

Key considerations: Social, structural and community dynamics of cholera transmission and mortality in Ethiopia

The current cholera outbreak in the Federal Democratic Republic of Ethiopia began in August 2022. As of April 2024, active outbreaks had been recorded in most regions of the country, including: Amhara; Dire Dawa; Harari; Oromia; Southern Nations, Nationalities and Peoples' Region (SNNPR); Somali and Tigray. This brief has been developed to support response efforts by exploring the social and structural determinants and community dynamics of cholera infection and mortality in Ethiopia. Socio-cultural and epidemiological information, academic and grey literature and consultations with cholera response experts in Ethiopia have been used to develop the brief.

Key considerations

- **Safe water supplies and adequate sanitation facilities are necessary to prevent cholera outbreaks. However, about half of Ethiopians lack access to potable water and most lack adequate latrine or toilet facilities.** Most people in Ethiopia are aware of how to prevent and treat cholera (including water treatment techniques; handwashing; proper sanitation; vaccines and oral rehydration salts solution), but many lack the resources necessary to put their knowledge into practice.
- **Significant investments in water and sanitation infrastructure are needed to prevent and control cholera in Ethiopia.** Prioritising certain locations and communities for infrastructural investments could make an important difference in preventing and controlling cholera outbreaks in the immediate and long term. Areas to prioritise include camps for internally displaced persons (IDPs) and refugees; schools; healthcare facilities; marketplaces; transit stations; migrant labour camps; factories; informal settlements and popular religious pilgrimage and holy water sites.
- **Provide oral cholera vaccine (OCV) doses in high-risk communities before cholera outbreaks occur and distribute OCVs immediately where cholera is detected in the environment or reported from health workers.** OCVs are effective for preventing and controlling cholera outbreaks but they must be paired with early warning and disease surveillance systems.
- **Many parts of the country do not have adequate disease surveillance; early warning systems; laboratories; diagnostic testing or data collection on cholera risks and outbreaks.** Conflicts and a lack of infrastructural investments and trained personnel hinder efforts to implement these systems and processes.
- **Population displacement, often due to conflict, is a key driver of cholera risk and mortality in Ethiopia.** Recent conflicts have destroyed health, water and sanitation infrastructure, particularly in northern Ethiopia. Conflict has also harmed cholera disease surveillance systems, distribution of supplies and relationships of trust between governmental authorities, healthcare providers and communities in need.
- **Cholera is endemic throughout Ethiopia, so in addition to providing technologies to treat and control the disease, investment is needed to clean and protect Ethiopia's waterways and natural environments from contamination with cholera and other pathogens.** Investments should be aimed at ensuring the health of the waterways and ecosystems people depend on.

Cholera outbreaks in Ethiopia

Cholera is an acute diarrheal infectious disease caused by the ingestion of food or water contaminated with the bacterium *Vibrio cholerae*. In Ethiopia, cholera outbreaks occur regularly and especially during rainy seasons when flooding can contaminate surface water sources. Outbreaks also occur when people can no longer access safe water sources, such as during droughts or other natural disasters, and can disproportionately affect vulnerable populations including displaced people or migrants living in camps and informal settlements. In the current outbreak, most cholera cases have been reported in men, however, cases among women and children are likely underreported and women and children risk worse health outcomes.¹ The combination of climate hazards – such as heavy rains and flooding – population displacement and labour migrations in late 2023 have contributed to the spread of cholera.^{1,2} In the current outbreak, from 1 January to 29 February 2024, 1,000 cases were reported; the case fatality rate was 1.7%, surpassing the 1% standard rate for adequate case management.³

Cholera has a long history in Ethiopia.^{4,5} After the successful elimination of *V. cholerae* 01 strains in Ethiopia in the 1980s, cholera re-emerged in 1994. In 1998, an epidemic of multidrug-resistant *V. cholerae* in Ethiopia affected thousands of people throughout the country.⁵ There have since been outbreaks of cholera or undiagnosed cases of acute watery diarrhoea with clinical characteristics of cholera. About 15% of the country's population lives in a *woreda* (district) that has experienced cholera outbreaks – areas the government calls hotspot *woredas*.⁶

