DYNAMICS OF CHOLERA IN ZIMBABWE AND AN ASSESSMENT OF INFLUENCE OF SYSTEM OF THE INTERNATIONAL HUMANITARIAN AID ON REDUCTION OF CASES DURING THE 2008—2009 CHOLERA EPIDEMIC

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The article assess the cholera dynamics in Zimbabwe, environmental factors contributing to the cholera crises and the 2008—2009 cholera epidemic; humanitarian aid strategies and how they reduced the cholera case fatality rate from approximately 4.4 in January 2009 to 0 in June 2009.

Key words: cholera, case fatality rate, *Vibrio cholerae*, contamination, sanitation, water quality

Cholera is an infection of the small intestine by some strains of the bacterium *Vibrio cholera* [1]. In Zimbabwe, cholera is endemic with occasional outbreaks occurring since 1992. The classic symptom is large amounts of watery diarrhea that lasts a few days [2]. Other vibrios can sometimes cause isolated outbreaks of more slight diarrhea whereas others — the vast majority — is free living and do not cause any illness [3]. Copepods and chironomids are natural reservoirs of *V. cholerae*, they are dispersed by migratory water birds, hence distributing the bacteria between water bodies within and between continents.

Common sources of infection with cholera include:

— municipal water supplies (when water quality is below standards);

— ice made from municipal water;

— foods and drinks sold by street vendors;

— vegetables grown with water containing human wastes;

— raw or undercooked fish and seafood caught in waters polluted with sewage(and at times oysters);

— Occasionally standing or swimming in contaminated water (e.g. Sea) when you have open wound.

Cholera has its origins in the Indian sub-continent; it has been prevalent in the Ganges delta since ancient times [4]. The disease first spread by trade routes (land and sea) to Russia in 1817, later to the rest of Europe, and from Europe to North America and the rest of the world [4]. According to National data on supervision reported to World Health Organization (WHO), the cholera pandemic reached Africa, in 1970, and became endemic in many African countries [5]. The first recorded case of cholera in Zimbabwe was in 1972, along the Nyamapanda Border, Mashonaland East Province [6]. Cholera in Zimbabwe increased its frequency from 1992/1993, 2048 and 5385 respectively [7].

As from August 2008 to May 2009 Zimbabwe experienced the worst cholera epidemic described as the worst in Africa with a cumulative cholera case load of 98,592 by July 2009. The number of cumulative deaths was 4,288, with 2,631 community deaths in Mid-July [8]. On the 20th of August 2008, an outbreak of 118 cases was declared at St. Mary's and Zengeza wards of Chitungwiza, a large urban centre on the outskirts of Harare

[9]. Vibrio Cholerae El Tor 01 was isolated from 18 (30%) of the 59 specimens submitted for examination, thus supporting the clinical evidence for an outbreak [10], the overall case fatality rate was more than 4% but reached up to 20—30% in remote areas (Table 1).

Table 1

Trend of cholera incindence in Zimbabwe from 1992—2009*

Year	Cases	Deaths	Cfr	Year	Cases	Deaths	Cfr
1992	2 048	57	2,8	2001	649	13	2
1993	5 385	323	6	2002	3 684	354	9,6
1994	3	0	0	2003	879	19	2,2
1995	0	0	0	2004	125	10	8
1996	0	0	0	2005	231	15	6,5
1997	1	0	0	2006	789	63	8
1998	883	46	5,2	2007	65	4	6,2
1999	4 081	240	5,9	2008	31 921	1 596	5
2000	1 911	71	3,7	2009	66 664	2 667	4

