PRIORITIZATION OF INTERVENTION METHODS FOR PREVENTION OF COMMUNICABLE DISEASES IN TANZANIA

A. W. Mayo

Department of Water Resources Engineering, University of Dar es Salaam, P.O. Box 35131, Dar es Salaam, TANZANIA.
(E-mail: mayo@ce.udsm.ac.tz)

Abstract
Water, sanitation, housing and hygienic behavior plays dominant role in the transmission and intensification of diseases. To optimize utilization of limited financial resources, it is important to prioritize disease intervention methods in order to minimize mortality and morbidity cases. Realization of the environmental health components that respond to the practical effects of their contribution to transmission of diseases has greater chances of enhancing health at minimum cost.

Data of frequency of diseases and mortality rate were collected from four municipal hospitals from districts of Ilala, Kinondoni, Temeke and Kibaha in Dar es Salaam and Coast Regions. The populations at risk were sub-categorized in relation to age; below five years and above five years. The age parameter assists on envisaging the major causes to be either in-house or in public domain. Data were analyzed to assess the role of water quality, water quantity, excreta disposal, waste disposal and hygienic education on spreading the diseases in order to come up with scientifically evaluated information. Scores were given to each intervention method depending on its important in controlling a particular disease in order to establish the role of each alternative on transmission of diseases and the relative importance of each component.

The results indicate that incidences of malaria, skin and eye infections, pneumonia and diarrhea are frequent in these districts. Children under 5 years are particularly affected by pneumonia and diarrhea than adults. Malaria, tuberculosis and pneumonia are the major causes of mortality rates in these districts. Fatality cases are caused largely by malaria, pneumonia and diarrhea for children less than 5 years, but malaria, tuberculosis and pneumonia are responsible for mortality rates in adults and children over 5 years. Statistical analysis revealed that in all districts, hygiene education is the major factor responsible for transmission of diseases accounting for 32~39%. Other factors, which are the major contributors to the incidences of diseases, are inadequacy of water (15.6~22.5%) and poor housing environment (14.5%~24%). Water quantity played the least role in transmission of diseases accounting for only (3~8%).

Key words:
Morbidity, mortality, health, environment, intervention.

INTRODUCTION

Rapid urban population growth rates have heavily stressed demands on the already densely populated urban areas of Dar es Salaam. Majani (2001) estimated that 70% of the population in Dar es Salaam lives in 40 unplanned communities covering an area of 10,000 hectors. These unplanned communities lack organized sanitary infrastructure. Uncontrolled disposal of wastewater and solid wastes is a common problem affecting water sources and living conditions in unplanned settlements (Mashauri and Mayo, 1989).

Prevalence of diseases, which are caused by poor facilities of waste and excreta disposal, poor housing environment and provision of adequate water supply is not uncommon. The network distributing water in Dar es Salaam and Kibaha is extremely old, which is allowing recontamination of treated water because of intermittent water supply and leakages.

Several studies have been carried out all over the world, attempting to quantify the health benefits secured by giving households access to better sanitation services, hygiene education and/or improved water supply. Esrey *et al.* (1990) in a global review of 144 studies for estimating the health benefits of improved water supply and sanitation projects produced median estimates of expected reductions in six diseases. Esrey (1996) conducted another study to revile whether incremental improvement in health resulted in incremental improvements in water and sanitation services. Focus was made mainly in sub-Saharan Africa countries of Burundi, Ghana, Togo and Uganda. In this paper an attempt was made to identify and categorize diseases according to the environmental factors contributing to their existence. The paper further prioritized intervention methods based on the degree of effectiveness of the intervention on control strategy and the extent of spread of the diseases.

METHODS AND MATERIALS

The study area

This study was conducted in four districts of Temeke, Ilala, Kinondoni in Dar es Salaam region and Kibaha in Coast region. Dar es Salaam city with a total population of 1350 km^2 has a population of 2.2 million people accounting for 35% of the total urban population (National census, 2002). Kibaha district, which lies 40 km west of Dar es Salaam, is one of the six districts of Coast region. The population of Dar es Salaam is estimated to grow at the rate of 4.3% per annum while Kibaha district is growing at the rate of 2.4% per annum.