Progress has been made in Ethiopia to detect, prevent and control cholera. The Government of Ethiopia has developed a detailed National Cholera Control Operation Plan to prevent and control outbreaks, with an emphasis on both political commitment and community-based action.⁶ As part of this, new rapid diagnostic tests for cholera have enabled enhanced cholera disease surveillance, and they are starting to provide an early warning about outbreaks to public health officials, even in parts of the country lacking laboratory facilities.^{7–9} These rapid diagnostic tests were designed specifically for use in resource-constrained environments and in humanitarian emergencies at the highest risk of a cholera outbreak, such as in crisis-affected locations, refugee camps, informal settlements and under-served communities. Also, oral cholera vaccines (OCVs) have been proven to prevent and control outbreaks in Ethiopia as in other low-resource, crisis-affected locations.^{6,10,11}

The World Health Organization (WHO) and partners have called for more emphasis on preventing and controlling cholera outbreaks in addition to enhanced testing and treatment. As part of this, WHO has been developing and disseminating Cholera Kits designed to help organisations prepare for a potential cholera outbreak, support the first month of an outbreak response and to treat cases. Each kit includes caches of medications, medical supplies and cleaning and sanitation supplies to treat about 100 cases.¹² WHO and UNICEF have also developed strategies for Risk Communication and Community Engagement to support community-based cholera policies, programmes and care.¹³

Recent cholera outbreaks have highlighted the need for comprehensive and sustained infrastructural investments to prevent and control the disease. Testing, clinical treatment, and vaccination campaigns alone cannot fully address the endemicity of *V. cholerae* in urban and rural environments throughout the country. Significant and sustained investments are needed to build and maintain high-quality water and sanitation infrastructure, especially in impoverished, conflict-affected and historically neglected communities, and in popular gathering places where cholera outbreaks are most likely to occur. Investment is needed across multiple kinds of infrastructure, including: treated and piped water supplies; toilets; latrines; sewage and waste management systems; water quality surveillance and response systems; disease surveillance systems; networks of diagnostic laboratories and primary healthcare facilities.

Cholera is an infamous political as well as medical scourge – in Ethiopia and elsewhere. More than perhaps any other infectious disease, cholera is frequently perceived to threaten the

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www.doi.org/10.19088/SSHAP.2024.004

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legitimacy of, and popular support for, governments.¹⁴ Cholera outbreaks have been seen as a result and symbol of government incapacity and political irresponsibility.^{15,16} For example, perceptions of the Government of Zimbabwe's responsibility for, and then failure to curtail, a deadly cholera outbreak in 2008/9 caused public outrage and were central to Zimbabweans' subsequent demands for political rights and better public services.¹⁷ Communities as well as individuals may be stigmatised in cholera outbreaks and responses, increasing the risks of secrecy, blame and marginalisation.

Basic cholera prevention and control measures

There are several effective strategies to prevent cholera and control outbreaks.

Cholera disease surveillance, surveillance of water sources, and the use of rapid diagnostic tests can together provide data for planning and protection against the disease, particularly in outbreak-prone areas and among high-risk populations.^{7,8,18,19} Also, early distribution of OCVs provides an effective and affordable method to prevent and control outbreaks.^{10,11,20,21} Despite the proven efficacy and feasibility of all these efforts, however, several parts of Ethiopia still lack diagnostic testing, laboratory capacity, healthcare workforce capacity and reliable supplies of OCVs.

Controlling cholera in the long term requires sustainable and country-wide improvements in water and sanitation infrastructure.^{10,22–24} These measures include: constructing and maintaining continuous piped and/or treated water supplies; providing acceptable water purification technologies; building proper toileting and wastewater disposal systems and constructing and maintaining clean spaces for handwashing with soap. While these measures are all expensive and time-consuming, they can dramatically reduce the risk of infection from cholera and other water- and food-borne pathogens.

