

Prevention first

February
2023



Why clean water and hygiene are
the best medicine against the spread
of drug-resistant infections

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All-Party Parliamentary Groups

The All-Party Parliamentary Group (APPG) on Antibiotics and APPG on Water, Sanitation and Hygiene have collaborated to deliver this inquiry.

The Antibiotics APPG exists to raise the profile of antibiotic resistance, the need to preserve the appropriate use of antibiotics through education (including non-human uses), the lack of new treatments for bacterial infections and to help accelerate efforts to discover, research and develop new treatments. The [British Society for Antimicrobial Chemotherapy \(BSAC\)](#) serves as Secretariat to the Antibiotics APPG. BSAC is a learned society whose members are among the world's leading infectious disease physicians, pharmacists, microbiologists and nurses.

The Water, Sanitation and Hygiene APPG aims to raise awareness within Parliament and Government of the impact that a lack of water, sanitation and hygiene (WASH) has on the lives of people around the world, and the Government's obligation to help meet the Sustainable Development Goal on water and sanitation. WaterAid UK serves as Secretariat to the WASH APPG. [WaterAid](#) is an international not-for-profit, determined to make clean water, decent toilets and good hygiene a reality for everyone, everywhere.

WASH APPG members:

- **Fleur Anderson MP**, Labour, Co-Chair and Registered Contact
- **Lord Leigh of Hurley**, Conservative, Co-Chair
- **Peter Bottomley MP**, Conservative, Vice-Chair
- **Paulette Hamilton MP**, Labour, Vice-Chair
- **Matthew Offord MP**, Conservative, Vice-Chair
- **Patrick Grady MP**, SNP, Vice-Chair
- **Rachel Hopkins MP**, Labour, Vice-Chair
- **Alex Sobel MP**, Labour, Officer
- **Sarah Champion MP**, Labour, Officer

Antibiotics APPG members:

- **Julian Sturdy MP**, Conservative, Chair and Registered Contact
- **Hilary Benn MP**, Labour, Co-Chair
- **Maggie Throup MP**, Conservative, Co-Chair
- **Patrick Grady MP**, SNP, Co-Chair
- **Baroness Bennett of Manor Castle**, Green, Secretary
- **Lord Trees**, Crossbench, Treasurer

This inquiry is supported by Trio Policy, a strategy consultancy operating in the private, public and voluntary sector in the fields of international development, human rights, foreign policy, sustainability and corporate social responsibility.

Foreword



A wake-up call we can't ignore.

We can't win the battle against antibiotic resistance without acting on the water, sanitation and hygiene crisis in healthcare facilities now.

Antibiotics are essential to modern healthcare. **Without effective antibiotics, premature babies would not survive. Cancer chemotherapy, organ transplants and joint replacement surgery would be impossible.**

However, the overuse of antibiotics can lead to the spread of bacteria that have developed resistance to the antibiotics they have encountered – meaning they can no longer kill them.

This is a major threat to global health. Resistance to antibiotics and other drugs designed to kill infections has already contributed to at least 5 million deaths a year,¹ more than HIV, malaria and breast cancer individually. Without effective action to tackle the spread of antibiotic resistance, not only will many infectious diseases effectively have “no cure and no vaccine”, but **it could also cost the global economy over \$100 trillion.²**

The spread of resistant infections is particularly prevalent in poorer countries and the lack of adequate water, sanitation and hygiene in many healthcare facilities in least developed countries is a major factor driving this. When clinics and hospitals lack water supply or handwashing facilities, midwives, for example, can't wash their hands between patients and don't have enough water for safe births – putting new mothers and their newborn babies at risk.

This means antibiotics are used to prevent and treat infections that could be prevented with adequate water, sanitation and hygiene facilities. Investing in these basic services in healthcare facilities decreases the demand for antibiotics, breaks the chain of infection and the opportunity for a resistant infection to become dominant.

Without effective global action, the UK's world leading efforts to tackle antibiotic resistance here in the UK will be of little use as **the majority of multi-drug-resistant infections treated in the UK originated elsewhere in the world, particularly low- and middle-income countries.**

Tackling this problem is therefore critical to UK public health and to protect the NHS. The UK is uniquely placed to lead global efforts to tackle this threat – but only if all relevant Government departments play their part. Investment in water, sanitation and hygiene in healthcare facilities in the world's poorest countries is an immediate, affordable high-impact option for tackling antibiotic resistance that provides a rapid return on investment. It buys time to develop new drugs and other approaches to tackle antibiotic resistance.

