Cholera in Zimbabwe: Epidemiological Bulletin number 1
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Photos: Paul Garwood/WHO

Prepared by the
World Health Organization Cholera Outbreak Response Team
Harare, Zimbabwe

Please send any comments and feedback to Cholera_Taskforce@zw.afro.who.int .

Foreword

This is the first epidemiological bulletin to be issued since the August, 2008 onset of a countrywide cholera epidemic in Zimbabwe. Further bulletins are planned with a weekly frequency, coinciding with the end of each epidemiological week (Sunday to Saturday). In addition, daily short epidemiological updates are envisaged: these will eventually integrate and supplement the current OCHA daily cumulative caseload updates.

This epidemiological bulletin aims to provide an overview of the epidemic throughout Zimbabwe, including province by province data, so as to inform and improve the ongoing public health response. It also provides guidance to agencies on issues relating to data collection, analysis and interpretation, and suggests operational strategies on the basis of epidemiological patterns so far.

Readers will find that, for most provinces, the bulletin relies on incomplete and somewhat outdated data, with the last date of reporting being between 2 and 21 days before its date of publication. The WHO Cholera Outbreak Response Team is working hard to improve surveillance. The challenges are daunting, due to the countrywide nature of the epidemic (56 districts affected; more than 100 cholera treatment centres or units estimated to be operating); human resource and material shortages at province and district level; communications problems; and the fulminant nature of cholera outbreaks.

So as to improve surveillance, agencies directly engaged in case management are strongly encouraged to share daily data with the respective District Health Teams: this will ensure consistency and reliability of data. While focus must be on strengthening Zimbabwe's surveillance system, the WHO Cholera Outbreak Response Team greatly welcomes feedback and data provided by individual agencies, and will take these into account when producing further bulletins. Given the scope of this epidemic, errors and omissions are almost inevitable: we will be grateful for any information that helps to rectify these.

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1. Countrywide surveillance data

1.1. Overview of the epidemic

A countrywide epidemic of cholera has been occurring in Zimbabwe since August 2008. The epidemic currently affects 9 out of the 10 provinces in the country, and at least 57 (67.9%) out of a total of 84 rural and urban districts (see the Annexes and Figure 1). As of 15 December 2008, a total of 18 413 suspected cases had been reported to the World Health Organization (WHO), by way of the Ministry of Health and Child Welfare (MoHCW)'s surveillance department. Table 3 in the Annexes details the districts affected and the dates on which the first cases were reported.

In all provinces affected, *Vibrio cholerae* has been isolated from suspected cases. Two serotypes have been found: *Ogawa* in Harare urban and Beitbridge city, Matabeleland South; and both *Ogawa* and *Inaba* in Chegutu and Makonde districts, Mashonaland West. Drug sensitivity testing was carried out in some of the affected provinces, but to date, results of these investigations have not been consolidated. Tests on Mudzi samples are currently being carried out at the National Reference Laboratory.

1.2. Chronological trend

1.2.1. Timeline

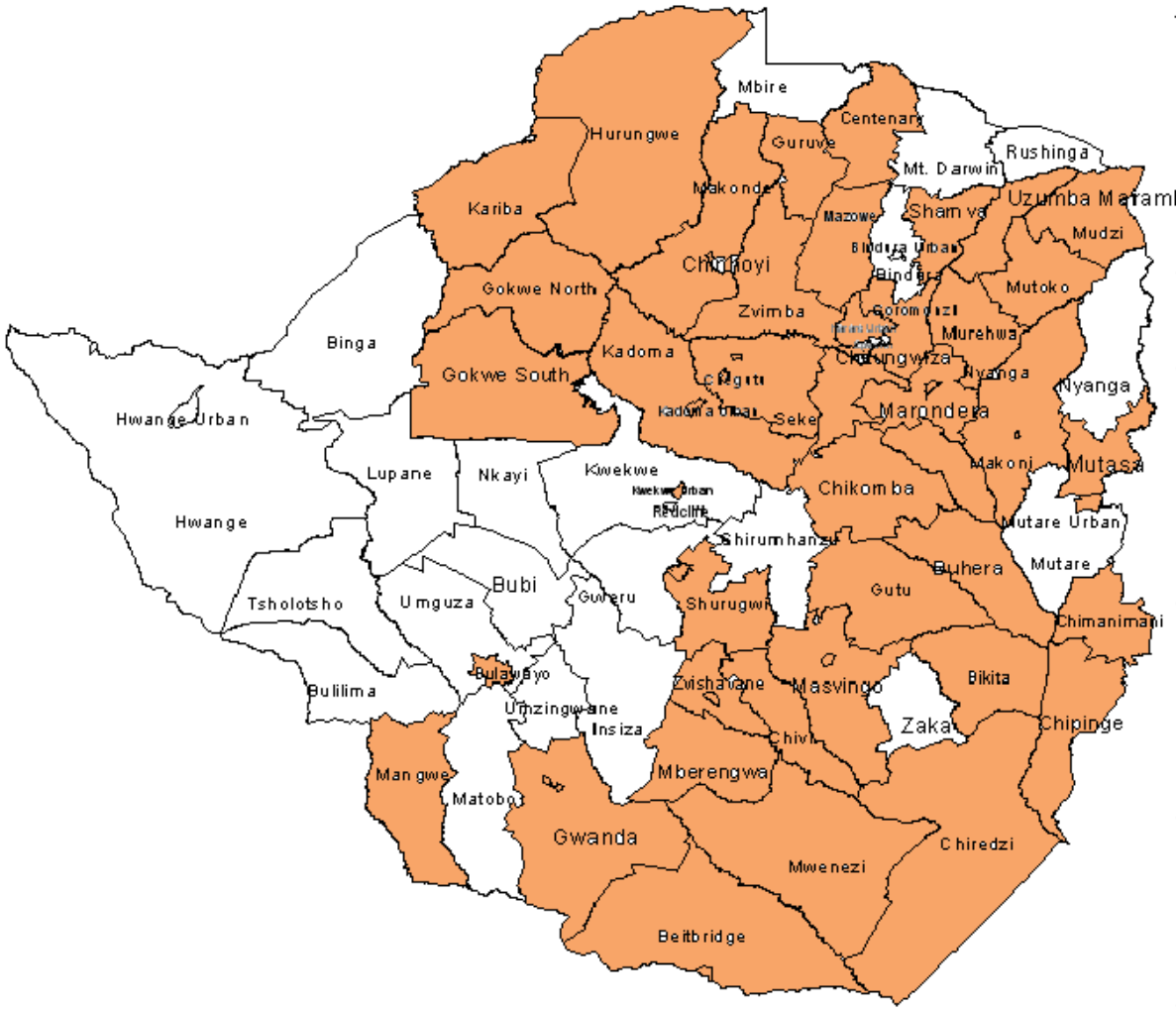
Cholera epidemics have been occurring every year in Zimbabwe since 1998. Between **January and April 2008**, a relatively small epidemic occurred in 16 districts of Mashonaland East, Mashonaland Central, Mashonaland West, Harare and Manicaland, with <2000 cases recorded in total.

Cholera resurfaced on **20 August** in Chitungwiza city, just south of Harare. There is no evidence that the two epidemics are independent: in the present context of low access to health care, low-level transmission could have gone on undetected.

During **September**, cholera cases began to be reported in Makonde and Chinhoyi urban districts (Mashonaland West). By the end of **October**, outbreaks were reported two more districts of the same province (Kariba rural and urban districts); two districts of Mashonaland East (Mudzi and Murehwa); and, critically, in Harare city, where explosive outbreaks began, centered around Budiriro suburb, in the south west. As of the end of October, however, only 3 provinces and 8 districts were affected.

Between **1 and 15 November**, the epidemic swept through Zimbabwe, affecting 6 more provinces and 46 more districts. After that time, the expansion appears to have slowed down, with only 3 further districts reporting outbreaks. However, this may partly be attributable to inadequate surveillance.

Figure 1. Map of Zimbabwe, with affected districts and the date on which the first case was reported in each district.