Efforts to prevent and control cholera outbreaks in Ethiopia are now typically led by actors within affected communities, including locally respected leaders and community-based healthcare providers, including health extension workers (HEWs).^{6,25–27} HEWs regularly provide effective education and awareness to people in their communities on the importance of consuming safe water, the proper use and maintenance of sanitation facilities, and vaccines and treatments for cholera.^{6,25} Women and religious leaders are also often important partners, especially to help communicate risks effectively, to design and implement prevention and control measures, and to help ensure treatment protocols for cholera are well utilised.^{26,28} See recent SSHAP guidance on [community engagement](#) and [community-based surveillance](#) for further details.^{29,30} However, the lack of material investments in basic infrastructure, supplies and the healthcare workforce limits the clinical responses to cholera and other diarrhoeal diseases in Ethiopia.^{25,31}

Cholera knowledge, behaviours and stigma

Most adults in Ethiopia are aware of the major risk factors, symptoms and treatments for cholera.^{6,26,32,33} Thanks to community-based education efforts around the country (particularly through the HEW programme), many Ethiopians have participated in health communication initiatives where they have learnt about the importance of handwashing with soap, using latrines or toilets instead of open defecation, and ensuring drinking water is piped or treated.^{13,23,34–36} People who fail to properly wash their hands with soap or use latrines or toilets typically either lack access to these facilities, or these facilities are inadequately designed, cleaned or maintained.

People are also aware of the danger that cholera poses and can reliably distinguish cholera symptoms from other forms of diarrhoea. Community members in Dire Dawa and the Somali Region described cholera diarrhoea as significantly different in both colour and consistency from other types of loose stool; instead of brown, bloody or yellow with intestinal bile, cholera diarrhoea was described as similar to the starchy water left in a pot after boiling pasta or

potatoes.^{31,37} Those in the Somali Region even use different words and phrases to signify cholera and distinguish it from other types of diarrhoeal diseases or loose stools – calling it ‘*daacuun*’ rather than ‘*shuban*’ (diarrhoea) or ‘*shuban biyood*’ (watery diarrhoea). Cholera was understood to be significantly more dangerous and deadlier than other types of diarrhoea, and yet preventable with proper water and sanitation infrastructure.^{33,38}

The Government of Ethiopia has made important advances in recent years to diagnose, report and respond to cases and outbreaks of cholera.⁶ During previous outbreaks, however, studies and media outlets reported that Ethiopian public health authorities euphemistically classified suspected cholera cases or outbreaks using the generic term ‘acute watery diarrhoea’ rather than testing for and reporting specific diagnoses.^{9,39} Ripoll found that the ‘reluctance of State [in Ethiopia and Somalia] and humanitarian actors to acknowledge and speak of cholera contributes to the spread of the disease’.³³ The stigma of cholera infection significantly affects the actions and transparency of governments and political actors afraid of losing public and political support.

Social and structural determinants of cholera in Ethiopia

Understanding the social determinants of health is crucial for developing effective strategies to prevent, control and mitigate the impact of diseases like cholera.⁴⁰

The social determinants framework focuses attention on individuals’ and communities’ behaviours, such as improper handwashing or delayed healthcare seeking. A criticism of this framework is that it often fails to address and prioritise the political, economic and health systems that limit people’s actions and decisions.⁴¹

A focus on structural determinants instead prioritises actions to address specific policies, social inequities, and the stigma, discrimination and neglect that affect individuals’ exposures to pathogens and their access to (and experiences of) healthcare. A focus on structures also highlights the responsibilities and power of governments, international organisations and other stakeholders to shape individual behaviours, knowledge and attitudes.⁴² Rather than focusing responsibility and interventions mostly on the individuals and communities at greatest risk of cholera (e.g., those who are displaced or impoverished), responsibility and interventions are focused on changing the policies and material conditions that shape health outcomes.

The most important structural and social determinants of cholera infection and mortality in Ethiopia are described below, along with recommended priorities for immediate actions and priorities for long-term investment.