To provide this leadership, the UK Government must provide its fair share of funding for water, sanitation and hygiene in healthcare facilities, lead international advocacy in the G7 and elsewhere, and use all relevant programmes and partnerships to tackle antibiotic and other forms of antimicrobial resistance.

Julian Sturdy MP and Fleur Anderson MP, chairs of the All Party Groups on Antibiotics and Water, Sanitation and Hygiene.

Executive Summary



Antimicrobial resistance (AMR) occurs when germs, such as bacteria or fungi, are no longer affected by drugs designed to kill them. Resistance to antibiotics is a large part of this problem, which is **already a major cause of death worldwide, contributing to around 5 million lost lives a year**. It has been described as a significant threat to humanity, one that most threatens the lives of young children under five, and those living in low- and middle-income countries (LMICs) – particularly in sub-Saharan Africa.

The COVID-19 pandemic has exposed the devastating economic and societal consequences of infectious disease spreading unchecked – risks that are expected to increase significantly over the course of the century because of climate change. A 2016 World Bank report shows that a high-case scenario of AMR could push up to 28 million people, mostly in developing countries, into poverty by 2050. Global increases in healthcare costs may range from \$300 billion to more than \$1 trillion per year by 2050. And **the wider economic costs could be as high as \$100 trillion by 2050**.

Infection prevention and control (IPC) is of critical importance to containing and controlling antibiotic resistance. Yet in low-income countries, **a lack of water, sanitation and hygiene (WASH) services in healthcare facilities (HCFs) is creating environments where harmful bacteria can thrive**.

A lack of WASH in HCFs not only drives the spread of resistant infections by exposing patients and health workers but also by encouraging the overuse of antibiotics to prevent and treat infections.



▲ Adela, with her baby Francis, collects water from a tap just within the health centre compound. Busolwa Health Centre, Nyang'hwale District, Tanzania. June 2019.

WaterAid / James Kyimba



Stepping up investment in WASH in HCF has the potential to help save lives from day one, and to continue delivering returns for decades to come.

◀ Shagormoni, Health Worker, collects water from a tap in the community health clinic. Kashmiri Community Clinic, Kashmiri Union, Bangladesh. December 2021.

Half of the world's HCFs do not have basic hand hygiene services – rising to two thirds across the 46 least developed countries (LDCs). In 2021, 3.85 billion people used HCFs without basic hand hygiene services, 1.7 billion used facilities that lack basic water services, and 780 million used facilities with no sanitation services.

This means that doctors and nurses are unable to wash their hands before and after touching patients, new mothers are unable to clean themselves or their babies, and health workers and patients alike have no safe and hygienic toilet. This is causing repeated disease outbreaks and the need to treat them with antibiotics, contributing to the increase in antibiotic resistance around the world.

The provision of WASH in HCFs is therefore crucial to reduce the spread of many life-threatening infectious agents, from multidrug-resistant bacteria to viral pathogens like Ebola and COVID-19. It stops the spread of antibiotic resistance by reducing infections acquired in HCFs and reducing the need to use antibiotics to prevent or treat them. According to the WHO, **70% of healthcare-acquired infections (HCAIs) could be prevented through good hand hygiene and other cost-effective healthcare practices facilitated by WASH.**

Targeted investment in WASH in HCFs in the world's poorest countries offers an immediate, affordable and achievable high-impact option for tackling antibiotic resistance. The estimated cost of achieving universal access to WASH in existing HCFs in the world's 46 least developed countries is around \$9.6 billion – an average of just \$0.65 per person per year. To make this a reality, catalytic funding of \$601 million annually up to 2030 would meet the external financing needs and complement efforts by least developed countries to mobilise resources domestically – a modest fraction of what is currently being spent on aid for global health and WASH aid. These investments would not only yield benefits of up to 16 times their value, but also start paying for themselves within a year and produce savings of around \$1.50 for every dollar invested thereafter,

The first step in reducing the need for antibiotics is to get the basics of prevention right. Yet, **half of the world's healthcare facilities do not have basic hand hygiene services** – rising to two thirds across the 46 least developed countries.

As COVID-19 has shown, infectious diseases do not respect borders. Most resistant infections treated by the NHS originated elsewhere in the world.

through a range of immediate and long-term cost savings.