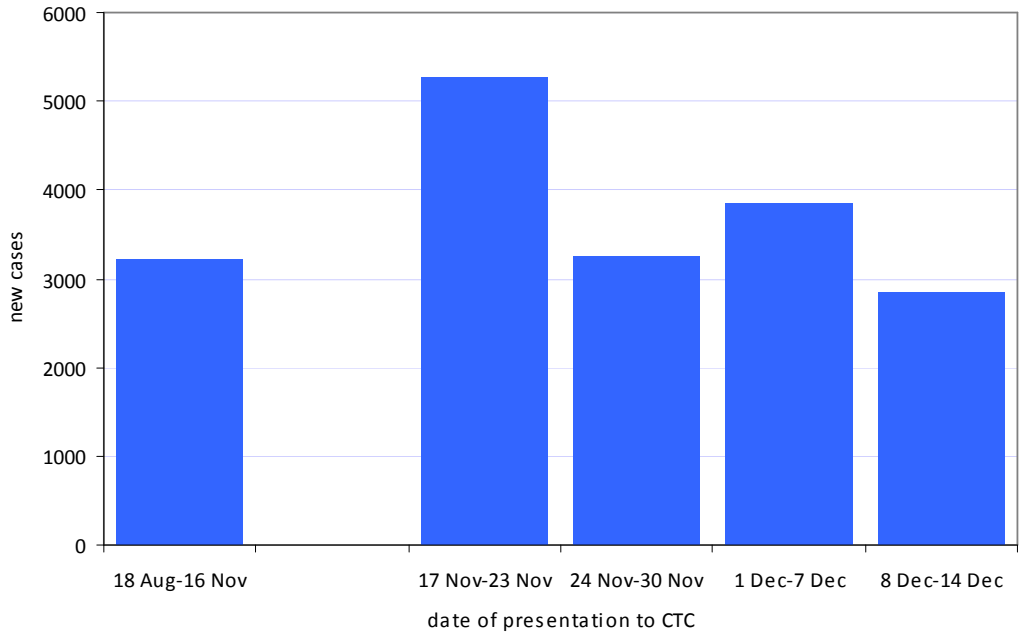
Province	District	Date of index case
Harare	Chitungwiza	20 August
	Epworth	December?
	Harare Rural	(with Harare Urban)
	Harare Urban	13 October
Bulawayo	Bulawayo	14 November
Mashonaland West	Chegutu	(with Chegutu urban)
	Chegutu Urban	23 November
	Chinhoyi	(with Makonde)
	Chirundu	12 December
	Hurungwe	09 November
	Kadoma Urban	14 November
	Kariba Rural	October
	Kariba Urban (Mahombakombe)	October
	Makonde	21 September
	Zvimba	?
Mashonaland Central	Centenary	12 November
	Guruve	?
	Mazowe	?
	Shamva	?
Mashonaland East	Chikomba	15 November
	Goromonzi	03 November
	Hwedza	10 November
	Marondera	(with Marondera Urb.)
	Marondera Urban	13 November
	Mudzi	06 October
	Murehwa	25 October
	Mutoko	05 November
	Seke	05 November
	UMP	09 November
Midlands	Gokwe North	?
	Gokwe South	?
	Gweru Urban	17 November
	Kwekwe Urban	19 November
	Mberengwa	14 November
	Shurugwi Rural	(with Shurugwi Urban)
	Shurugwi Urban	11 November
	Zvishavane Rural	(with Zvishavane Urb.)
	Zvishavane Urban	
Masvingo	Bikita	?
	Chiredzi Rural	(with Chiredzi Urban)
	Chiredzi Urban	16 November
	Chivi	?
	Gutu	?
	Masvingo Rural	(with Masvingo Urban)
	Masvingo Urban	13 November
	Mwenezi	17 November
Manicaland	Buhera	?
	Chimanimani	13 November
	Chipinge	07 November
	Makoni	02 November
	Mutare Urban	?

1.2.2. Countrywide epidemiological trend

Constructing an accurate epidemiological curve for Zimbabwe as a whole is difficult, due to the varying delay with which data from the different districts are updated (see Frequently Asked Questions), and the infrequent nature of updates before mid-November. Furthermore, each site-specific outbreak is best analysed separately.

However, a crude country-wide epidemiological curve (Figure 2) suggests that the peak of the epidemic was between 17 and 23 November, and that incidence is more or less stable since then.

Figure 2. New cholera cases by time period, Zimbabwe, 18 Aug-14 Dec 2008.



1.3. Case-fatality ratios

Throughout Zimbabwe, cholera case-fatality ratios (CFR, or the proportion of cases that die of the disease) are unacceptably high, and considerably in excess of the <1% target (see Table 4 in the Annexes). The countrywide CFR is currently **5.3%**. This may be an underestimation, considering that it is calculated based on all cases (the denominator should instead be all cases admitted: see Frequently Asked Questions). CFRs of 15-25% are not uncommon, particularly in the more isolated parts of the country.

1.3.1. Case-fatality ratio as a function of time since beginning of the outbreak

There is evidence from some sites that CFR markedly improves with time (Table 1), though generally it remains above the target threshold.

Table 1. Case-fatality ratio (%), by time after the onset of the first outbreak wave, in selected CTCs where long-term line listings are available.

Site	1-7 days into outbreak	8-14 days into outbreak
Beitbridge	11.8	2.1
Chitungwiza	10.9	3.2
Mudzi	2.8	1.5

Clearly, most mortality occurs in the early days of each outbreak: the most vulnerable patients fall sick first, and health structures are more likely to be overwhelmed.

1.3.2. Delay in treatment-seeking

Delays in treatment seeking are commonly reported as a reason for the high CFRs noted. In the upcoming bulletin, we will provide an analysis of time to treatment-seeking, based on the considerable number of line listing databases that have now reached us.

1.3.3. The possible role of HIV infection

As of 2005-2006 (date of the last Demographic and Health Survey), Zimbabwe's HIV prevalence was 18% in the age group 15-54 years, which is also the most affected by cholera. HIV infection can plausibly be assumed to increase the risk of infection, the risk of progression to symptomatic disease, and case-fatality from cholera, due to immune suppression. These increased risks, taken together, could mean a higher prevalence of HIV-positive persons among cholera cases and cholera deaths especially, i.e. a self-selection of HIV-positives among cholera victims. This alone might partly explain the high CFRs noted countrywide. It would also have implications for nosocomial infection control within CTCs: handling of medical waste, sharps etc. should adhere to the highest standards.

1.4. Community deaths

Deaths occurring outside of the treatment centres are normally detected by community health workers, but the extent to which these deaths are indeed being captured is unknown. Data should therefore be treated with caution.

Community deaths speak to the issue of coverage, namely the proportion of cases that are actually treated: a low coverage can potentially have a far greater negative impact than a high CFR. Available data (Table 2) show that between 20% and 50% of deaths, depending on the province, occur in the community. While these figures cannot immediately be translated into coverage, they nonetheless suggest that in all provinces there are considerable problems with access to health care, and/or treatment seeking decisions.

Table 2. Details on the proportion of deaths that occur outside cholera treatment centres, by province.

Province	Deaths within treatment centres	Deaths outside treatment centres	Proportion of deaths that occur outside treatment centres (%)
Bulawayo	11	7	38.9
Mashonaland West	147	36	19.7
Mashonaland Central	163	40	19.7
Mashonaland East	98	97	49.7
Midlands	28	25	47.2
Masvingo	63	45	41.7
Manicaland	129	105	44.9
Matabeleland South	91	22	19.5

The proportion of deaths occurring outside treatment centres, per week, could in any site be used as a useful proxy indicator of coverage: the target should be 0%.

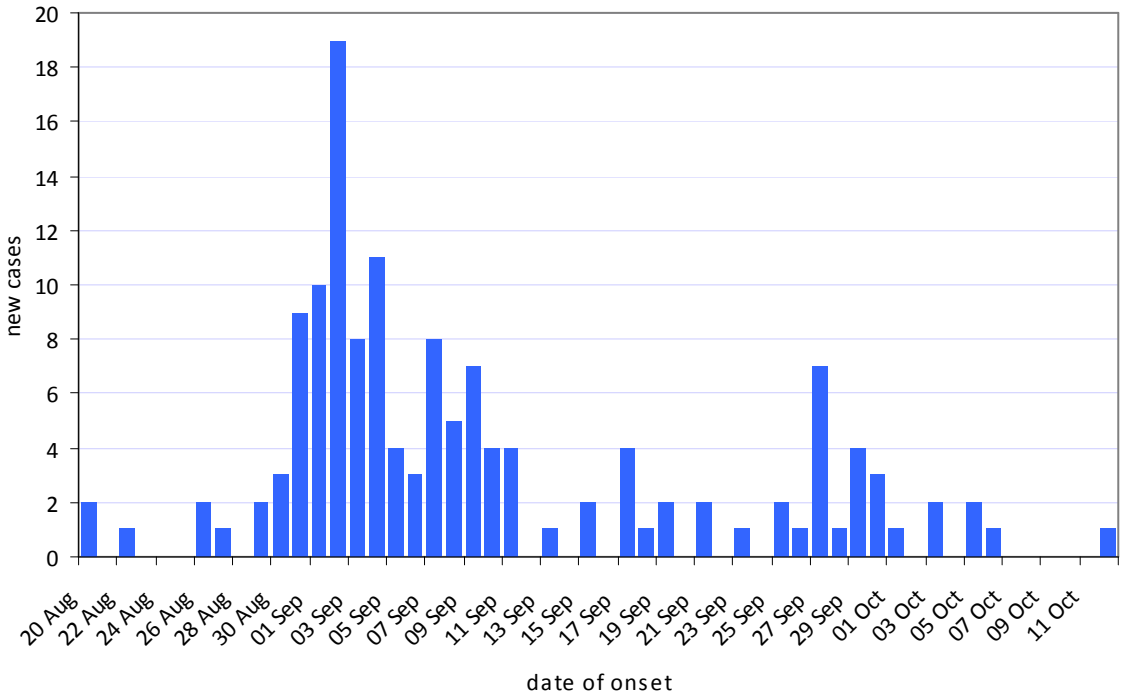
2. Surveillance findings by province

2.1. Harare

2.1.1. Chitungwiza city

On 20 August 2008, an outbreak started in St Mary's and Zengeza sections of Chitungwiza city (population 320 000), about 25 Km south of Harare city centre. The outbreak was well managed, and high-quality data were collected. Altogether 118 cases were treated; among 59 for which laboratory confirmation was sought, 18 (30.5%) were positive. The outbreak lasted 4 weeks (Figure 3).