* http://www.who.int/cholera/countries/ZimbabweCountryProfileOct2009.pdf

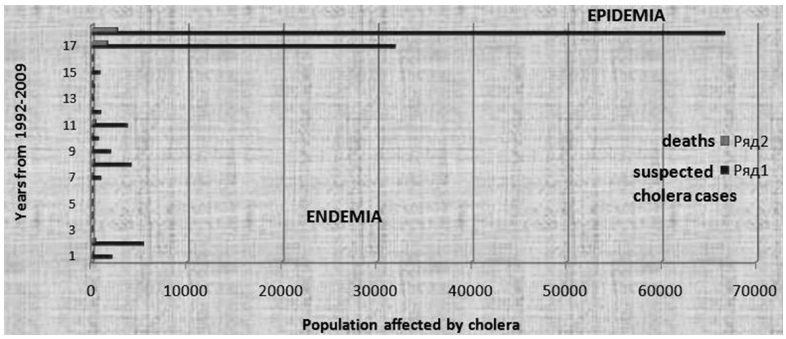

Fig. 1. Epidemiology of cholera in Zimbabwe from 1992—2009

Shown in figures 1 and 2, Cholera, cases were first reported in 1992, with a high Case Fatality Rate of 2, 8%, which is higher than the WHO, cholera benchmark. From 1994—1997, there were no recorded cholera cases, CFC was 0.Cholera reappeared in 1998 with above WHO cholera CFC benchmark of 1 and has been endemic in the country up until to date. 2008—2009 was seen with an increase of cholera cases and deaths, this period was pronounced an epidemic as more than 100 000 cholera cases and 5000 deaths were recorded.

Reasons why cholera has become endemic in Zimbabwe

Economic crisis

From the 1990s Zimbabwe experienced hyper inflation. The peak month of hyperinflation occurred in mid-November 2008 with a rate estimated at 79,600,000,000% per month [11]. The economic crises in Zimbabwe lead to a lag in maintenance of infrastructure i.e. water pipes, water system plants etc and breakdown of services especially the Health system. Hospital staff was constantly protesting for pay rise, hospital equipment was continuously in shortage including medicine.

2001	112.1%
2002	198.93%
2003	598.75%
2004	132.75%
2005	585.84%
2006	1,281.11%
2007	66,212.3%
2008 July	231,150,888.87%
2008 Aug	471,000,000,000%
2008 Sept	3,840,000,000,000,000,000%
2008 Nov	89,700,000,000,000,000,000,000%

ZIMBABWE INFLATION

Fig. 2. Inflation in Zimbabwe from 2001—2008

Source: Newsday Zimbabwe; 2014 April

High rural to urban migration

After independence the black population started to influx into urban areas for better life , which resulted in an increase in the demand for domestic water. The municipal authorities in the 2000-s were challenged in maintaining large populations in the urban areas. In high density suburbs where rents and rates are cheaper were over populated and still are. A toilet which is supposed to carter for 4 or 5 would support 10 or more people. Sewage and water pipe bursts are common in such areas such as Mbare a high density suburb in Harare.

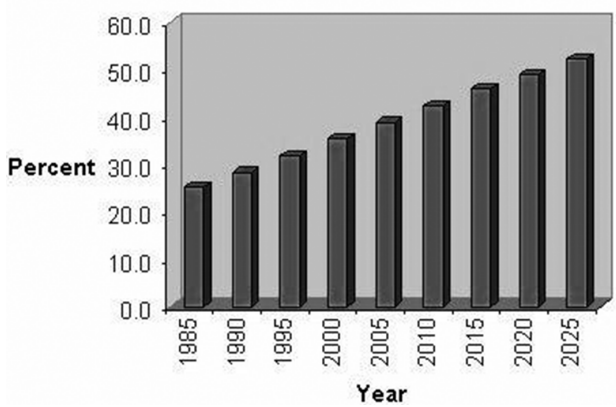

Fig. 3. Rate of urbanization in Zimbabwe

Source: Newsday Zimbabwe, 2013

Non functional water plants

Zimbabwe's urban water and sanitation services development was of high service levels and standards and universal access for all. The economic meltdown in the last decade has led to the deterioration of services leading to many water supply and sewerage infrastructure going beyond the state of repair The sewer systems at many local authorities are in a state of disrepair due to the ageing infrastructure The maintenance Of water system plants include maintenance of sewer lines, pumps and also pipe replacement. For

a long period of time Zimbabwe has had inadequate operation and maintenance of the existing Water sanitation systems, by 2008 they were operating well below their installed capacities. Water supply systems in urban areas have been operating with substandard equipment including some of their critical installations like intake works, pump stations and treatment plants, e.g. there were no provisions for standby, and breakdown of a single piece of equipment would leave the entire city's population with no water supply. Almost all water treatment plants had been operating without sufficient filter sand, proper flow measurement devices and chemical dosing equipment. Water treatment chemicals had also became in adequate; therefore the population was being supplied with water of substandard quality (Fig. 3).

Zimbabwe National Water Authority (ZINWA) oversees water supply and distribution to the industrial, agriculture, and private sectors. it is the main authority which oversees the safe supply of water in the urban areas and rural areas. With economic challenges in the country ZINWA was not able to deliver its services adequately. Its inadequacy to deliver services lead to continuous water pipe bursts, partially treated water due to shortages of chemicals. Some boreholes where contaminated due to leaks of sewage pipes there by contaminating underground water which is the source of borehole water.