In addition to the economic arguments, there is a moral imperative to ensure patients and health workers have access to universal, sustainable and safe services. Maternity services are also severely impacted by the lack of adequate and safe WASH. In fact, women also account for the majority of health and care workers globally, so are disproportionately affected by the lack of WASH in HCFs in LDCs.

That said, there is a very clear imperative for the UK to act on antibiotic resistance and AMR to protect our own health and economy. **AMR is already a financial burden on the NHS. The UK Government has predicted that AMR will be the leading cause of death domestically by 2050.**

Yet, while the UK is recognised as a world leader in its approach to tackling antibiotic resistance domestically – with innovative approaches to research and the use of antibiotics – most resistant infections treated by the NHS originated elsewhere in the world. Gains made by UK efforts to tackle antibiotic resistance will be undermined if it does not do more on this internationally.

The Government has recognised the necessity of improved WASH services globally, particularly in HCFs, to slow the spread of antibiotic resistance. However, **the steep decline in UK bilateral aid for WASH raises concerns about the UK's commitment to the sector and to the fight against antibiotic resistance.** This retreat from our role at the forefront of the WASH sector puts our national health security at risk.

The UK should ensure that it is working across Government to tackle antibiotic resistance by: leading international advocacy; providing its fair share of additional financing in support of countries' own plans on WASH in HCFs (instead of roadmaps); advocating for additional financing from others and ensuring all its programmes recognise and tackle the problem – this includes advocating for WASH in HCFs to be a central component of multilateral initiatives such as the Pandemic Fund and Global Financing Facility for Women, Children and Adolescents (GFF); ensuring that the UK prioritises WASH in HCFs in its bilateral programmes and investments; championing action on WASH in HCFs at international fora, such as the G7 and G20.

With UK expertise and leadership to galvanise multilateral finance and multi-sectoral engagement, we can improve health outcomes, tackle the spread of antibiotic resistance, and change millions of lives at home and abroad.

The UK is a world leader when it comes to antibiotic resistance. It is uniquely placed to lead global efforts to combat antibiotic resistance and to catalyse progress in achieving universal access to WASH in healthcare facilities.

Overview

Purpose

The objective of the inquiry was to understand the UK's role in curbing antibiotic resistance, through water, sanitation, and hygiene (WASH) services in healthcare facilities (HCFs) in the least developed countries (LDCs).

Process

The inquiry commenced in April 2022 and has involved:

1. A call for written evidence on the link between WASH in HCFs and antibiotic resistance.
2. Two oral evidence sessions in October and November 2022 with academics; policy professionals; and health workers and parliamentary officials from LDCs.
3. An interview with Dame Sally Davies, the UK's Special Envoy on AMR.
4. The development of this report to share the findings from the inquiry and make recommendations on the role of the UK Government to address this issue.

Lines of inquiry

The inquiry focused on understanding the link between antibiotic resistance and the lack of WASH facilities in healthcare settings. This involved inquiring about the effect a lack of adequate WASH in healthcare settings has on levels of infection and, as a result, the use of antibiotics and the spread of antibiotic resistant infections. It also looked at the differential impact on women and girls, through maternity services and child and maternal health, and on healthcare and healthcare workers, the majority of which are women. We also examined the links to pandemic prevention and control, and the costs of solving the problem, as well as the economic impact of not doing so.

Questions to help identify potential policy solutions included:

- What are the actions health workers, LDC Governments, donors and the private sector should take?
- What should the UK Government do and prioritise?
- What specific role can the UK play? What opportunities are there to do more? What more should the UK be doing?

Section 1:

Antibiotic resistance

Antibiotic resistance is an important component of AMR that affects LDCs due to the high prevalence of healthcare-associated infections (HCAIs).

Antibiotics treat bacterial infections. AMR encompasses resistance to drugs to treat infections caused by all microbes such as parasites (e.g. malaria), viruses (e.g. HIV) and fungi (e.g. Candida).³ Antibiotic resistance, however, occurs when bacteria become resistant to the antibiotics used to treat them. These bacteria, when they infect people, are then harder to treat compared to non-resistant bacteria.³ Inquiry findings relate to both AMR and antibiotic resistance, however the focus of the inquiry and this report is antibiotic resistance.