Figure 3. New cholera cases per day, Chitungwiza city, 20 August-12 October 2008.



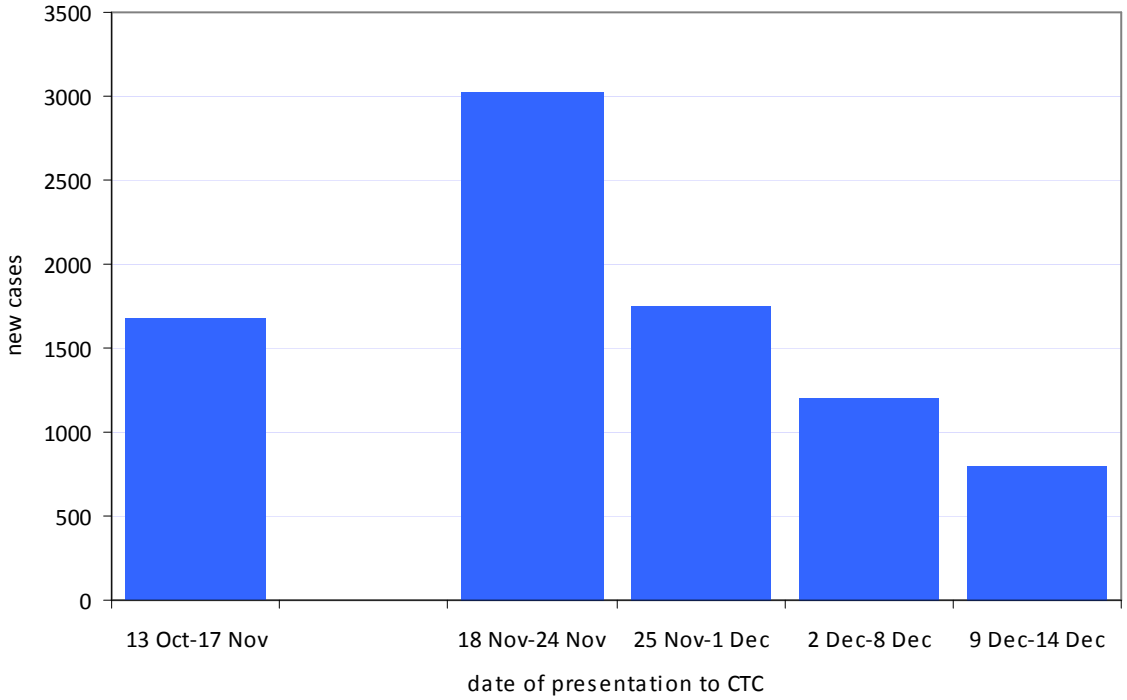
A second outbreak in Chitungwiza city began at some point in November in wards L, M and N. 433 cases had been reported as of 12 December, with 86 deaths (CFR **19.9%**). No further data are available, although daily summaries suggest that the outbreak is still ongoing, with about 10-15 new cases per day.

2.1.2. Harare city

Harare city accounts for 8454/18 413 (45.9%) of suspected cholera cases recorded to date throughout Zimbabwe. Here, outbreaks started on 13 October, though a vast increase in incidence occurred in mid-November.

During the last two weeks, the outbreak appears to be subsiding slowly, though daily incidence is still very elevated (about 100 new cases). WHO is currently reconstructing the chronological and spatial spread of the outbreak, based on data from Budiriro Polyclinic and Beatrice Road Infectious Diseases Hospital (BRIDH), the two CTCs in Harare city. Data for the last week are shown in the Annexes, Figure 13. These suggest that there is for now no further significant propagation to previously unaffected suburbs.

Figure 4. New cholera cases by time period, Harare city (Budiriro and BRIDH CTCs), 3 Oct-14 Dec.



The fact that only two CTCs exist within Harare, and that both are in the southwest, may lead to observation bias. While it is likely that a large outbreak occurring within other Harare suburbs would be detected, the present setup does not ensure timely alerts, as it would be unlikely to capture small clusters of cases occurring far from Budiriro suburb.

2.1.3. Other districts within Harare urban

Cases are also reported from Epworth town. From 10 November to 15 December, 158 cases had occurred, of which 75 in the last week.

2.2. Bulawayo

2.2.1. Bulawayo city

An outbreak was detected on 14 November in this city of 680 000 people. As of 12 December, 152 cases were reported to the WHO, with 11 deaths (CFR 7.2%). About 5 new cases per day appear to be occurring, though a spike may be occurring in the last few days.

2.3. Mashonaland West

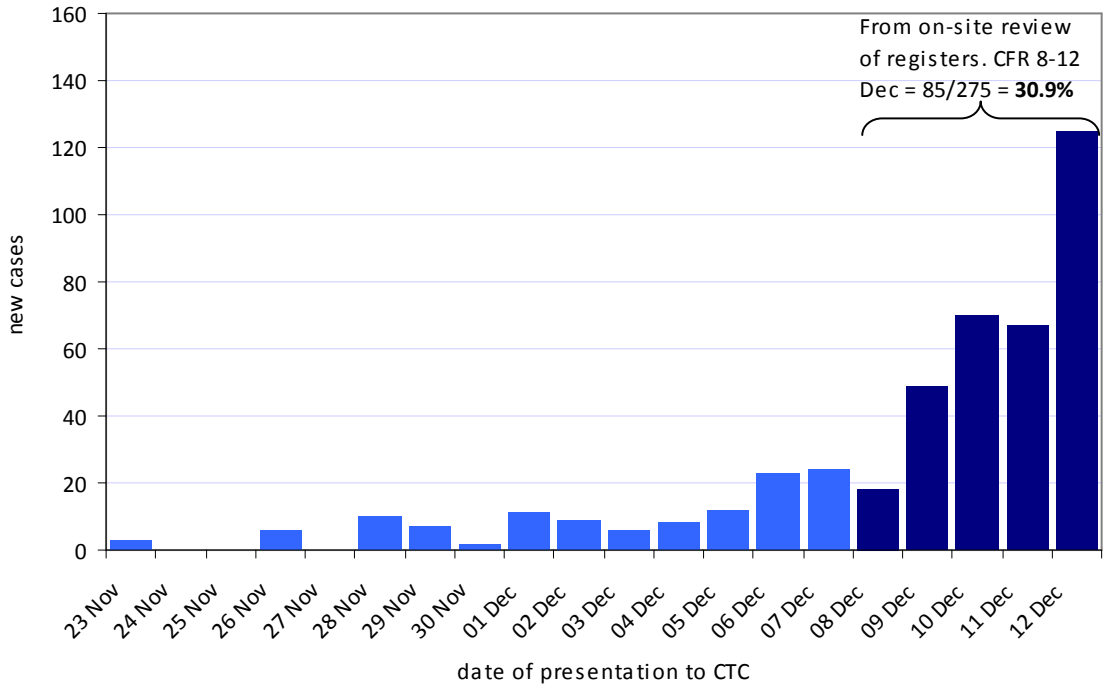
2.3.1. Chegutu district

Chegutu city

The population of Chegutu city is said to be about 50 000. The first cases had an onset on 23 November. Laboratory testing done in Chegutu suggested the bacteria are sensitive to ciprofloxacin. The outbreak progressed slowly until 9 December, when a sudden rise in cases was noted (Figure 5). The vast majority of cases originate from a very circumscribed area of wards C and P, where water pipes were tampered with, leading to contamination from sewage ducts. A multi-agency site visit on 13 December revealed that the population is drawing drinking water from a variety of sources, some clearly unprotected. There was also an

obvious problem with household water storage. The CTC was staffed by two nurses only up to 11 December, and was overwhelmed by the sudden rise in cases, leading to an extremely high CFR (**30.9%**) between 8 and 12 December. While a high number of deaths have occurred in the CTC, a further 28 were recorded from the community. The district health team sent out an alert on Wednesday 10 December, but this was only received by WHO, Unicef and other agencies on Friday 12 December. A site visit on 13 December revealed appalling conditions within the CTC. A variety of agencies, including Zimbabwean medical volunteers from Harare and elsewhere, are now supporting the site, under the coordination of the District Medical Office, and with MSF-Spain mainly in charge of case management. Considering the expected proportion of asymptomatic infections, the number of cases seen so far from the two wards in question (about 150 and 450 respectively), and the population of each ward (about 5000), it is likely that about half of the population in ward P has already been infected.

Figure 5. New cholera cases per day, Chegutu city, 23 November-12 December. Data up to 7 December are as transmitted by the District Health Team.