Hospital Records

Data of incidence and mortality cases were compiled from the records collected from municipal hospitals of Ilala, Kinondoni, Temeke and Kibaha districts as a sample reflecting their respective districts. Tumbi hospital at Kibaha is generally serving a large rural community and a small semi-urban population. Amana hospital in Ilala district, Mwananyama hospital in Kinondoni district and Temeke hospital in Temeke district are serving urban community. The *populations at risk were* sub-categorized in accordance with age; below five years and above five years in order to determine whether the source of the disease is in-house or in public domain. The data recorded were further classified into major categories of communicable and non-communicable diseases. To check for the eligibility of the samples used for this locale, a comparison was made by evaluating the cases registered by all dispensaries and hospitals of each of the three districts. Records were extracted from the annual summary issued by HMIS offices. Other health indicators such as Years of life lost due to premature mortality (YLL), Years lived with disability (YLD) and Disability adjusted life years (DALY) have been not established in Tanzania yet.

RESULTS AND DISCUSSION

Reported cases on Morbidity and Mortality

Morbidity cases were obtained from HMIS offices of the respective hospital or district. The data were available in two categories of children under 5 years and children over 5 years, youth and adults. Accidents, Communicable diseases that are not related to water or environmental conditions such as HIV-AIDS, and non-communicable diseases such as cancer were identified and removed

from the database. Eleven communicable diseases were identified and results tabulated in two categories. Data from Temeke hospital is shown as an example.

Table 1: Morbidity Cases Reported at Temeke Hospital in Temeke Municipality

	2000			2001			2002		
Disease	**<5yrs**	**>5yrs**	**Total**	**<5yrs**	**>5yrs**	**Total**	**<5yrs**	**>5yrs**	**Total**
Malaria	16266	23027	39293	33818	45632	79450	28165	88601	116766
Pneumonia	6903	4794	11697	22820	14470	37290	8300	13163	21463
Diarrhea	7188	2835	10023	2967	13378	16345	8467	13587	22054
Typhoid	77	106	183	98	67	165	104	318	422
Tuberculosis	127	542	669	195	558	753	67	463	530
Dysentery	95	256	351	74	119	193	42	174	216
Worms	2370	1832	4202	1084	879	1963	907	603	1510
Schistosomiasis	7	43	50	14	17	31	0	53	53
Hepatitis A	0	14	14	0	0	0	0	0	0
Cholera	7	24	31	0	0	0	5	230	235
Skin & Eye inf.	7900	10089	17989	2121	3373	5494	1547	998	2545

(Source: HMIS Office, Temeke Hospital)

Data obtained indicate that malaria is the most common disease in all municipal hospitals. Skin and eye diseases are the second most common disease in Temeke municipality, although Amana hospital in Ilala municipality and Mwananyamala hospital in Kinondoni municipality have recorded fewer cases. It is possible that inadequate water supply in Temeke municipality is responsible for high incidence of skin and eye diseases. Pneumonia and diarrhea cases are second and third most frequent in Mwananyamala and Amana hospitals. The records collected from Tumbi hospital indicates that diarrhea is more frequent than pneumonia followed by worm infection. The later is also fairly common in other hospitals as well. Morbidity cases of pneumonia and diarrhea are more frequent in children under five years than over five years age group in all hospitals. It is worth to note that cholera cases are more frequent in adults than children, suggesting that the disease is contacted outside homes. Typhoid, tuberculosis and schistosomiasis are less frequent in less than 5 years age group than over 5 years age group.

To check if data from municipal hospitals represent disease morbidity cases in the districts, morbidity cases in three districts of Ilala, Kinondoni and Temeke districts were collected. Table 2 shows reported morbidity cases in all hospitals and dispensaries of Dar es Salaam region in the year 2000. The figures are expressed in percentages and reported in two categories of in-patients and outpatients. The blank entries in the OPD columns were caused by record inadequacies because data for typhoid, tuberculosis and dysentery were not entered in the summary issued by HMIS office. However, the general trend indicates that in outpatient department (OPD) and in-patient department (IPD), malaria is the most frequent disease, followed by pneumonia and diarrhea. These diseases are more frequent in IPD than OPD. It is worth to note that skin and eye infections are less than 1% in IPD compared to 3.3~8.8% in OPD. This tend was not unexpected because of the nature of the disease.

Table 3 shows the sum of all mortality cases attributed to a specified disease, which were registered at all municipal hospitals. In all hospitals malaria is responsible for most fatality cases. Pneumonia and diarrhea are more fatal to children less than 5 years in all hospitals, but tuberculosis and cholera are more fatal to adults. Tuberculosis fatal cases in Amana hospital were based on records of 1998 and 2000 only because records of year 1999 and 2002 were missing from the archives of the hospital.