1. Lack of adequate water and sanitation infrastructure

Safe, piped water sources

Communities and individuals without access to safe, piped water sources often rely on contaminated surface water or unsafe open wells for water to drink and wash.^{43,44} Using these unreliable water sources increases people’s exposure to cholera-causing bacteria and other pathogens in faecal matter. Around half of Ethiopia’s population lacks access to safe drinking water, and 85% of schools lack a safe water supply.⁶ In Dire Dawa, one of the largest cities in the country, 41% of the population still uses rivers to collect drinking water.²⁶ Many residents of Dire Dawa then purchase commercially available chemicals to treat this water, including AquaTab and liquid or powder bleach formulas.²⁶

Mapping areas of population mobility, displacement and marginality can identify where people are most likely to use untreated water sources or waterways for combinations of drinking, washing and open defecation. These sites include rivers and dry riverbeds with dug wells. In the Democratic Republic of the Congo, mapping was used to identify areas at risk of cholera outbreaks. Disease surveillance and epidemiological data was used to inform the building

and/or rehabilitation of drinking water networks and stations, including ones where people collect drinking water from lakes.⁴⁵ For Ethiopia, building on data from hotspot *woredas* where cholera has recently been detected, elected *kebele* (a local administrative unit of the neighbourhood or community) leadership and HEWs could map rivers and dry riverbeds where people often use and collect water. These locations should be priorities for constructing new water stations, piped water infrastructure and latrines, designed for both resident and mobile populations.

Adequate latrines or toilets

Communities and individuals without access to adequate latrines or toilets are more likely to defecate outdoors – and they often do so close to surface water sources where they can then wash or bathe. Also, communities and individuals who lack access to waste and sewage management systems are more likely than others to dispose of dirty laundry, soiled nappies (diapers) and similar items in places that can further contaminate water sources and facilitate cholera transmission.

Around 91% of Ethiopians lack access to latrines, toilets or other basic sanitation facilities.⁶ In a study of informal settlements in Addis Ababa, 94.6% of people's sanitation facilities were 'unimproved'.⁴⁶ In Dire Dawa, 12% of adults reported defecating in the same rivers from which their household collected water. Of the people who defecate in rivers or bushes in Dire Dawa, most do so not because they choose to, but because they lack a latrine or toilet at home.²⁶ Similarly, in the rural Guradhamole *woreda*, a cholera hotspot in the Somali Region, while people's awareness of cholera risks and prevention was reported to be good – especially among women – they lacked latrines and access to clean water.³³ There, people continued to use river water for drinking and washing, even as it was contaminated by open defecation and livestock use.³²

Sanitation infrastructure that meets the needs of the users

Access to sanitation infrastructure that meets the needs of users is fundamental to improving sanitation behaviours. Throughout Ethiopia, in rural as well as urban settings, the lack of private latrines or toilets (or ones not shared with other households or families) has been shown to be a key factor in their popularity and effectiveness.^{27,43,46,47} Newly constructed, clean, ventilated and deeply dug latrines with easy access to handwashing facilities are more likely to be used than older or messier latrines.^{46,48}

Women report specific gendered needs to find sanitation facilities useful and appropriate (and preferable to open defecation and washing). These needs include privacy, lighting, adequate room for dressing and care of children and babies, diapering and laundry facilities, and clean water access for bathing close to latrines or toilets.^{28,33}

Religious practices are also important to take into consideration. For example, Muslims prefer to be able to take ablutions and wash close to latrine facilities, in a space that is well-maintained, ventilated and segregated by gender.

Substantial investment is needed to provide potable piped water, new latrines or toilet facilities and washing and bathing spaces using high-quality materials and sustainable designs. In addition to new construction projects, the sustainable maintenance and regular cleaning of these spaces should be prioritised for investment.

Language to avoid stigma and signal innovation

A reframing and renaming of water and sanitation infrastructural investment could decrease its stigma and disassociate it from personal hygiene and individual behaviours. New language could centre improvements on the functionality, safety and design of people's living conditions, homes, workplaces, communities and public spaces. Policymakers should therefore consider modifying the language used for major water and sanitation infrastructural investments to signal innovation and permanent infrastructural improvements rather than personal cleanliness and individual hygiene behaviours. For example, the WASH acronym (water, sanitation and

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www.doi.org/10.19088/SSHAP.2024.004

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hygiene) can be interpreted to mostly be about **individual washing** – washing hands, washing containers and treating water – and not material deficiencies, lack of public service investment or the structural and infrastructural challenges people face finding clean drinking water sources and adequate toileting facilities.