Contaminated rivers and dams

Most rivers in Zimbabwe are contaminated as partially treated domestic and industrial effluent is discharged into rivers. The most polluted lake is Lake Chivero, where the city of Harare draws water for domestic use, with shortage of chemicals the water is not treated to standard and at times has a color and a foul smell. From the same river, fish was caught and sold to the public, and fish is a reservoir of the Vibrio Cholerae.

Electricity power cuts

For the past ten years Zimbabwe has been rationing its electricity supply to the population. In recent years the rationing began in the industry. At times the water plants had no electricity; hence water is not pumped to residential areas, when the population got the water due to power cuts, most by passed the boiling of water before use, putting them at risk of cholera.

Table 2

Trend in water and sanitation in Zimbabwe from 1990—2012 (%)

Year	Population using improved water			Population using improved sanitation facilities		
	Rural	Urban	Total	Rural	Urban	Total
2012	69	97	80	32	52	40
2010	69	98	80	33	52	40
2005	69	98	80	33	52	40
2000	70	99	80	34	53	40
1995	70	99	79	35	53	41
1990	71	100	79	35	54	41

Source: www.wssinfo.org/data-estimates/tables

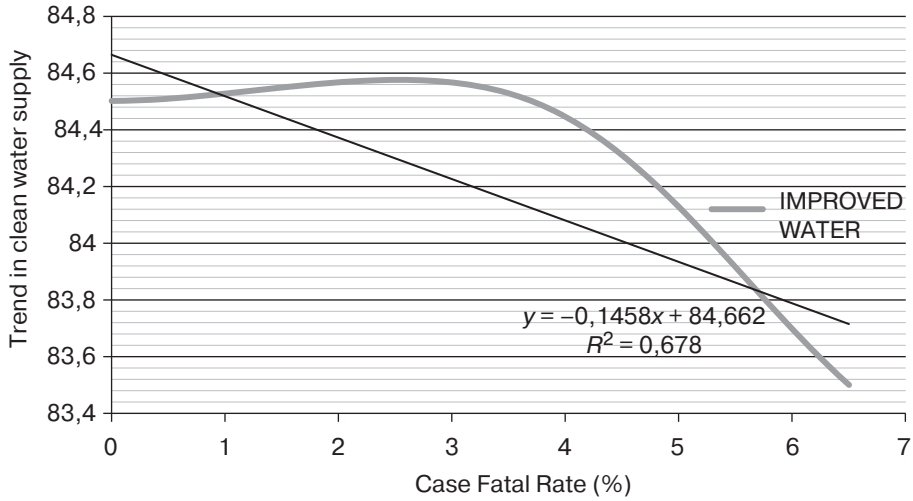

Fig. 4. Relationship of quality of water and cholera fatality rate from 1995—2005

Table 2 shows how the quality of water and sanitation has deteriorated over the years. Figure 4 shows the relationship of clean water supply and cholera case fatality rate. As quality of water decreased, the case fatality rate increased. This strongly suggests that the quality of water is the major effect why cholera is endemic in Zimbabwe.

The humanitarian aid provides the financial and logistic support to the needing people. It is, as a rule, short-term help until long-term help from the government and other establishments replace it. The humanitarian aid is response to humanitarian crises, including natural disasters and man — made catastrophes.

Humanity — The principle of humanity means that humankind should be treated humanely in all circumstances by saving lives and alleviating suffering, while ensuring respect for the individual. It is the fundamental principle of humanitarian response [12].

Humanitarian Imperative It states the obligation of the international community "to provide humanitarian assistance wherever it is needed [13].

Impartiality-humanitarian assistance must be fair, without basis on nationality, race, religion, or political point of view. It must be based on need alone.

Neutrality — working without giving to any party in case of any armed conflict or other disputes

The major humanitarian organizations in Zimbabwe.

1. CARE International In Zimbabwe(CARE), International NGO.
2. Catholic Agency for Overseas Development(CAFOD), International NGO.
3. International Committee of the Red Cross(ICRC), International NGO.
4. OXFAM America(OXFAMUSA), International NGO.
5. UNICEF, UNESCO, FAO etc.
6. Medecins Sans Frontiers (Doctors Without Borders) Operational Centre Amsterdam (MSF OCA), International NGO.
7. Mercy Corps(MERCYCORPS), International NGO.