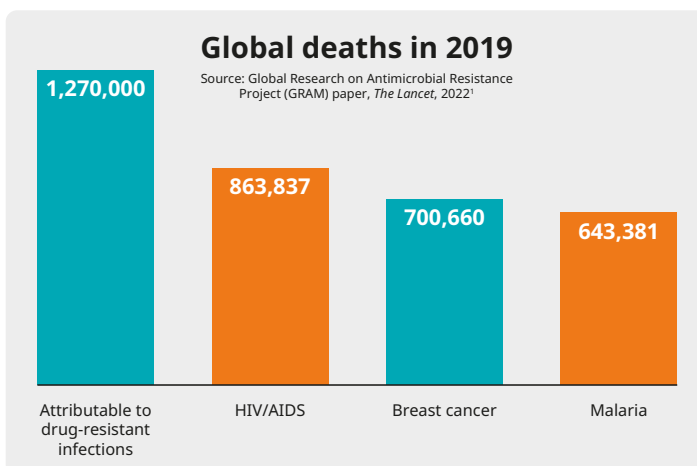
AMR is a leading cause of death around the world, with the highest burden in low-resource settings.

There were 4.95 million deaths associated with AMR in 2019 and over 1.27 million deaths directly attributable to AMR. This is more than HIV/AIDS, malaria, and breast cancer individually.⁴ Yet it does not receive either the attention or funding given to tackling these diseases.^{5,6}

A recent study of neonatal sepsis and AMR in low- and middle-income countries (LMICs) such as Bangladesh, Ethiopia, India, Nigeria, Pakistan, Rwanda and South Africa found that of 390 bacteria (Gram-negative isolates⁷) studied, 97.2% were resistant to the common antibiotic, ampicillin, whilst 70.3% of the bacteria were resistant to a broad-spectrum antibiotic recommended by WHO to treat neonatal sepsis known as gentamicin.⁸

Deaths associated with AMR are particularly devastating in LMICs. The death rate attributable to resistance was shown to be highest in sub-Saharan Africa and it is expected to rise over time.⁹ The UK AMR Review, commissioned in 2014,

Drug-resistant infections are now a leading cause of deaths worldwide



estimated that by 2050, up to 90% of all deaths related to AMR will come from Africa and Asia.¹⁰ Depending on the study and geographical area, it is estimated that between 4% to 56% of all deaths in the neonatal period among babies born in hospitals are attributable to HCAIs, with neonatal intensive care units commonly associated with the acquisition of antimicrobial-resistant pathogens.¹¹

In LMICs, more than 99.5% of those deaths occur in children under five.²

“One child dies every 3 mins of AMR according to the WHO. It’s serious and it’s partly a man-made problem as we are misusing antibiotics. We need to start with prevention though.”¹²

*Dame Sally Davies,
UK Special Envoy on AMR*

"No one is safe until everyone is safe. It's about equity." – Dame Sally Davies¹²

As COVID-19 has shown, infectious diseases do not respect borders – a threat anywhere poses a threat everywhere. This must be an urgent wake up call for immediate action to combat the spread of drug-resistant bacteria.⁵

"To stop new drug-resistant bugs from traveling from hospitals in Kenya to the UK's front door, we need to ensure that the safeguards are in place. As we've seen with COVID, it takes time for the global community to develop vaccines and treatments for emerging threats and therefore it is critical that the fundamentals of hygiene are in place to control and prevent further spread." – UNICEF¹³

International transmission routes are very common. The majority of multi-drug-resistant infections treated in UK hospitals initially came from elsewhere in the world. As recognised in the UK's five year action plan for AMR:

"International travel is widely recognised to play a major role in the global spread of AMR. People travelling to regions with a high prevalence of resistant bacteria are at greater risk of being colonised in their gut by these organisms in their microbiomes. This makes them more likely to acquire a drug-resistant infection themselves, and to spread it to others when they return home."¹⁵

Failure to act globally therefore means that the UK is constantly vulnerable to the emergence of resistant infections elsewhere and this undermines the UK's health security and its scientific investment and innovation on this issue.¹²

"Antibiotic resistance is inherently a global problem. Misuse in one country, or poor WASH in one country, will impact the health of other countries ... we must work to develop infrastructure worldwide to prevent resistance/ variants developing anywhere." – Anthony McDonnell and Katherine Klemperer²

We are at important cross-roads for antibiotic resistance.

The spread of resistant bacterial pathogens is outpacing our current capacity for antibiotic discovery, making the silent pandemic of antibiotic resistance one of the leading health threats of our time.