2. Displacement and conflict

Population displacement and the conflicts that cause displacement are key drivers of cholera risk and mortality in Ethiopia.⁴⁹ Conflicts have also destroyed vital health, water and sanitation infrastructure. Political insecurity throughout the country hinders responses to natural disasters, disease surveillance efforts, distributions of supplies and, importantly, relationships of trust between governmental authorities, healthcare providers and communities in need.

Facilities and materials necessary for cholera control, surveillance, testing, treatment and prevention have been devastated in the Tigray Region of the country since 2020.^{49–51} By June 2021 (18 months after the start of the conflict there), only 3.6% of all health facilities, 13.5% of all hospitals and larger referral health centres, and none of the small community-based health posts in the region were functional.⁵⁰ Since the official ceasefire in 2022, few resources have been allowed into the Tigray Region to rehabilitate the infrastructure and healthcare facilities destroyed in the conflict. Research and disease surveillance are also difficult and dangerous throughout the northern, conflict-affected parts of the country.⁴⁹ While the Tigray Region is surely at a high risk of a cholera outbreak, disease surveillance data have not been consistently or quickly reported by the Government of Ethiopia or WHO.^{18,52}

Conflict, political insecurity and human rights abuses affect healthcare and the risk of disease several parts of the Amhara Region as well. In 2023, the security situation in the Amhara Region deteriorated as violence escalated between armed groups and governmental forces. This led to significant damage to hospitals and water infrastructure, both necessary to prevent and control cholera.⁵³ In the Oromia Region of Ethiopia, cholera is present in the environment and cholera cases continue to emerge. However, political insecurity, rising reports of criminal activity and internal population displacement present major challenges for disease surveillance and intervention.^{44,52}

Refugees, asylum seekers and IDPs are at elevated risk of exposure to cholera. Ethiopia is the third largest host for refugees in Africa. In 2023, Ethiopia hosted approximately 942,000 refugees and asylum seekers, mostly from South Sudan, Somalia and Eritrea; women and children made up 81% of this population. While most refugees in Ethiopia live in camp settings, many others live in urban areas and informal settlements, including 76,000 in Addis Ababa. There were also approximately 4.4 million IDPs living in camps and settlements throughout the country in 2023.⁵⁴ While camps and IDP settlements have been successfully targeted in recent years for OCV campaigns, these populations still have little to no access to water and sanitation facilities, and they remain at high risk of cholera outbreaks.^{6,52,54}

Specifically in the Tigray, Amhara and Oromia Regions, there needs to be coordinated support to end conflict, increase humanitarian assistance, rebuild the health system and public infrastructure, and protect the workforce that provides cholera research and data collection. Investment is urgently needed to rebuild or restore hospitals, water and sewage systems, electricity and internet networks, and other public infrastructure necessary for cholera responses that have been damaged or destroyed during the conflict. The priority should be to prevent cholera, provide supplies to control and treat cholera, and support the salaries and benefits for the personnel working towards these. In terms of locations, IDP camps, refugee camps and informal settlements of displaced people should be prioritised within each conflict-affected region.

3. Lack of adequate healthcare services and resources

Cholera surveillance

Multiple interventions and studies have shown the effectiveness of cholera control and OCV campaigns in Ethiopia, even in conflict-affected *woredas* and IDP settlements.⁶ Disease surveillance, diagnostic testing and laboratory capacity have also improved in much of the country in recent years, and these are all key elements of the government's cholera response plan.⁶

However, gaps and challenges remain. Major challenges to cholera control include a lack of rigorous disease surveillance, a lack of supplies of rapid diagnostic tests and inadequate laboratory facilities in places at highest risk of cholera outbreaks. There are, for example, inadequate laboratories to test for cholera throughout the eastern part of Ethiopia, including the cities of Jigjiga and Dire Dawa as well as in multiple refugee camps and towns (e.g., Moyale and Dolo Ado) along the Somaliland, Somalia and Kenya borders where outbreaks of cholera and acute watery diarrhoea have recurred.