The activities done by the humanitarian organizations against cholera in Zimbabwe in 2008—2009:

— social mobilization, health and hygiene advance and distribution of IEC;

— chemicals for water processing;
— safe water supply;
— monitoring quality of water;
— ecological management;
— sanitation and hygiene programs.

Strategy and interventions used for safe water supply included:
— rehabilitation of boreholes;
— drilling of boreholes;
— water treatment at the household level (chlorine tablets);
— water bacteriological and chemical monitoring.

Sanitation strategies included:
— rehabilitation of public toilets or latrines;
— construction of alternative systems of sanitation.

Figure 5 shows the cumulative cholera cases from January 2008 to March 2009 and cases in every province within this period. The highest case fatalities where in the capital city, Harare followed by the eastern border town Mutare.

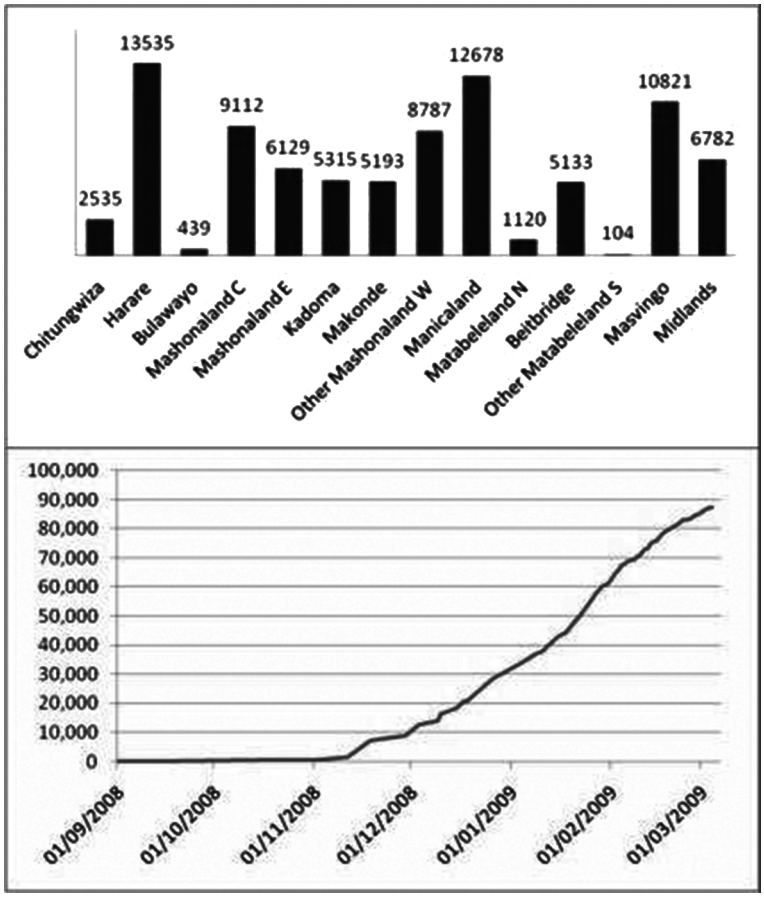

Fig. 5. Cholera epidemia 2008—2009 in Zimbabwe

Source: United Nations Office for the Coordination of Humanitarian Affairs, the World Health Organisation, the International Federation of Red Cross and Red Crescent Societies.