"We stand at the precipice of a post-antibiotic era, in which once easily treatable common infections will become challenging to treat and, in many cases, lethal." – WaterAid and BSAC⁵

"There aren't plausible and good treatments for antibiotic resistance in the wings. We are possibly running out of ways to kill antibiotic resistance." – Anthony McDonnell¹⁶

If antibiotic resistance is not addressed, it will have a devastating impact on health systems

Antibiotic resistance, and AMR more broadly, can dismantle health systems as it undermines the capacity of workers but also has impacts on the affordability of care.

"We work in Africa and 70% of the bacteria that we isolate are resistant to the first line antibiotics." – Professor Tim Walsh¹⁷

Section 1:

Antibiotic resistance

Antibiotic resistance increases the burden on the healthcare workers as it drives higher rates of infection in patients, particularly among newborns, young children, and women.^{5,18,19} Furthermore, health workers are also vulnerable to infection and need to take antibiotics regularly to prevent or treat infection.^{13,19}

“The nurses have to deal with sometimes three different patients at a time and so what you may do is quickly take off your gloves and assist them. There is normally inadequate infection prevention and control and WASH measures.” – *Pacharo Matchere*²⁸

According to a 2019 study, AMR awareness was high among human and animal healthcare professionals in LMICs,²¹ yet it is impossible to put into practice where HCFs lack WASH:

“[As a nurse] you know what you are supposed to do in the workspace, but you don’t have the facilities to do that. It can be very demotivating and debilitating. Instead of helping, you could be contributing to the problem.” – *Pacharo Matchere*²⁰

▼ Adela and her children use the old out-patient toilet at Busolwa Health Centre, Nyang’hwale District, Tanzania. June 2019.



Beyond health implications, AMR has detrimental impacts on the global economy.

“No one wants to have their pension invested in something which shortens their life and antibiotics add an average of 20 years to the average human lifespan in the UK. If nothing is done to stop it, the UK Government’s Review is predicting that by 2050, antibiotic resistance will be the number one cause of death in the UK.” – *Abigail Herron*²³

HCAIs already cost the NHS at least £2.1 billion a year - a cost that will go up if these infections become increasingly resistant to antibiotics.¹ COVID-19 demonstrated the disastrous effect infectious diseases can have on global growth – with this falling from 2.6% in 2019 to negative 3.3% in 2020, according to World Bank data. AMR could contribute to 24 million more people

being forced into extreme poverty by 2030, mostly in LMICs. We are likely to pay huge costs if resistance rates continue to rise. The 2014 AMR Review estimates the compound effect of AMR, and within that antibiotic resistance, on the global economy would be \$100 trillion over 35 years, possibly more if wider indirect costs are considered.²⁴ **It would be far cheaper to make investments now that prevent the rise in resistance.**²

“Morbidity and caring for parents due to sickness, these cause huge levels of economic cost and will run into the hundreds of trillions in the future which will affect economic growth [if AMR is not addressed]. As we saw during COVID, you don’t need to have a huge impact to have a significant effect on the economy.” – *Anthony McDonnell*¹⁶



Groups of women carry buckets of water back to the mother’s shelter at Sikachapa in Kazungula District, Zambia. May 2022.

WaterAid / Cynthia Matonhlope

Guest J, Keating T, Gould D, Wigglesworth N (2020). Modelling the annual NHS costs and outcomes attributable to healthcare-associated infections in England. *BMJ Open*. vol 10, no 1. Available at bmjopen.bmj.com/content/10/1/e033367 (accessed 29 Mar 2023).



Section 2:

The role of inadequate water, sanitation and hygiene

Inadequate WASH and waste management are significant problems in LDCs.

Many of the LDCs in the world have poor WASH in HCFs which can then drive antibiotic resistance.

22% of HCFs globally do not have basic water services.²⁵ Although 73% of HCFs in sub-Saharan Africa have alcohol-based hand rub or water and soap at points of care, only 37% have handwashing facilities with water and soap at toilets. Furthermore, sometimes the water itself can pose a risk: Médecins Sans Frontières (MSF) in Bangui, Central African Republic, experienced outbreaks of bacterial infection where the causative organism was found in taps, water tubes and other water sources.²⁶

One in ten HCFs globally also have no sanitation service. This ranges from 3% in Latin America, Caribbean, and eastern and south-eastern Asia, to 22% in sub-Saharan Africa. In LDCs, only one in

five had basic sanitation services in HCFs and only a third have basic healthcare waste management services.²⁵

“We needed water so that we can clean the delivery room, but also for washing the clothes with blood after delivery. We also didn’t have an environmentally friendly area to burn the dirt and used equipment. We disposed them in a not so deep hole. You might find syringes and other dirt disposed in the same hole.” – Joseph Siame, Clinical Officer at Busolwa, Tanzania²⁷

Management of human waste and excretion is also important in addressing AMR. Many of the resistant genes are excreted and without appropriate disposal, it spreads infection and the resistant genes.