Even in areas with adequate or functioning laboratories, supplies of rapid diagnostic tests for cholera should be provided to all HEWs and health posts in every hotspot *woreda* that has experienced cholera cases in the last five years to provide early warnings of cholera outbreaks.^{6,7} These rapid diagnostic tests were designed specifically for use in resource-constrained environments and humanitarian emergencies – and have already been used by HEWs throughout the country.^{7,9,55} They can also be used in areas without adequate or functioning laboratories.

A robust community-based surveillance system could monitor cholera cases, track transmission patterns and identify disease dynamics in high-risk areas, including conflict-affected parts of the country, informal settlements and camps, and in crowded gathering places.³⁰ This system could be built and funded sustainably and be part of cholera early warning systems that predict and mitigate outbreaks. Early warning systems should use real-time data on potential cases from HEWs and other health providers in addition to data on population displacement, labour migrations and environmental factors (e.g., rainfall and water quality).^{7,8,18,19}

The Government of Ethiopia and its partners should be encouraged to remain transparent about cholera outbreaks, epidemiology and responses despite challenges associated with these. This information will identify where international partnerships can help address gaps in disease surveillance, health system capacity and financing for significant infrastructural investments.

Cholera vaccines

The distribution of OCVs is effective but alone is insufficient to prevent or effectively respond to cholera outbreaks. While OCVs remain in demand, there is a limited supply of OCVs, limited numbers of health workers to deliver OCVs, and a lack of vehicles and drivers to provide logistical support for OCV campaigns. These limitations are particularly challenging in conflict-affected parts of the country, including the Tigray Region and, to a lesser extent, in politically insecure parts of the Amhara, Afar and Oromia Regions.

Given the efficacy, popularity and affordability of OCVs, communities at high risk of cholera outbreaks (e.g., in hotspot *woredas* and in camps of displaced persons where cholera has repeatedly emerged and where adequate water and sanitation infrastructure are unavailable), health planners should consider providing two doses of the OCV ahead of a cholera outbreak.^{3,7,8,17} Teams could stockpile and pre-position additional vaccine supplies in hotspot *woredas* where cases of cholera are most likely to emerge.

Wherever cholera is detected, OCV campaigns should start with a rapid distribution of first doses, with second doses planned and provided thereafter. This is especially important for high-risk populations, including displaced persons, migrants, residents of slums and informal

settlements, people in healthcare facilities and schools, and those at risk of worse health outcomes – especially women and children. Two doses of OCVs have around 70% to 80% rate of effectiveness in outbreak situations, and they can provide protection for at least three years.^{7,8,17} Even just one dose of the OCV can provide short-term protection,^{7,8,25} making it a practical option in outbreaks in which a rapid reduction in short-term risk is needed. Coordination is needed to link plans to distribute OCVs with disease surveillance systems, early warning systems and case-reporting mechanisms, and to collaborate with HEWs.

Cholera treatment

People in Ethiopia are aware of the potential effectiveness of vaccines, oral rehydration solutions, antibiotics and clinical care for severe cholera cases. HEWs and health posts are popular resources for cholera prevention and home- and community-based treatment. However, in rural, underserved and conflict-affected locations, health-seeking behaviours are constrained by the paucity of higher-level functional health centres and hospitals close to people's homes. People face challenges in accessing transportation to high-level health centres and hospitals for primary healthcare in general, and for cholera treatment in particular. Ambulances and other vehicles for patient transportation are in short supply in many *woredas* – especially in remote, rural and conflict-affected parts of the country. Deadly traffic collisions and criminal activity along major roadways are now commonplace in Ethiopia, especially in the Afar and Oromia Regions, making vehicle travel both dangerous and expensive. The lack of safe transit may significantly hinder people's ability to travel to healthcare facilities. This may also affect the ability and willingness of healthcare providers, aid workers and government officials to travel for cholera responses.