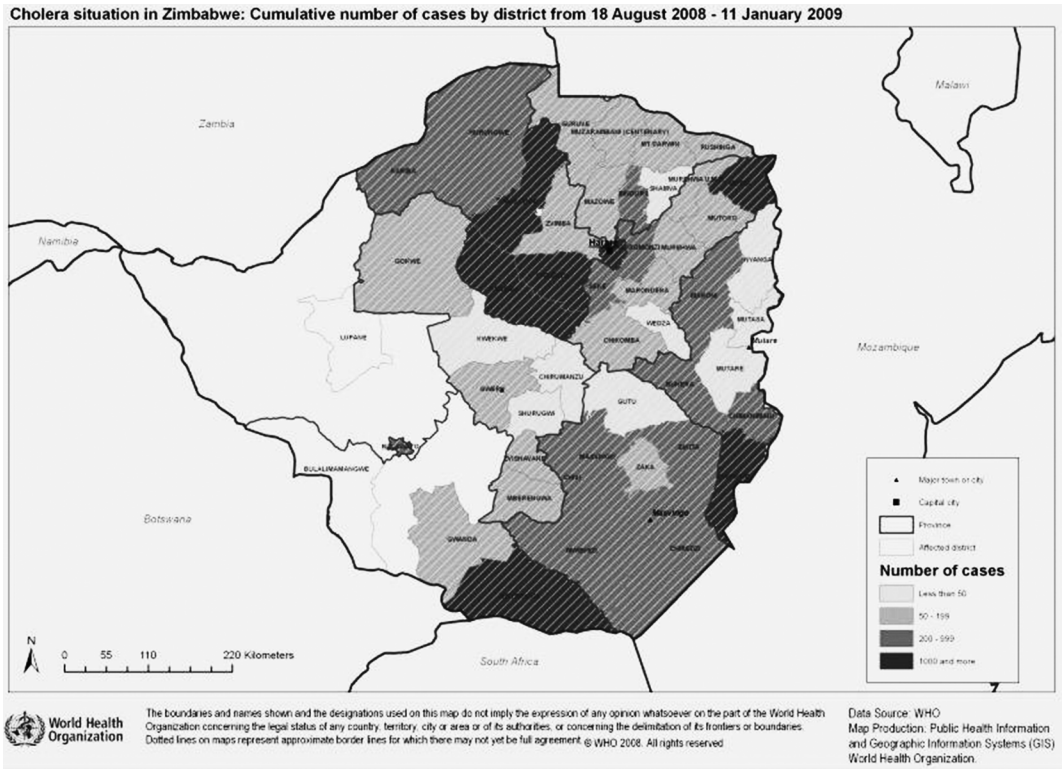

Fig. 6. Cholera fatality before humanitarian aid intervention

Source: WHO, Zimbabwe cholera reports. January 2009.

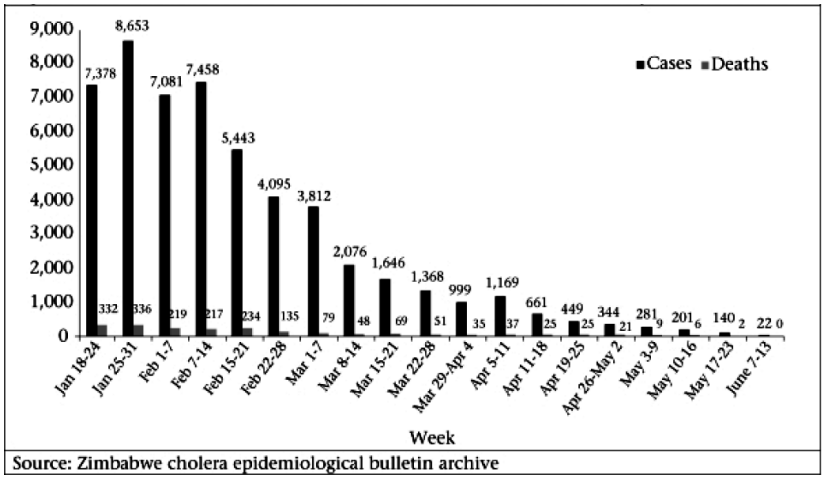

Fig. 7. Cholera fatality after arrival of humanitarian aid

Source: WHO, Zimbabwe cholera epidemiological bulletin archive.

Figure 6 shows the fatality rate of cholera in different parts of Zimbabwe. The eastern part of the country was most affected and border regions. The frequency of the disease was most in the regions denoted by the dark color; north part, which include Harare, the

border towns; in the south Beitbridge, in the east, Mutare, in the north Nyamapanda. In border towns sanitation is usually low as travelers wait for exit for long hours or even days, toilets are few to carter for travelers.

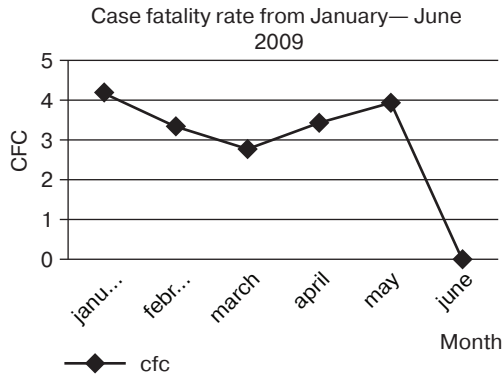

Fig. 8. Graph showing trend in case fatality rate with humanitarian aid

The 2008—2009 cholera epidemic was severe with cumulative new cases of cholera every week, the government reported the epidemic and humanitarian aid community intervened; governments, nongovernmental organizations, they provided cash, medical supplies and personnel. Figure 7 and 6 show how the case fatality rate began to decrease in January 2009. This was after humanitarian aid intervention in December, despite the rainy season (January to March)where it is expected that the cholera cases rise, the cholera case fatalities continued to decrease until June, where no new cases were reported, which marked the end of the cholera epidemic (Fig. 8).