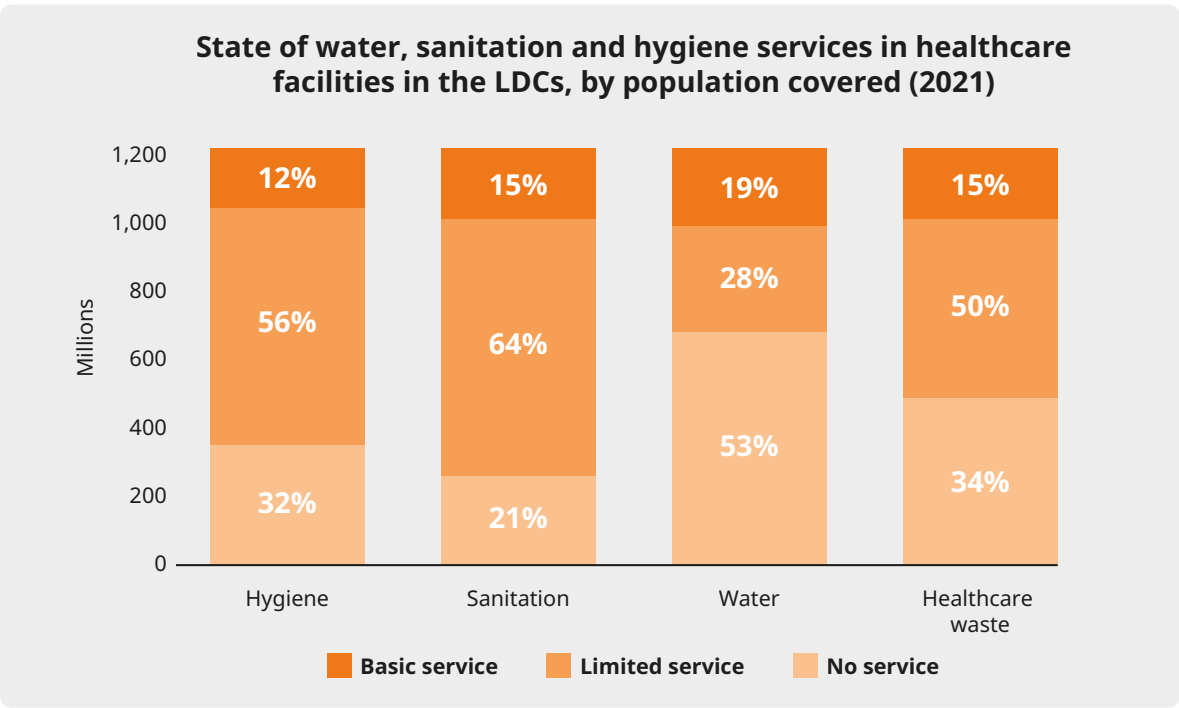


Figure 1:
WASH service by population covered in the LDCs.²⁵

Section 2:

The role of inadequate water, sanitation and hygiene

The lack of adequate WASH in healthcare settings contributes to the spread of resistant infections.