4. Labour migration and population mobility

People migrate and travel abroad and within Ethiopia for many reasons, including for employment, school, trade, shopping and the seasonal grazing and herding of livestock. While these moves can present economic opportunities, migration can also present risks of cholera infection and mortality when people lack access to safe water, adequate sanitation, healthcare and food along their routes or in their destinations. For example, cross-border movements from Ethiopia to Yemen as people migrate eastward for work, and cross-border flows of people between Somalia, Kenya and Ethiopia, present significant risks for cholera transmission.^{39,56}

Labour migrants may also be exposed to gathering places known to be at risk of outbreaks or hotspots for cases of cholera, including transit stations, migrant labour camps and large factory settings.⁶ Typically, these spaces are informally built and organised, and they lack adequate latrines or toilets, safe piped water sources and staffing to ensure facilities are kept clean and maintained. Ethiopia's investment sites, where labour migrants work and reside in low-quality housing, present opportunities for important cholera prevention and control investments.⁶

Pastoralist and agropastoralist communities in Ethiopia, mostly in the Somali and Afar Regions as well as in parts of southern Ethiopia, are highly mobile. These communities often cross borders, but their mobility alone does not increase their risk of cholera exposure. Unlike many IDPs, refugees and labour migrants, pastoralists typically live and travel in places without population density or crowded housing conditions.²⁹ However, when pastoralists and agropastoralists are displaced due to conflict, lose their livestock, settle in year-round camps or communities, and/or participate in the Hajj and other religious pilgrimages, their risk of cholera may increase.

5. Lack of food safety infrastructure, regulation and enforcement

V. cholerae can be transmitted on food washed in contaminated water or via hands that have not been washed properly. Therefore, unsafe food is related to the lack of safe water and inadequate sanitation infrastructure where food is prepared.

Many restaurants, street vendors and home cooks in Ethiopia lack access to potable water needed to safely wash and prepare food, and they often lack adequate toileting and handwashing facilities as well. In a recent study of a cholera outbreak in Jijjiga, people had a higher risk of cholera infection if they consumed unrefrigerated food, dined in commercial restaurants or purchased food from street vendors.⁵⁷ A study on the outbreak of cholera in Addis Ababa found the consumption of raw vegetables to be a risk factor for cholera infection.⁵⁵ Food service workers mostly report good knowledge of safe food handling and hygiene practices, but they lack adequate water, sanitation and hygiene infrastructure.²⁴

In Ethiopia, there is also variable and inadequate enforcement of food safety laws and regulations by local government health inspectors and HEWs.^{58–61} In places lacking adequate health inspectors, HEWs could be trained to engage with restaurants and other food vendors to ensure they are aware of food safety practices. Support from government and international organisations could help provide or subsidise potable water supplies, help build or renovate latrines, and provide handwashing stations in and around restaurants and marketplaces where people eat and shop.

6. Contamination of holy water and religious pilgrimage routes

Holy water from natural springs

Holy water is a common element of ritual prayers, spiritual cleansing and healing rituals among Orthodox Christian and Muslim Ethiopians throughout the country.^{31,62} Holy water is frequently consumed, poured over or bathed in by people who are sick (including with gastrointestinal diseases^{63,64}) or who exhibit symptoms of a wide range of mental illnesses and spiritual afflictions. Holy water collected from natural springs is often stored for ritual use in churches, monasteries and mosques throughout the country.^{31,64,19}

Natural springs often create pools where people can bathe or collect holy water. There are typically shelters, seating areas and worship spaces near natural springs and pools, but most of these lack adequate latrines, toilets, waste disposal and potable water sources. Instead, when people travel and visit, they are forced to defecate in the outdoors, use basic communal latrines and drink untreated water.

