) Field Survey in 2007

placed on food hygiene, safe water storage, and general health education. The integrated water and sanitation program was equally introduced in the primary and secondary schools to promote health and hygienic education for an improved standard of living among pupils and students. All these interventions conformed with the National Health and Sanitation Policy and international practices.

Conclusion

This paper has tried to analyze the role of the European Union Micro-Projects Program in water and sanitation in the reduction of the incidence of some diseases in the beneficiary communities in Imo State. Results obtained have explicitly shown how micro-projects in the water and sanitation sector can greatly improve the conditions of living of rural inhabitants and contribute to their development process. They have also shown that if the rural populations are given the opportunity to participate in decision-making, planning, implementing and operating projects that touch them directly, the projects end up being well-managed and sustainable. The success recorded in this program was as a result of many factors including the use of simple and appropriate technology in service delivery, local capacity building, regular maintenance of water systems, regular water sample analyses to monitor the level of water quality, increased intervention in sanitation and basic hygiene education as well as the mobilization of local forces for the sustainability of projects. Our results corroborate the idea that the provision of improved drinking water will result in an improved health pattern in a population only when individuals practice improve personal hygiene. The study also demonstrated that decentralized planning and decision-making in water and sanitation management offer potential benefits relating to increased responsiveness to local demands and needs and hence increased willingness of communities to contribute for increased services. The replication of such a community-based program in water and sanitation in other rural communities in Imo State in particular, and in Nigeria in general, is urgently needed as this will go a long way in reducing the incidence of diseases associated with water and sanitation in these areas in the future.

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