Table 2: Cases reported at all health centers of three districts of Dar es Salaam

Disease	*ILALA*			*TEMEKE*			*KINONDONI*		
	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total
	331500	3133	(%)	*766600*	15629	(%)	*1099100*	18762	(%)
Malaria	53.7	58.1	53.741	51.6	49.6	51.581	45.4	53.7	45.478
Pneumonia	5.5	10.2	5.544	7.5	12.4	7.546	7.7	3.2	7.658
Diarrhea	3.2	9.2	3.256	5.7	8.7	5.728	7.2	7.1	7.199
Typhoid		0	0.000		0	0.000		0.9	0.008
Tuberculosis		5.1	0.048		5.2	0.049		1.3	0.012
Dysentery		0.0	0.0		0.7	0.007		0.0	0.000
Worms	3.8	3.3	3.795	5.0	0.0	4.953	5.4	0.0	5.349
Skin & Eye infection	3.3	0	3.269	4.8	0	4.755	8.8	1	8.727

(Source HMIS Office Dar es Salaam, 2000)

Table 3: Case mortality registered at the municipalities hospitals

Disease	**TEMEKE** ***(2000-03)***			**MWANANYAMALA** ***(2000-03)***			**AMANA** ***(1998-00&2002)***			**TUMBI** ***(2000-01)***		
	<5	**>5**	**Sum**	**<5**	**>5**	**Sum**	**<5**	**>5**	Sum	**<5**	**>5**	Sum
Malaria	435	550	985	147	390	537	477	308	785	359	60	419
Pneumonia	345	133	478	69	44	113	379	44	423	153	22	175
Diarrhea	233	22	255	25	18	43	130	28	158	54	13	67
Typhoid	0	0	0	0	0	0	0	0	0	0	0	0
Tuberculosis	27	389	416	13	124	137	7	77	84	3	61	64
Dysentery	0	4	4	0	3	3	0	3	3	0	1	1
Worms	0	1	1	0	0	0	0	0	0	0	0	0
Schistosomiasis	0	0	0	0	0	0	0	0	0	0	0	0
Hepatitis A	0	0	0	0	0	0	0	0	0	0	0	0
Cholera	1	30	31	0	3	3	0	0	0	4	0	4
Skin & Eye infections	0	0	0	0	0	0	0	0	0	0	0	0

(Source: HMIS Offices of Temeke, Mwananyamala, Amana and Tumbi Hospital)

Setting Priorities

One approach of setting priorities is to rank the control strategies according to the priority of the health problem (Feachem *et al.,* 1989). Alternatively, prioritizing groups of people can set priorities, which involves first targeting certain groups such as women, children or rural populations. A third perspective is the health systems approach, which ranks health systems issues according to the importance of the problem. Examples of this are health financing, which would impact on the entire health system or strict enforcement of health regulations. A fourth means of prioritizing is to examine the potential health gain from different types of interventions that have broad effects such as improvements in water supply, sanitation, health education and food supplementation (Murray, 1990; Aron and Davis, 1993). The later approach was adopted in this work.

Source of the Disease

Having established the data for frequency of diseases related to water, sanitation and housing, the source of problem and type of intervention was determined. Table 4 shows the relative importance

of each preventive measure for a particular disease. Multiplying the annual cases of each disease with a relative score of each individual preventive measure and summing up the total scores obtained vertically, the relative importance of each intervention technique was estimated.

Table 4: Relative importance of intervention techniques (Listorti, 1990)

Diseases	Water Quality	Water Quantity	Excreta Disposal	Waste Disposal	Housing	Education
Malaria	0	1	0	1	1	2
Pneumonia	0	0	0	0	3	2
Diarrhea	2	3	2	1	1	3
Skin infection	0	3	0	0	2	3
Eye infection	0	3	0	0	2	3
Dysentery	2	1	3	0	1	3
Tuberculosis	0	0	0	0	3	2
Cholera	3	1	2	0	1	2
Hepatitis A	1	2	2	0	0	3
Typhoid	2	1	1	0	0	3
Worms	0	1	3	2	2	3
Schistosomiasis	1	1	3	1	0	3

Legend: 0: negligible or not applicable; 1: low; 2: medium; 3: high

Table 5 shows the scores obtained for Amana hospital in Ilala municipality as an example. The percentage score of each intervention technique for each municipal hospital was calculated and compared to the entire district. The results indicate that mortality records obtained from municipal hospitals are a fair representation of the entire district as evidence from scores of impacts. Statistical analysis revealed that in all districts, hygiene education is the major factor responsible for transmission of diseases accounting for 32~39%, which logically indicates that provision of health education will minimize the number of new cases. Other factors, which are the major contributors to the incidences of diseases, are inadequacy of water (15.6~22.5%) and poor housing environment (14.5%~24%). Water quantity is the second most important factor in Ilala and Kinondoni districts, followed by housing. In Kibaha and Temeke districts improvement of housing is the second intervention method followed by water quantity. Waste and excreta disposal, and water quality have the least impact on the reduction of total number of new morbidity cases accounting for only (3~8%).