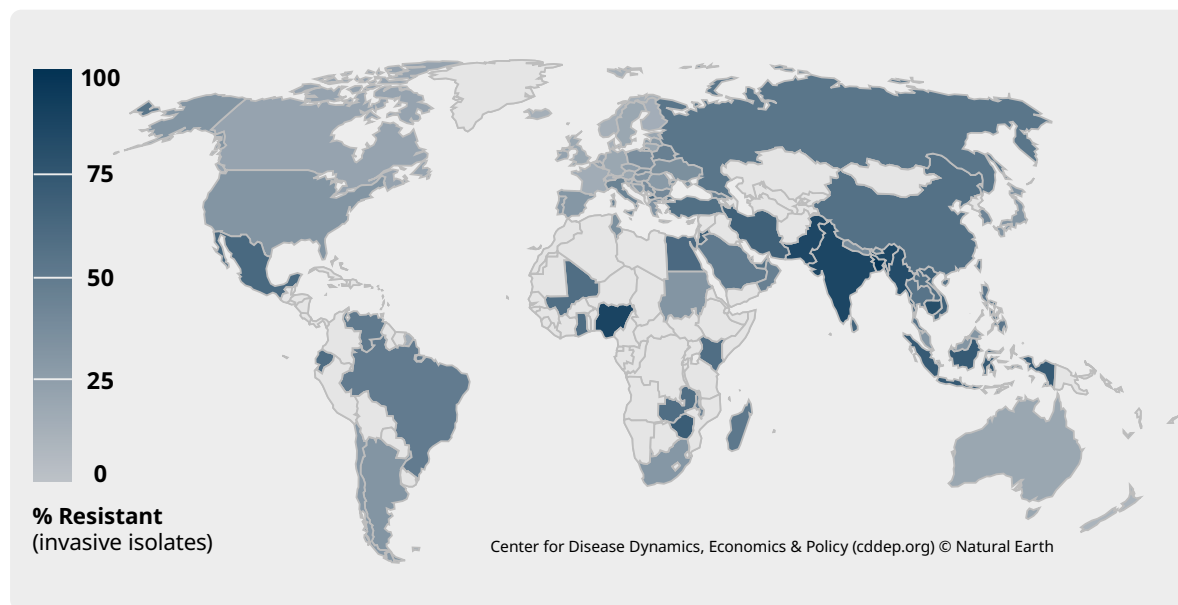


Figure 2:
Global map of
resistance of
Escherichia coli to
Fluoroquinolones.²⁸

“Antibiotics and AMR genes are excreted. You need good WASH facilities and sanitation or you’re polluting the environment with these genes. Disposal of excretion is important.” – Dame Sally Davies¹²

“Antibiotic resistance is a product of infection and people take antibiotics because they have an infection. The more they take, the more resistance is built up. WASH breaks those chains of infections.” – Anthony McDonnell¹⁶

The standard of WASH in HCFs is directly linked with quality of health service because HCAs affect patients.²⁹ HCAs spread to the community very easily in LDCs due to the lack of WASH and infection prevention and control (IPC) measures.^{19, 22, 30} For instance, the Indian Institute of Public Health Gandhinagar, conducted a study in which they took environmental samples from HCFs and they found that despite being visually clean, they were not microbiologically clean and safe.³¹

“More people die every year from care rather than not receiving healthcare. [There are] approximately 5.7 million – 8 million deaths from poor quality care each year.” – Dame Sally Davies¹²

An estimated 15% of patients in LMICs acquire a new infection while receiving care – compared to 7% in high income countries.^{12,18} A study of newborns in LMICs by the BARNARDS programme found very high levels of resistant bacterial infections in both mothers and even more so in their newborn children.¹⁸

If healthcare-associated infections are addressed, not only does the quality of care improve, but immunocompromised people would be protected when they go to healthcare facilities.” – Anthony McDonnell¹⁶

Where a HCF does not have enough water to perform their IPC measures (hand hygiene, cleaning, and disinfection of the environment etc.), the risk of contracting an infection

Section 2:

The role of inadequate water, sanitation and hygiene

"Sepsis remains a major cause of mortality globally, causing approximately 20% of all deaths: around 11 million potentially avoidable deaths each year. Approximately one in four hospital-treated sepsis cases are healthcare-associated, mortality among patients affected by healthcare-associated sepsis is nearly one in four. And mortality among patients affected with antimicrobial resistant pathogens is at least two to three times higher than among those infected with sensitive pathogens. Sepsis mortality is often related to suboptimal quality of care in healthcare settings, inadequate WASH and health infrastructure, poor IPC, late diagnosis and inappropriate clinical management. More than half of all cases of healthcare-associated sepsis are thought to be preventable through basic WASH services and appropriate IPC measures."

WHO report on WASH and infection prevention, 2022²⁵

increases.²² Many of these infections will be drug-resistant.²⁵ The widespread risk of infection also drives overuse of antibiotics not only to treat but also to prevent infections – particularly, for example, among health workers and in maternity services.