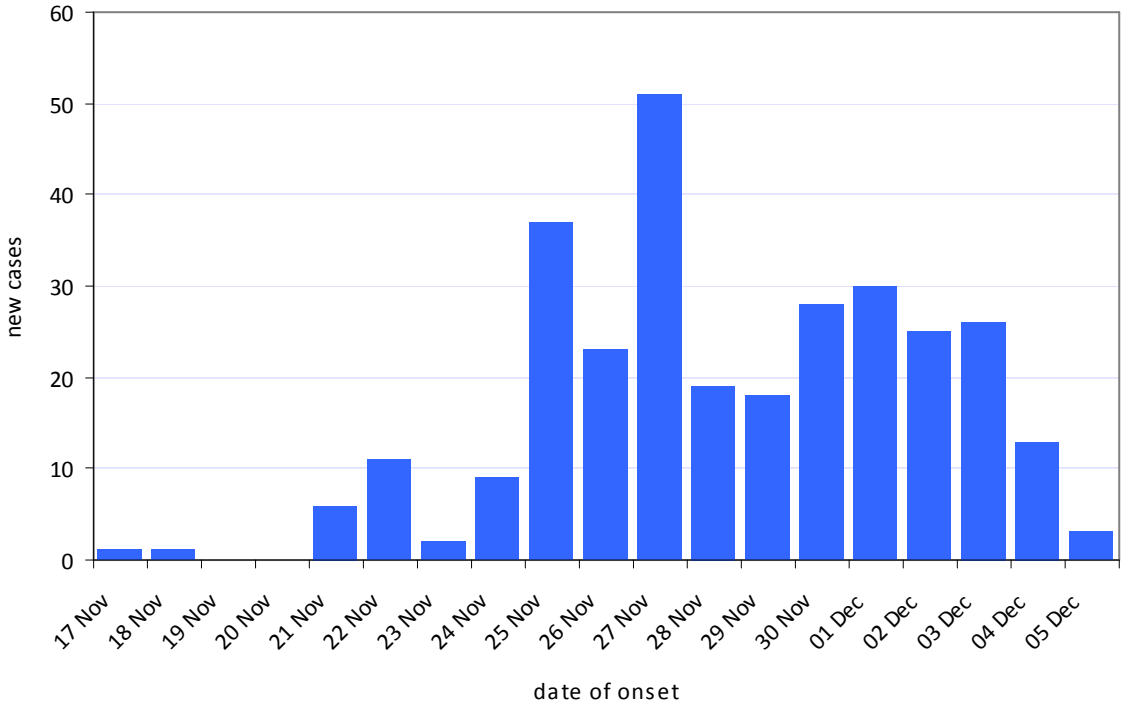


Cholera cases are also reported from the rural parts of Chegutu district, and local health centres are said to be managing these, though little information is available.

Norton town

Norton has a population of 44 000. A MoHCW-WHO outbreak investigation (report available on request) revealed that the probable index case died on 18 November: the first 9 cases to present around 21-22 November had attended the funeral. The town has clear water and sanitation problems, with burst sewers, unprotected wells, and only one tanker and one borehole available to the population. The outbreak peaked on 25-27 November, and was stable to declining as of 12 December: 302 cases were recorded up to 5 December, but only 66 more were reported to the WHO since the MoHCW-WHO visit. To date, Ngoni and Katanga suburbs account for the vast majority of cases. The minimum clinical attack rate (see Frequently Asked Questions) is about 0.8% considering the whole town.

Figure 6. New cholera cases per day, Norton town, 17 November-5 December.

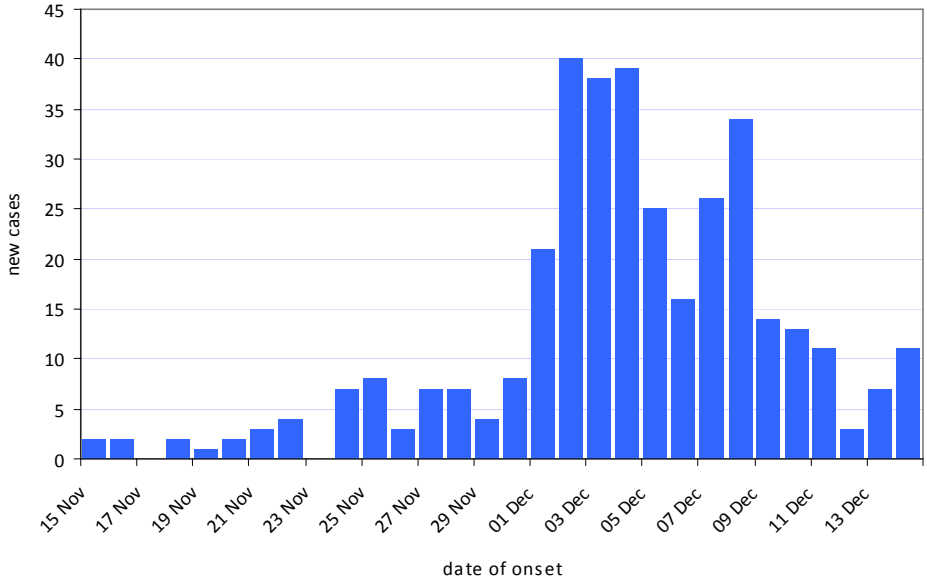


2.3.2. Kadoma district

Kadoma city

The Kadoma City Health Department issues excellent weekly outbreak updates, from which data presented here are extracted. Cases first appeared on 14 November, and suddenly peaked around 1-4 December (Figure 7). As of 14 December, 361 cases had been recorded, the vast majority being residents of Rimuka suburb.

Figure 7. New cholera cases per day, Kadoma city, 15 November-14 December. Adapted from the Kadoma City Health Department weekly cholera outbreak update, 15 December.



2.3.3. Other districts in Mashonaland West

Chinhoyi urban, within Makonde district, has reported cases since 21 September. As of 18 November, 103 cases had occurred, rising to 145 by 25 November and 208 by 12 December. The outbreak appears to be continuing, with stable incidence.

In Kariba district, outbreaks are reported from both Mahombakombe town (34 by 11 November; 193 by 12 December) and rural areas (224 cases). The start date of these outbreaks is unclear, but is prior to 11 November. Communications with this district are poor, but the outbreaks are said to be spreading. Caseload may be seriously underestimated, and seems to be increasing very fast in the rural areas (Kariba Mola).

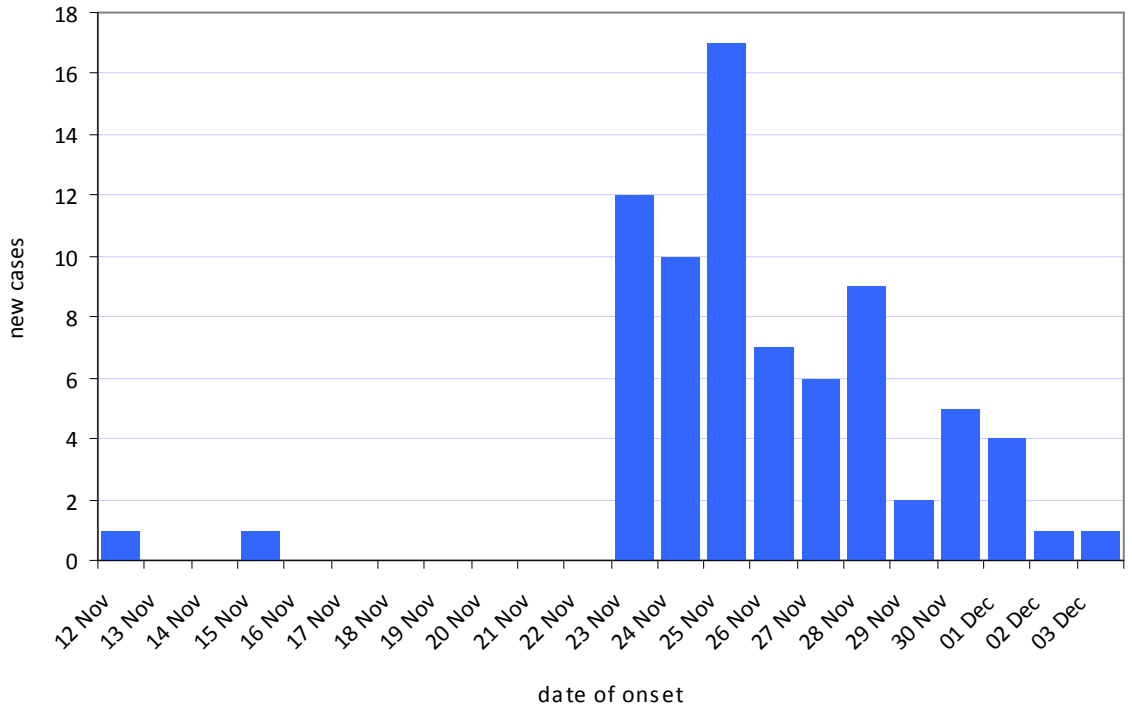
Hurungwe district has reported cholera since 9 November, though the reported caseload is <20. Zvimba district has reported a similarly small number of cases (start date unknown).

2.4. Mashonaland Central

2.4.1. Centenary district

The district began reporting cases on 23 November, although the index case may have occurred on 12 November in Makombe village: the first cases came from this village and had attended his funeral on 15 November. 68 cases had occurred by 3 December, and 82 by 12 December. The outbreak peaked around 23-25 November, and appeared to be declining as of 3 December.

Figure 8. New cases per day, Centenary district, 12 Nov-3 Dec.