The priorities for intervention techniques used to control morbidity rate is not necessarily the same as for mortality rate because fatality rates for various diseases are different. Fig. 2 compares the impact of the control measures on morbidity and mortality. The scores were obtained by average scores of all districts on each intervention method. The results show that mortality has higher scores on education and housing components, while morbidity is ahead of mortality in the remaining alternatives. In general, the ranking of the intervention methods is the same although there are differences in percentage of scores for intervention techniques for control of mortality and morbidity.

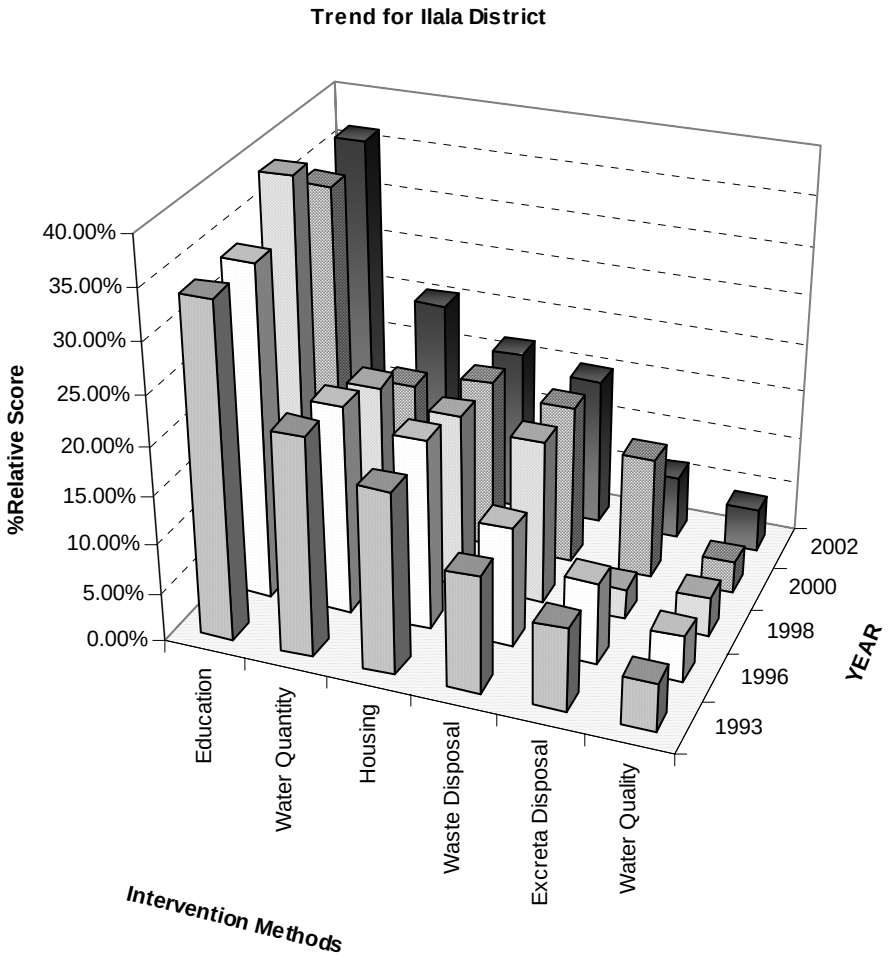


Fig. 1: Relative Importance of Intervention Techniques in Ilala District

Table 5: Relative Scores for Amana Hospital based on morbidity records

YEAR		*Water Quality*	*Water Quantity*	*Excreta Disposal*	*Waste Disposal*	*Housing*	*Education*
1998	SCORES	20726	104766	18011	92621	98806	215006
	Percentage	**3.77%**	**19.05%**	**3.28%**	**16.84%**	**17.97%**	**39.10%**
1999	SCORES	69972	217138	78899	124487	146466	371378
	Percentage	**6.94%**	**21.53%**	**7.82%**	**12.35%**	**14.53%**	**36.83%**
2000	SCORES	5461	27924	22381	29226	31337	62553
	Percentage	**3.05%**	**15.61%**	**12.51%**	**16.34%**	**17.52%**	**34.97%**
2002	SCORES	33380	140690	48129	115594	116931	261152
	Percentage	**4.66%**	**19.65%**	**6.72%**	**16.15%**	**16.33%**	**36.48%**
Average		**4.61%**	**18.96%**	**7.58%**	**15.42%**	**16.59%**	**36.85%**
Entire district (%)		**1.73%**	**19.90%**	**4.65%**	**16.63%**	**21.64%**	**35.46%**