One well-known site for holy water collection, consumption and bathing exists in Erer, in the northern Somali Region of Ethiopia, a one-day walk or bus ride from Dire Dawa. A natural spring in Erer is reputed for its healing properties, and ill people from Orthodox and Muslim backgrounds travel for long distances to drink and bathe there.³¹ However, Erer has also experienced recent outbreaks of cholera,²⁷ presenting an infection risk. One study found that consumption of a contaminated holy water source was an independent risk factor for disease in an outbreak of cholera in Addis Ababa in 2017.^{6,55}

There are opportunities to develop locally appropriate systems for protecting religious ceremonies and sites from contamination. These could be developed by creating committees or teams that bring together religious leaders and traditional leaders (e.g., Ugaas in Somali communities and Sultans in Afari communities) as well as local elected *kebele* committees and women's groups in combination with facilities managers, engineers and planners. These teams would need to design water surveillance and testing protocols for major Orthodox, Protestant and Muslim holy water sources and supplies. The teams would also need to agree to test and treat contaminated holy water in an appropriate way (e.g., potentially through boiling or filtering, rather than chemical treatment) to ensure its safety but not disrupt perceptions of its spiritual efficacy.

Routes and destinations for religious pilgrimages

Religious pilgrimages are common in Ethiopia. There are pilgrimages for the Hajj among Ethiopian Muslims or for *Timkat* (Epiphany) and *Fasika* (Easter) among Christians, as well as

for numerous additional celebrations and holidays. Pilgrimage tourism contributes significantly to local Ethiopian economies.^{65,66} Many religious pilgrims walk either part of the way or the entire way between their homes and religious sites, or they travel in large groups and in shared vehicles. One challenge faced by religious pilgrims is the lack of sanitation infrastructure at transit stations, along the walking or driving routes, and then in their destinations. Therefore, it is necessary to coordinate with religious leaders for disease surveillance, data collection and the design and implementation of cholera prevention measures to serve religious pilgrims.

There are opportunities for partnerships with local leaders to map pilgrimage routes and coordinate religious calendars across Orthodox, Protestant and Muslim traditions. These partnerships could build and maintain new and sustainable sanitation facilities close to major religious gathering sites, including along important pilgrimage routes. For example, a system of clean, new and deep latrines could be built and maintained by religious and *kebele* leadership committees in the East Hararge part of the Oromia Region along the road between the towns of Dire Dawa and Asebe Teferi, especially near the pilgrimage site at Kulubi, as well as from Dire Dawa out to the natural springs in Erer. With assistance from networks of churches, monasteries and mosques, additional small sanitation facilities could be built and maintained along these and other popular pilgrimage routes throughout the country.

Health experts have partnered for many years with religious and traditional leaders in the Somali Region to address people's reservations about measles vaccinations, hospital births, contraception and other health challenges.³² Health experts could join as a partner on this kind of initiative as well.

Partnerships to project water sources

Partnerships between international agencies, the Government of Ethiopia and religious leaders from the Ethiopian Orthodox, Protestant and Muslim communities could be developed to recast Ethiopian riverways, seasonally dry riverbeds, ponds and lakes as all part of greater holy water flows, to dissuade people from contaminating these water sources with open defecation and waste disposal. Natural springs with holy water are already perceived to derive from surface and underground freshwater flows. The famous Gish Abay natural water spring near Lake Tana and Bahir Dar, for example, is believed by many Orthodox Christians to be the source of the Blue Nile, flowing directly from biblical paradise, thus imbuing it with spiritual healing potential.⁶⁷ Religious and traditional leadership could be brought into a national plan to revitalise and clean Ethiopia's waterways, as a way to ensure the continuing legacy and efficacy of holy water applications.

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Acknowledgements: This brief was reviewed by Megan Schmidt-Sane (Institute of Development Studies, IDS), Eva Niederberger (Anthrologica) and Juliet Bedford (Anthrologica). Research assistance was provided to the author by Joshua Jacobsen (American University, Washington, D.C., USA). The brief was edited by Harriet MacLehose (SSHAP editorial team).

Suggested citation: Carruth, L. (2024). *Key Considerations: Social, Structural and Community Dynamics of Cholera Transmission and Mortality in Ethiopia*. Social Science in Humanitarian Action (SSHAP). www.doi.org/10.19088/SSHAP.2024.004

Published by the Institute of Development Studies: April 2024.

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