2.4.2. Other districts in Mashonaland Central

Shamva, Mazowe and Guruve district had each reported <20 cases as of 26 November, but data for the last 18 days are missing.

Mount Darwin, Rushinga, Bindura rural and Bindura urban districts had not reported any cases as of 12 December.

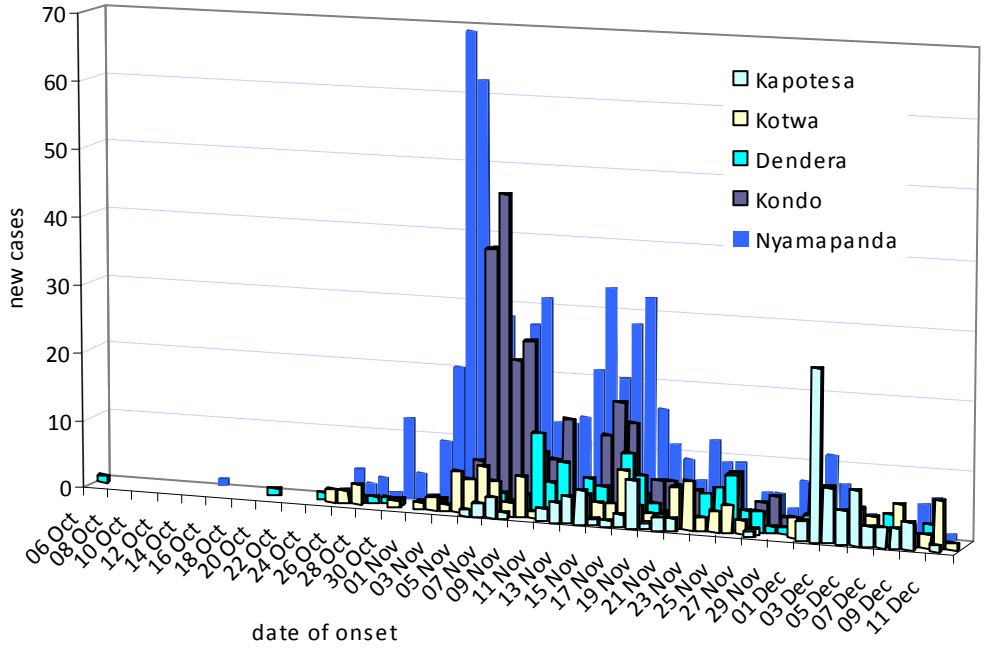
2.5. Mashonaland East

2.5.1. Mudzi district

Mudzi, near the border with Mozambique and an important highway post, was affected early on in the epidemic, with outbreaks starting on 6 October in the catchment area of Dendera health centre. The district and town have adopted a very decentralised strategy, with several small CTCs established within existing health centres. To date, 16 different CTCs have reported, with Dendera, Kapotesa, Kondo, Kotwa, and Nyamapanda accounting for 1302 (84.0%) of the 1550 cases as of 12 December.

The major outbreaks in the district, peaking in the first week of November, now appear under control (Figure 9), though the example of Kapotesa shows that renewed outbreak waves can occur, warranting continued vigilance and preparedness.

Figure 9. New cholera cases per day, selected sites within Mudzi district, 6 Oct-11 Dec.



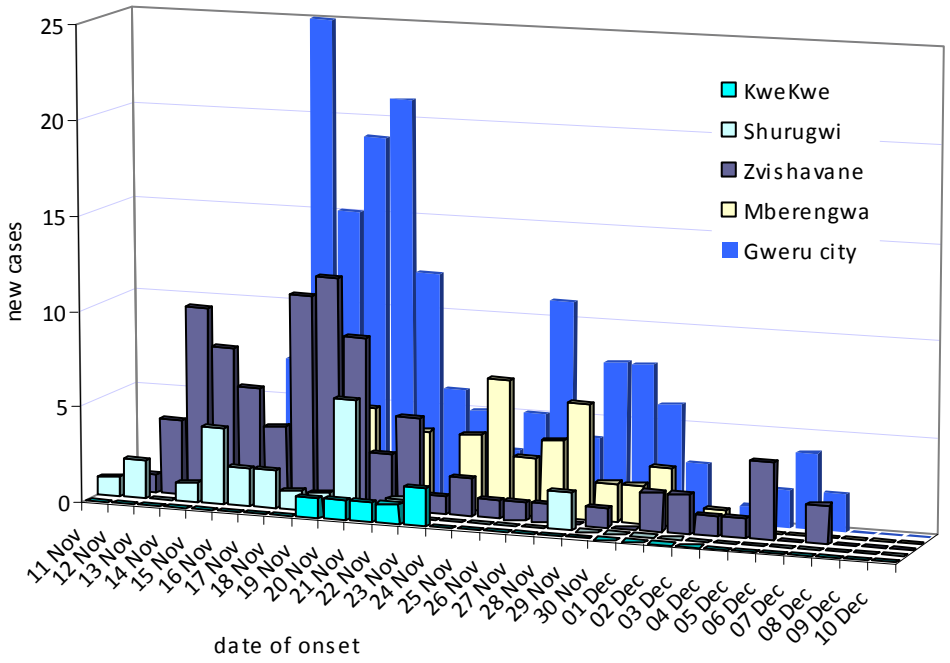
2.5.2. Other districts in Mashonaland East

All other districts in Mashonaland East, except for Ruwa, have reported cases, the first occurring between 25 October and 15 November. As of 12 December, the biggest outbreaks were in Goromonzi and Mutoke (>100 cases each).

2.6. Midlands

Midlands province reported its first cases between 11 and 17 November. The biggest reported outbreak is in Gweru city (population 141 000), with 167 cases as of 9 December. Smaller outbreaks are occurring in Shurugwi, Zvishavane, Mberengwa and KweKwe city (population 93 000). All of these outbreaks appeared to be on the decline as of early December (Figure 10).

Figure 10. New cholera cases per day, various locations within Midlands province, 11 Nov-9 Dec. Data are updated up to 10 December for Gweru city, 8 December for Zvishavane and Mberengwa, 5 December for Shurugwi and 1 December for KweKwe.



Data from Gokwe South and Gokwe North districts are missing due to transport constraints. These districts have each reported <5 deaths, but the last update was on 26 November.

Redcliff urban and Chirumhanzu districts have not reported cases.

2.7. Masvingo

All seven districts (Masvingo, Gutu, Chivi, Bikita, Chiredzi, Mwenezi) report cases. In Masvingo city (population 70 000), Chiredzi and Mwenezi, cholera was first reported between 13 and 17 November. Masvingo's outbreak appears to be the largest (120 cases), but data were last updated on 7 December. Considering the entire district, CFR to date is **22.4%**, suggesting poor case management.

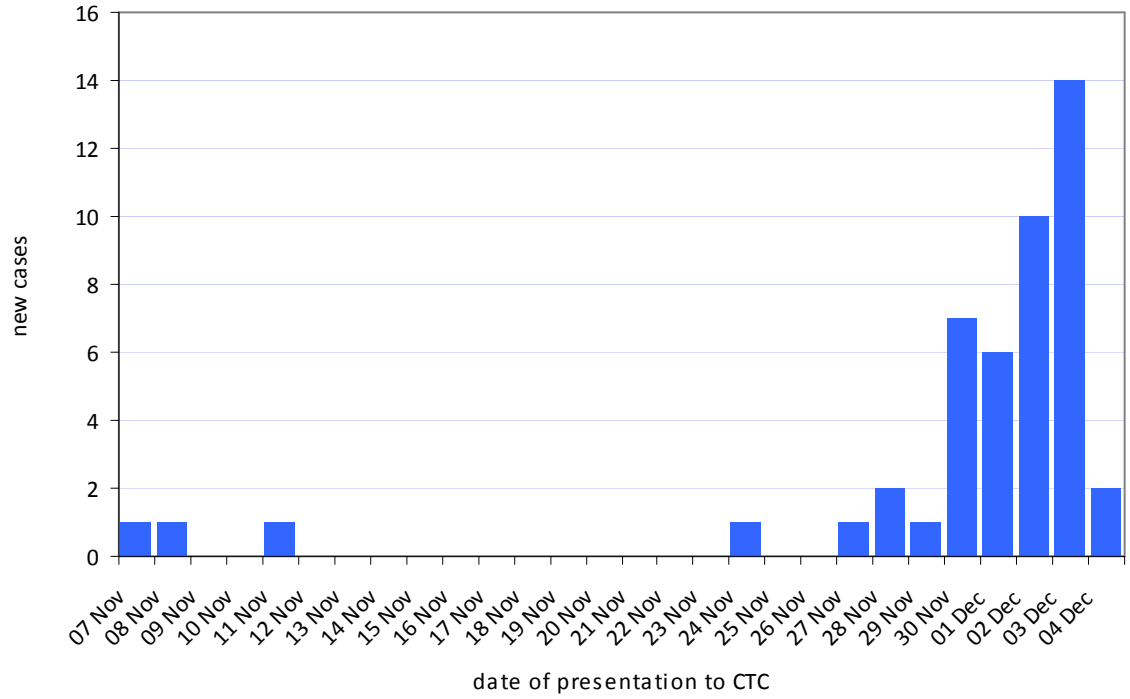
On the whole, data from Masvingo province are very limited.