Table 3

Case fatality rate from 2008—2012

Year	Case fatality rate
2008	5
2009	4
2010	2,21
2011	0,16
2012	4,4

Table 3 shows cholera case fatality rate from 2008 to 2012 the CFC Hs been fluctuating but with no serious cholera outbreaks. In 2011 the disease was even lower than the WHO cholera benchmark. Where as in 2012 the CFC was high but with no outbreak, a few where infected but comparing with the number of deaths the CFC rose but there was no cholera outbreak.

Discussion

Cholera in Zimbabwe is endemic. This is because of the poor administration of those in the water authority, though not solely their problem, but the economic crises prevailing in the country. The influx of the population in the urban areas especially in Harare, challenged ZINWA and other water authorities to maintain the water and sewage systems,

which include; waste water management, water purification, and even to replace old ones, the economic crisis was the major factor. Due to this constraint the water and sanitation from 1990 has been decreasing, making people vulnerable to all water-borne diseases such as cholera. 2008—2009 the country experienced a large cholera outbreak which killed more than 80 00 people. The cholera epidemic began in August, the government tried to put it under control but failed. The cumulative cases were very high. In figure 5 the graph shows how the cholera cases rose exponentially. The humanitarian community intervened in December 2008. They implemented their programs, which included drilling of boreholes, medical supplies, chlorine pills, campaigns etc. The programs helped to slow down the cumulative cholera cases. The number of new cases and deaths began to drop. Figure 7 and 8 show how the case fatalities began to drop in January 2009, even at the pick of the rainy season (January—March), the case fatality rate continued to decrease. The humanitarian aid community together with the Zimbabwe ministry of health, managed to bring the cholera epidemic under control in June 2009, with a case fatality rate of 0%.

After the epidemic there have not been major cholera outbreaks in Zimbabwe. Figure 9 shows CFCs from 2010 to 2012. Cholera remains endemic in Zimbabwe, with the CFC fluctuating, the cholera cases are very few but compared to fatalities they give a high cfc, for example in 2012, 20 people were recorded to be infected but only 1 died , giving a high CFC of approximately 4.

Conclusion

Water and sanitation in a country are vital, and they should be maintained in order to guard against risk of water borne diseases. The government of Zimbabwe should improvise on how to maintain water and sanitation infrastructure to provide the population with uncontaminated water. The policy and town planners should have a forecast plan on how to accommodate the increasing population in the cities, by maintaining water and sewer pipes and increasing their numbers to accommodate the growing population in urban areas. The humanitarian aid with its interventions and policies managed to control the cholera epidemic within almost a year. This is due to their delayed intervention, 3 months after the outbreak had begun. Even with their delayed intervention it is evident that their strategies helped decrease the cholera case fatality, bringing it to 0% within 6 months, from January to June. The government of Zimbabwe must follow the strategies the humanitarian community used in response and mitigation of the cholera outbreak. This will help the country to control future epidemics in time and even without the humanitarian aid, making the country self sustainable. With the cholera under control, there are still reports on cholera cases which are not severe, in these instances maybe the affected areas, the government through the ministry of health have not implemented strategies for controlling cholera. If there is no improvement of sanitation and water quality, proper mitigation and response to cholera cases the country will have another epidemia.

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ДИНАМИКА ХОЛЕРЫ В ЗИМБАБВЕ И ОЦЕНКИ ВЛИЯНИЯ СИСТЕМЫ МЕЖДУНАРОДНОЙ ГУМАНИТАРНОЙ ПОМОЩИ НА СОКРАЩЕНИИ СЛУЧАЕВ ВО ВРЕМЯ ЭПИДЕМИИ ХОЛЕРЫ 2008—2009 гг.

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Дана оценка динамики холеры в Зимбабве, факторов окружающей среды, способствующих кризисам холеры и эпидемии холеры 2008—2009 гг. Рассмотрены стратегии гуманитарной помощи и их роль в уменьшении коэффициента смертности от холеры (от 4.4 в январе 2009 до 0 в июне 2009).

Ключевые слова: холера, летальность, холерный вибрион, загрязнение, санитария, качество воды