Focal Point of Intervention

It should be noted that on improvement of a health both environmental and curative interventions measures are necessary. Hence during evaluation the importance of curative intervention should be assessed. The alternatives considered are shown in Table 6 and the column of the health care represents the curative intervention. The percentage of the importance of each intervention techniques for each district was calculated by multiplying the average annual morbidity cases for

each district by relative importance scores shown in Table 6. The results indicate that health care is the most important solution for Temeke, Ilala and Kibaha districts (Fig. 3). The second most important solution in these districts is health education. In Kinondoni district education is ahead of health care as the most important solution to reducing morbidity rate. In all districts improvement of housing, water supply, waste disposal and excreta disposal follow in that order.

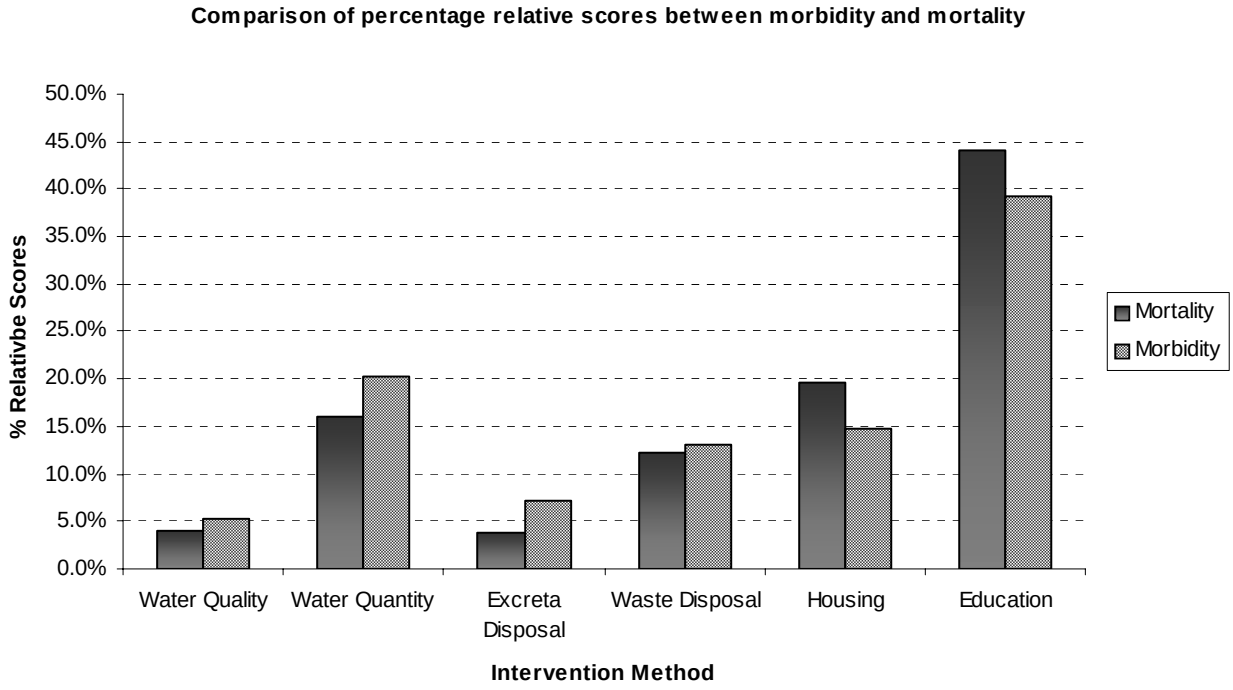


Fig. 2: Comparison of control measures by using mortality and morbidity

Table 6: Relative importance of the focal intervention points (Listorti, 1990)