2.8. Manicaland

2.8.1. Chipinge district

In Chipinge district, the index cases may have occurred as early as 7-8 November, although the bulk of cases has occurred since 30 November (Figure 11). Cases have come from several villages, but mainly Rimbi, Mukuya, Munepasi and Musani. The index cases were travellers returning from Harare and South Africa.

Figure 11. New cholera cases per day, Chipinge district, 7 Nov-4 Dec.



2.8.2. Other districts in Manicaland

Apart from Nyanga and Rusape, all other districts have reported considerable numbers of cases, with outbreaks starting between 1 and 13 November. Buhera, Makoni, Mutare and Chimanimani each reported **>200 cases** as of 12 December, with CFRs between 6.0% and 13.8%. In all of these, incidence appears stable, with about 5-10 new cases per day.

Mutasa district and Mutare city have also reported cases, though data have not been updated since about 1 December.

2.9. Matabeleland South

2.9.1. Beitbridge district

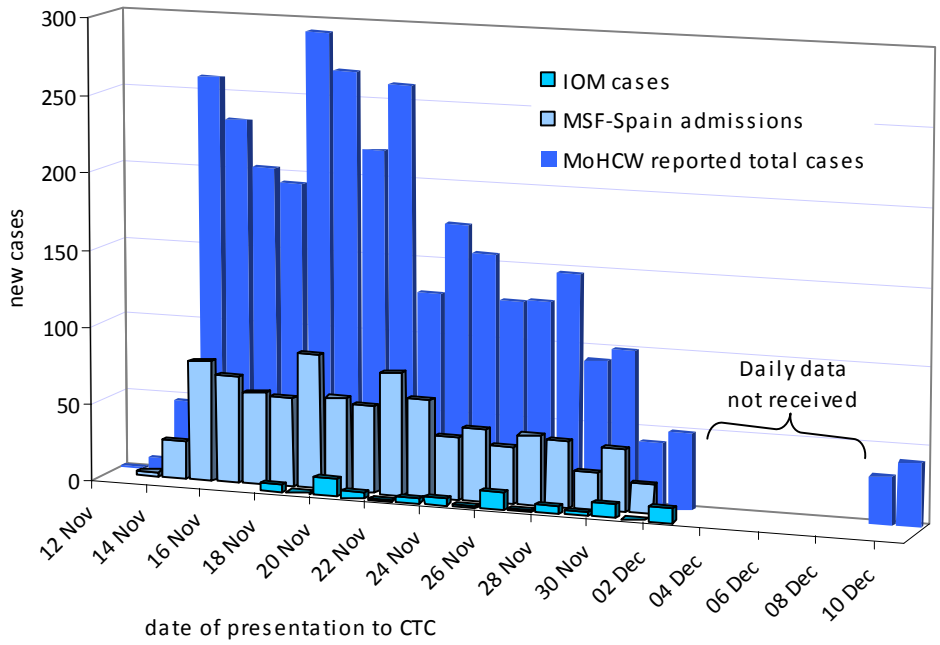
Beitbridge city

Beitbridge has an estimated population of 30-50 000, which however doubles or triples considering the large number of travellers who make it a stopover en route to or from South Africa. Here, cases were first reported on 12 November. Interestingly, the case with the earliest onset date (8 November) was a traveller from Harare.

The outbreak was explosive, peaking between 14-24 November, and spilling over into neighbouring South Africa, where the area around Masina has since been declared a disaster zone. As of 10 December, the outbreak was slowly subsiding. Altogether, some 3456 cases had been treated as of the same date.

As the Christmas holidays approach, traffic through Beitbridge is expected to increase, and could lead to larger outbreaks, with the potential for fresh propagation within both Zimbabwe and South Africa.

Figure 12. New cases or admissions per day by source, Beitbridge city, 12 Nov-10 Dec. Note that MSF-Spain and IOM data were received until 2 December.



2.9.2. Other districts in Matabeleland South

Plumtree town, in Mangwe district, and Gwanda district reported 1 and 19 cases on 25 November respectively, though no update has been received since then.

2.10. Matabeleland North

No cases have been reported yet to the WHO, but the International Organization for Migration (IOM) is establishing a CTC in Victoria Falls city (on the border with Zambia).

3. Discussion

3.1. General epidemiological pattern

Outside of Harare city, it appears that most outbreaks are **point source**, with a very sudden spike of 2-5 days, during which most cases and deaths occur, as local government staff, many of whom are currently working on a semi-volunteer basis, find themselves overwhelmed. Outbreaks appear to last about 3-5 weeks, with a slow decline. Primary cases are probably travellers or migrants from other areas: once transmission is established, a trigger event occurs that results in a massive point source contamination. In the outbreaks investigated to date, trigger events appear to be funerals and/or defective water pipes.

3.1.1. Who is most at risk?

Generally, the epidemic seems to be affecting the North, East and South, as in previous countrywide epidemics (data not shown). Soil conditions, rainfall and population concentrations may be less conducive to cholera transmission in the West of the country (particularly Matabeleland North).

Nearly 50% of Zimbabwe's population is estimated to be urban. Urban residents are likely to be more at risk of large cholera outbreaks, due to population concentration and reliance on failing water systems that can, if contaminated, result in fulminant, hard-to-predict outbreaks.

On the other hand, rural patients and those in the most isolated districts may be more at risk of dying from a cholera case, due to lower coverage of health services and reach of non-governmental organisations.

3.2. Some lessons learned

The example of Chegutu city, and probably other outbreaks that were less well documented, shows that the main determinant of impact, at least in terms of reactive activities, is the timeliness of alerts: if supporting agencies arrive on site with >1-2 days of delay with respect to when the main outbreak wave starts, it will be difficult to avert most avoidable deaths.

3.2.1. How can we ensure timely alerts?

The WHO and the Ministry of Health and Child Welfare are currently establishing a Cholera Control and Command Centre, located within WHO's country office, that is increasingly expected to take charge of alerts. The Centre would receive alerts, and relay them to Health and WaSH cluster leads so that immediate action is taken by partners.

An improved alert system requires very robust exchange of intelligence, including epidemiological data, field assessments and even rumours by all agencies involved in the cholera response. Such a network, however formal or informal, needs to be urgently reinforced.

Improved telecommunications with districts and provinces are also crucial. One short-term solution may be to rely on existing radio and other facilities available with UN agencies, NGOs and other field actors.

3.2.2. Reducing mortality during outbreaks

A highly mobile strategy is probably warranted, whereby agencies who can support emergency case management, water and sanitation and hygiene promotion deploy units that operate on a provincial level, and are rapidly able to intervene in case of alerts, providing the crucial bridge support (e.g. manage the expected 50-150 severe cases that have characterised most sudden outbreak peaks thus far; immediately provide safe water), before more substantial aid arrives.

4. Acknowledgements

We are very grateful to District and Provincial surveillance officers, who have helped to gather and transmit the bulk of the information herein presented. Likewise, we acknowledge agencies, including members of the Health and WaSH clusters, that have kindly shared their data with our team.

This document would not have been possible without the contributions of the MoHCW's department of surveillance, and the data management team at WHO.

5. Frequently Asked Questions

5.1. What key indicators should my agency monitor, and why?

We encourage individual CTCs and agencies to perform continuous data analysis within their sites of operation. This can fulfil several operationally important functions:

- **Monitor the quality of case management.** The CFR of a CTC/CTU is an excellent indicator of case management performance. The CFR should be calculated as the number of deaths, out of all patients admitted (i.e. kept under observation or hospitalised). The target is <1%. If the CFR is high, a review of the patient register may provide good clues: in particular, the following indicators should be considered: (i) the proportion of deaths occurring during the night shift; (ii) the delay between onset of symptoms and presentation at the treatment centre (this should be less than one day).
- **Monitor epidemic trends in space and time.** This can be done considering all cases treated, or admissions only if there is a suspicion that the majority of mild cases are in fact not cholera at all. Zimbabwe's residential layout is neatly organised, and addresses are easy to map. A spot map (one dot = one case) is useful to see where cases are coming from and target community-based activities (including active case finding) accordingly. On a daily basis, teams should review where cases are coming from: new pockets of infection can appear suddenly in previously unaffected areas. Furthermore, a standard epidemic curve (a histogram of new cases per day) should be drawn to observe whether the outbreak is expanding or decreasing. Note that a decline does not necessarily mean that operations should be scaled down or closed: new waves of cases can occur due to events such as ruptures of water pipes, heavy rains, etc.
- **Understand the extent to which the outbreak has affected the population.** For this, one can compute the clinical attack rate (proportion of the population that has experienced a case of symptomatic cholera). The clinical attack rate should be calculated as follows: all cases treated / population of the CTC/CTU's catchment area. However, it should be understood that this represents a minimum: it does not include cases who were not treated. Furthermore, we expect that only about 25% of infections will be asymptomatic: therefore, the overall attack rate (i.e. proportion of the population that has already been infected) could be calculated as the clinical attack rate, divided by 0.25. Note that outbreaks can exhaust themselves simply by virtue of the fact that most of the population has already been infected.

If several CTCs and CTUs cater for the same catchment area, it is advisable to monitor trends and attack rates considering the total caseload seen at these CTCs/CTUs.

5.2. How reliable are OCHA's daily updates?

Zimbabwe's surveillance system has historically been a model for neighbouring countries, but has been severely weakened by the current crisis in the health sector. Currently, District, Provincial and headquarters surveillance officers are working on a semi-volunteer basis to collect and transmit to WHO daily data on the cumulative caseload and death toll due to cholera. These updates are then published by OCHA on its country website.

In practice, updates are not actually daily, with the exception of selected sites (e.g. Beitbridge). On any typical day, reasons for the lack of an update may include (i) impossibility by CTC/CTU staff to transmit data to the Districts, due to telecommunications problems; (ii) lack of fuel for District surveillance vehicles; (iii) lack of contact between Districts, Provinces and MoHCW headquarters, due to failing phone networks; (iv) weekends and public holidays.

Further limitations of the OCHA daily updates include the following: (i) facilities may use different case definitions; (ii) some facilities may report only admitted cases (i.e. patients hospitalised or kept under observation); (iii) not all facilities may report data to the District on any given day; (iv) community deaths are captured in only a few sites.

On the whole, the OCHA updates should be interpreted as a minimum number of cases and deaths thus far. For surveillance purposes, trends in space and time are much more telling. The best use of OCHA updates is to raise alerts about sites where cases are increasingly rapidly.

5.3. Where no cases are reported, should we assume there is no cholera outbreak occurring there?

No. The safe assumption is probably that no *major* outbreak is occurring (i.e. many hundreds of cases). However, lack of data is most likely to be due to poor communications and low access to health services. Filling in missing information from these districts is a priority for the upcoming days.

5.4. Where will the next major outbreak occur?

This is very difficult to predict. The more important question is: which areas are most vulnerable (i.e. would feature higher attack rate and case-fatality) if an outbreak were to strike? Sites where no agencies are supporting government health structures, and/or where CFR is already high, are probably the most vulnerable, and should be the object of close surveillance.

5.5. How do we know all outbreaks are under surveillance?

We do not, although we are fairly confident that the large outbreaks are. WHO and other partners are currently engaged in service mapping or Who-What-Where exercises: over the next few days, these will hopefully paint an accurate picture of the cholera treatment centres, as well as water and sanitation activities, throughout Zimbabwe. It will then be easier to identify gaps in surveillance. Up to date information from cluster partners on their activities is vital to this end.

6. Annexes

Table 3. Districts of Zimbabwe, with projected population and details of whether and when cholera cases have been reported.

Province	District	Projected population	Cases reported to MoHCW?	Date first case was recognised
Harare	Chitungwiza	339 750	yes	20 August
	Epworth	119 886	yes	December?
	Harare Rural	24 197	(with Harare Urban)	(with Harare Urban)
	Harare Urban	1 509 023	yes	13 October
Bulawayo	Bulawayo	711 166	yes	14 November
Mashonaland West	Chegutu	191 003	(with Chegutu Urban)	(with Chegutu urban)
	Chegutu Urban	45 639	yes	23 November
	Chinhoyi	58 823	(with Makonde)	(with Makonde)
	Chirundu	1 894	yes	12 December
	Hurungwe	300 902	yes	09 November
	Kadoma Rural	168 038	no	
	Kadoma Urban	80 246	yes	14 November
	Kariba Rural	36 758	yes	October
	Kariba Urban (Mahombakombe)	25 035	yes	October
	Karoi	23 525	no	
	Makonde	123 254	yes	21 September
	Zvimba	232 024	yes	?
Mashonaland Central	Bindura Rural	114 133	no	
	Bindura Urban	35 353	no	
	Centenary	113 275	yes	12 November
	Guruve	194 751	yes	?
	Mazowe	204 870	yes	?
	Mount Darwin	210 189	no	
	Rushinga	70 614	no	
	Shamva	103 018	yes	?
Mashonaland East	Chikomba	126 382	yes	15 November
	Goromonzi	162 131	yes	03 November
	Hwedza	74 282	yes	10 November
	Marondera	108 075	(with Marondera Urban)	(with Marondera Urban)
	Marondera Urban	54 492	yes	13 November
	Mudzi	134 712	yes	06 October
	Murehwa	170 439	yes	25 October
	Mutoko	139 015	yes	05 November
	Ruwa	24 889	no	
	Seke	80 847	yes	05 November
	UMP	109 658	yes	09 November
Midlands	Chirumhanzu	74 024	no	
	Gokwe North	225 293	yes	?
	Gokwe South	308 598	yes	?
	Gweru Rural	88 635	no	
	Gweru Urban	147 989	yes	17 November
	Kwekwe Rural	167 601	no	
	Kwekwe Urban	98 383	yes	19 November
	Mberengwa	192 754	yes	14 November
	Redcliff	34 108	no	
	Shurugwi Rural	75 176	(with Shurugwi Urban)	(with Shurugwi Urban)
	Shurugwi Urban	17 723	yes	11 November
	Zvishavane Rural	71 468	(with Zvishavane Urban)	(with Zvishavane

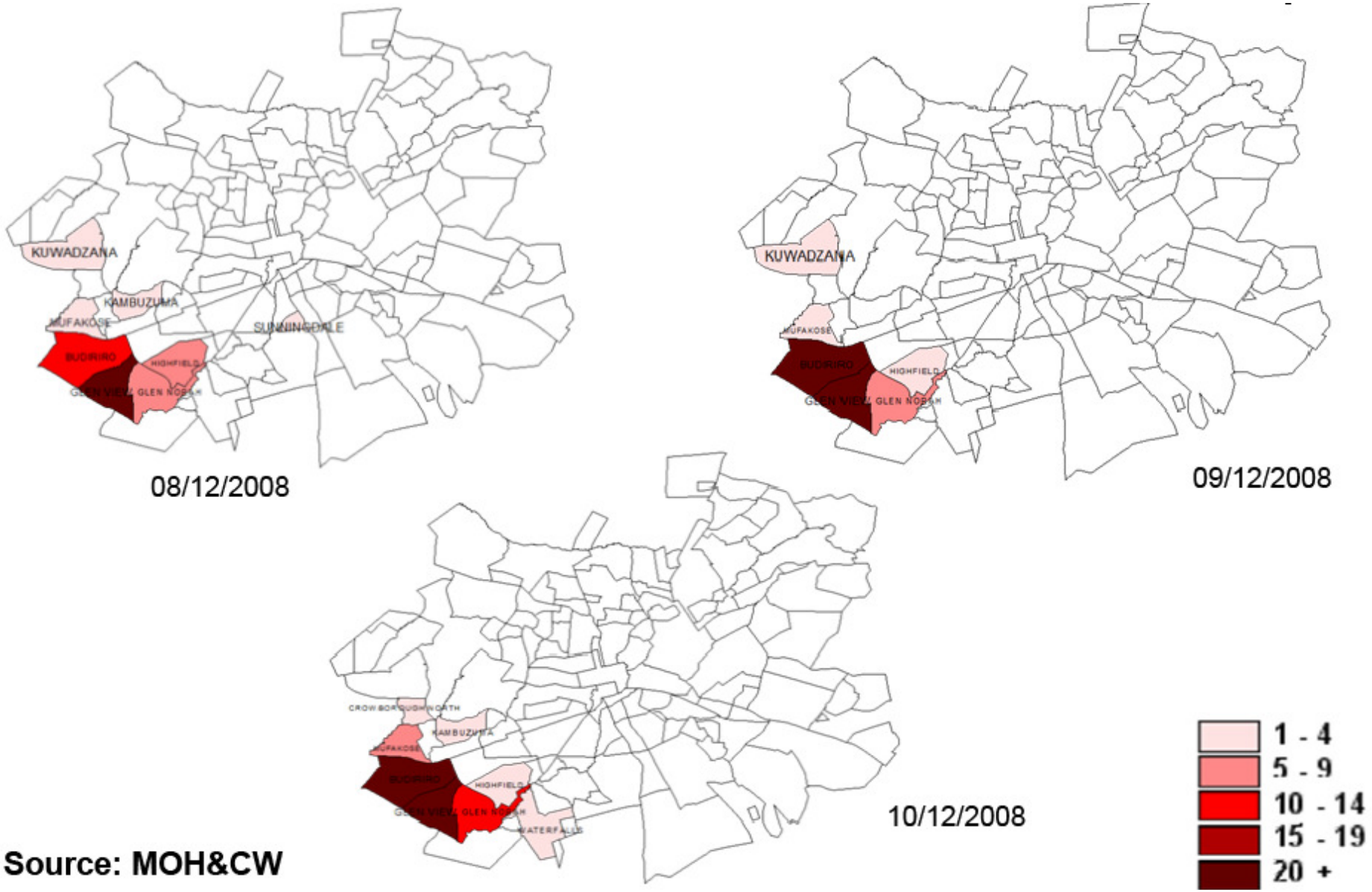
				Urban)
	Zvishavane Urban	36 920	yes	
Masvingo	Bikita	164 946	yes	?
	Chiredzi Rural	218 790	(with Chiredzi urban)	(with Chiredzi Urban)
	Chiredzi Urban	27 168	yes	16 November
	Chivi	163 579	yes	?
	Gutu	208 663	yes	?
	Masvingo Rural	204 387	(with Masvingo Urban)	(with Masvingo Urban)
	Masvingo Urban	73 035	yes	13 November
	Mwenezi	132 677	yes	17 November
	Zaka	194 549	no	
Manicaland	Buhera	231 285	yes	?
	Chimanimani	121 178	yes	13 November
	Chipinge	298 268	yes	07 November
	Makoni	260 643	yes	02 November
	Mutare Rural	233 727	no	
	Mutare Urban	179 161	yes	?
	Mutasa	175 147	yes	?
	Nyanga	123 261	no	
	Rusape	26 290	(with Makoni)	(with Makoni)
Matabeleland South	Beitbridge	109 015	yes	12 November
	Bulilima	99 131	no	
	Gwanda Rural	122 609	(with Gwanda Urban)	(with Gwanda Urban)
	Gwanda Urban	14 045	yes	?
	Insiza	89 990	no	
	Mangwe	82 149	yes	?
	Matobo	104 810	no	
	Umzingwane	64 618	no	
Matabeleland North	Binga	126 130	no	
	Bubi	50 312	no	
	Hwange	64 529	no	
	Hwange Urban	41 560	no	
	Lupane	103 701	no	
	Nkayi	117 952	no	
	Tsholotsho	125 786	no	
	Umguza	77 812	no	
	Victoria Falls	33 127	no	