Diseases	Water Supply	Excreta Disposal	Waste Disposal	Housing	Health Care	Education
Malaria	1	0	1	2	3	2
Pneumonia	0	0	0	2	3	2
Diarrhea	2	2	2	2	2	3
Tuberculosis	0	0	0	3	2	2
Tuberculosis	0	0	0	3	2	2
Dysentery	1	3	3	1	0	3
Worms	1	2	3	2	0	3
Schistosomiasis	0	3	3	1	0	3
Hepatitis A	1	3	3	0	0	3
Cholera	3	2	2	1	3	2
Skin& Eye infection	3	0	0	2	1	3

Legend: 0: negligible or not applicable; 1: low; 2: medium; 3: high

CONCLUSIONS

From the results obtained in this work, the following conclusions are made:

1. Lack of hygiene education has significantly contributed to the prevalence of communicable diseases in the area. Water quantity and housing have significant contributions as well, but water quality has the least effect on the number of morbidity and mortality cases.

2. Improvement of health care services and hygiene education has a great role on combating environment related diseases. Provision of adequate quantity of the water is the next intervention technique that may be used to reduce the total number of morbidity and mortality cases.

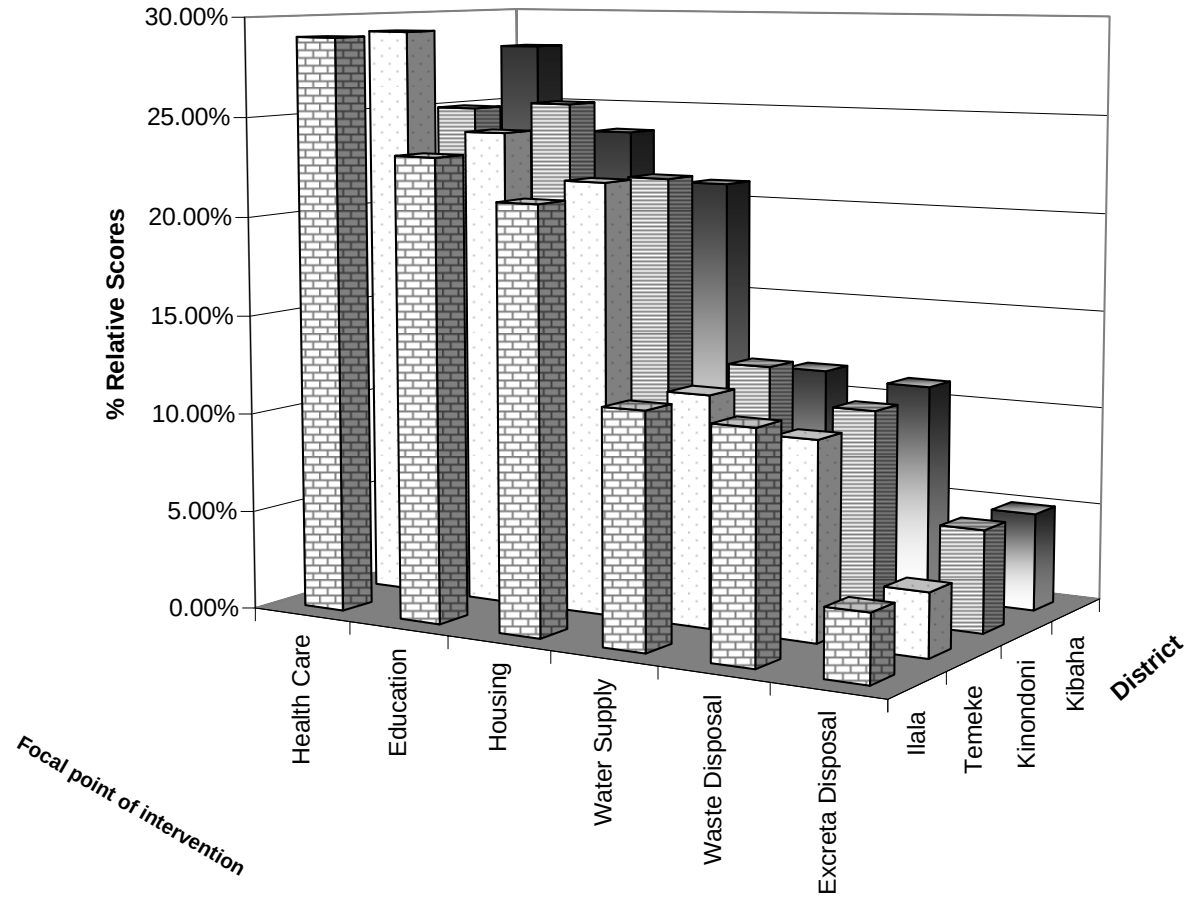


Fig. 3: Relative importance of focal points of interventions.

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