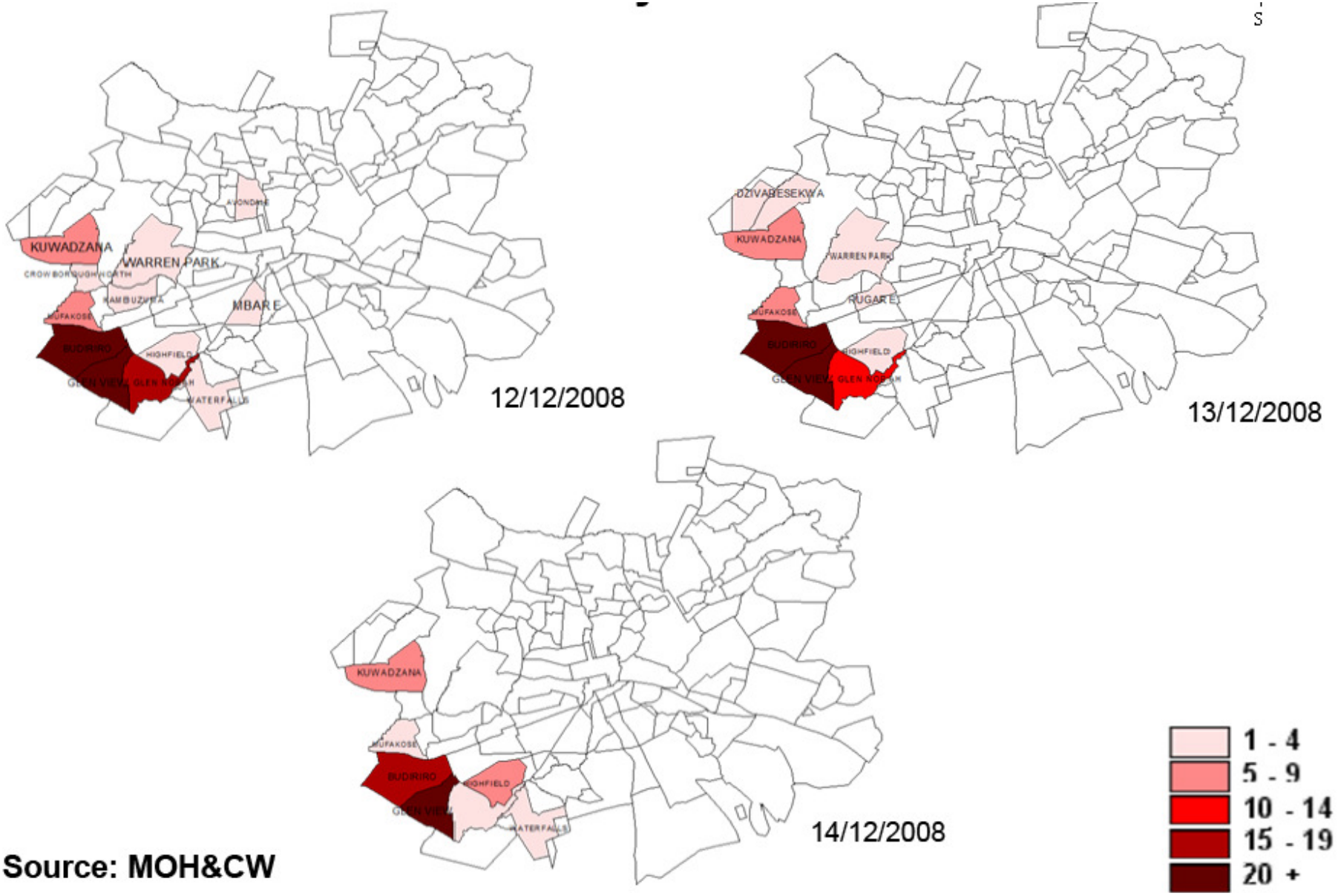
Table 4. Cumulative caseload and deaths reported to MoHCW, crude case-fatality ratio, and date of last data update, by district. Note: please refer to data published on the OCHA Zimbabwe website for the most up to date figures.

Province	District	Cumulative suspected cases to date	Cumulative deaths within treatment centres	CFR (%)	Date of last update
Harare	Chitungwiza	551	99	18.0	12 December
	Epworth	158	1	0.7	15 December
	Harare Rural				(with Harare Urban)
	Harare Urban	8454	208	2.5	15 December
Bulawayo	Bulawayo	152	11	7.2	12 December
Mashonaland West	Chegutu				(with Chegutu urban)
	Chegutu Urban	378	95	27.1	12 December
	Chinhoyi				(with Makonde)
	Hurungwe	14	1	7.1	12 December
	Kadoma Urban	361	5	1.4	14 December
	Kariba Rural	224	11	4.9	12 December
	Kariba Urban (Mahombakombe)	193	8	4.1	10 December
	Makonde	208	29	13.9	12 December
	Zvimba	13	0	0.0	25 November
Mashonaland Central	Centenary	82	9	11.0	11 December
	Guruve	16	2	12.5	25 November
	Mazowe	4	1	25.0	25 November
	Shamva	12	4	33.3	< 11 November (over?)
Mashonaland East	Chikomba	16	1	6.3	09 December
	Goromonzi	194	17	8.8	09 December
	Hwedza	2	0	0.0	02 December
	Marondera				(with Marondera Urban)
	Marondera Urban	23	5	21.7	12 December
	Mudzi	1550	41	2.6	12 December
	Murehwa	56	4	7.1	25 November
	Mutoko	104	17	16.3	05 December
	Seke	83	11	13.3	12 December
	UMP	17	2	11.8	09 December
Midlands	Gokwe North	3	0	0.0	26 November
	Gokwe South	5	0	0.0	26 November
	Gweru Urban	167	3	1.8	12 December
	Kwekwe Urban	10	1	10.0	05 December
	Mberengwa	52	9	17.3	05 December
	Shurungwi Rural				(with Shurugwi Urban)
	Shurungwi Urban	23	6	26.1	12 December
	Zvishavane Rural				(with Zvishavane Urban)
	Zvishavane Urban	93	9	9.7	12 December
Masvingo	Bikita	32	16	50.0	09 December
	Chiredzi Rural				(with Chiredzi Urban)
	Chiredzi Urban	56	9	16.1	09 December
	Chivi	28	14	50.0	25 November
	Gutu	5	4	80.0	09 December
	Masvingo Rural				(with Masvingo Urban)
	Masvingo Urban	120	13	10.8	09 December
	Mwenezi	40	7	17.5	09 December
Manicaland	Buhera	302	24	7.9	12 December
	Chimanimani	200	12	6.0	12 December
	Chipinge	49	13	26.5	04 December
	Makoni	261	36	13.8	12 December
	Mutare Urban	7	0	0.0	09 December

	Mutasa	7	5	71.4	09 December
	Rusape				(with Makoni)
Matabeleland South	Beitbridge	3456	91	2.6	12 December
	Gwanda Rural				(with Gwanda Urban)
	Gwanda Urban	19	0	0.0	25 November
	Mangwe (Plumtree)	1	0	0.0	25 November

Figure 13. Spatial distribution of new cholera cases in Harare city, 8 dec-14 Dec. Note that 11 December data are missing.




KUWADZANA
WARREN PARK
MBARE
BUDIRIRO
HIGHFIELD
GLEN VIEW
GLEN NORAH
WATERFALLS
12/12/2008
DZIVARESEKWA
KUWADZANA
WARREN PARK
RUGARE
BUDIRIRO
HIGHFIELD
GLEN VIEW
GLEN NORAH
13/12/2008
KUWADZANA
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WATERFALLS
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1 - 4
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Source: MOH&CW