"What happens in Malawi is that every mother before being assisted, is given antibiotics. It's the standard. Why? At the healthcare facility there are more infections. This happens without a diagnosis taking place." – *Hon. Madalitso Kazombo³²*

"We would want the UK Government to support us in these AMR plans and support in the healthcare facilities. Our healthcare facilities are struggling in maintaining infection prevention and control practices because of inadequate WASH facilities... there's a high chance of spreading microbes, some of which could be resistant to antibiotics." – *Pacharo Matchere²⁰*



► Olice Namuswa, Clinic Cleaner, is able to clean the clinic to a safe standard now it has a clean water source. Sinde Clinic, Kazungula District, Zambia. March 2022.



WaterAid / Drik / Chileshe Chanda

Section 2:

The role of inadequate water, sanitation and hygiene

Women and girls are disproportionately affected by antibiotic resistance and inadequate WASH in HCFs.

Women are overrepresented in the health system as health workers and patients. They form 70% of the health and social sector workforce and are disproportionately at risk of contracting infections while working in HCFs with inadequate WASH.

“Women are more affected as they’re guardians caring for others and also most of the medical staff are women.” –

Hon. Madalitso Kazombo, First Deputy Speaker, Parliament of Malawi³²

In terms of the patient cohort, women are particularly exposed to a range of infections due to inadequate WASH. For instance, urinary tract infections (UTIs) and cystitis are a common issue for women in LMICs where toilet facilities and personal hygiene are lacking due to poverty and lack of education.

“For mothers who are delivering babies, because the water is not available, she leaves the HCF with infections like UTIs because the toilets were also unhygienic.” –

Joseph Siame, Clinical Officer at Busolwa, Tanzania²⁷

Over-the-counter antibiotics are available but for many are still unaffordable and if affordable, rarely is the full dose taken. This drives antibiotic resistance. Furthermore, lost productivity and

family income are known to decrease girl’s access to education and increase rates of gender-based violence, early marriage, and adolescent pregnancy with its associated risk factors. – *Mott MacDonald¹⁹*

Maternal care and gender norms related to care also explain why women are significantly affected by AMR and inadequate WASH. After respectful and dignified care, women’s second highest priority for maternal healthcare is WASH.

“We get situations where facilities don’t have running water – and we are forced to shut down the maternity wards in healthcare facilities. The women have no choice but to have the child themselves. WASH is very important to provide optimal care to all.” –

Pacharo Matchere, The Christian Health Association of Malawi²⁰

A lack of water for safe births means that many women are routinely prescribed prophylactic antibiotics to prevent infections. In some countries, 90% of women giving birth vaginally are prescribed these antibiotics. Furthermore, there is evidence to suggest resistance in the mother leads to AMR genes in their infant: the BARNARDS study found a very high carriage of resistant *Escherichia coli* (e. coli) bacteria (CRE and CTX-M-15) in the first days of life of infants examined.

Case study



Everlyne Okello, a Labour Ward Nurse at Kharumwa Health Centre, has been working at the facility long before the WASH investment initiative. **“Before the intervention of WaterAid, as a nurse, the first thing that used to occupy my mind was where I could get water, and the patients came second. We used to walk long distances to collect water from seasonal wells,”** Everlyne recalls. The nurses were exhausted as they used to endure long walks in search of water, which lead to poor delivery of health services and in turn, endangered patients. **“As I was going to collect water, I often got wet. Imagine walking a long distance carrying a bucket of water on your head all the way to the ward. This makes you lose a lot of energy even before starting serving the patients,”** she explains.

Owing to lack of water, at some point, Everlyne started to think about quitting her carrier altogether. **“When I was a little girl, my dream was always to become a nurse. I promised my parents that I would be a nurse because I was an outgoing person who enjoyed working with and helping others,”** Everlyne said. **“I had a deep conviction that I could make a difference in each patient’s life that I encountered, it might be as small as just talking to a patient to get their mind off pre-surgery. Indeed, after hard work and dedication in my studies, I realised my lifetime dream. However, the poor working condition at Kharumwa Health Centre without water, was so difficult,”** Everlyne explained. **“As a caregiver I enjoy doing my work now, I’ve enough time to serve the patients with dignity. Kharumwa Health Centre is clean, there is a place to wash my hands with running water. I can now adhere to the patient care protocol in serving sick people,”** Everlyne said. Now, patients at the facility can be treated safely – something that would not be possible without investment in WASH.



WaterAid / Richard Raphael



WaterAid / Richard Raphael

Case study

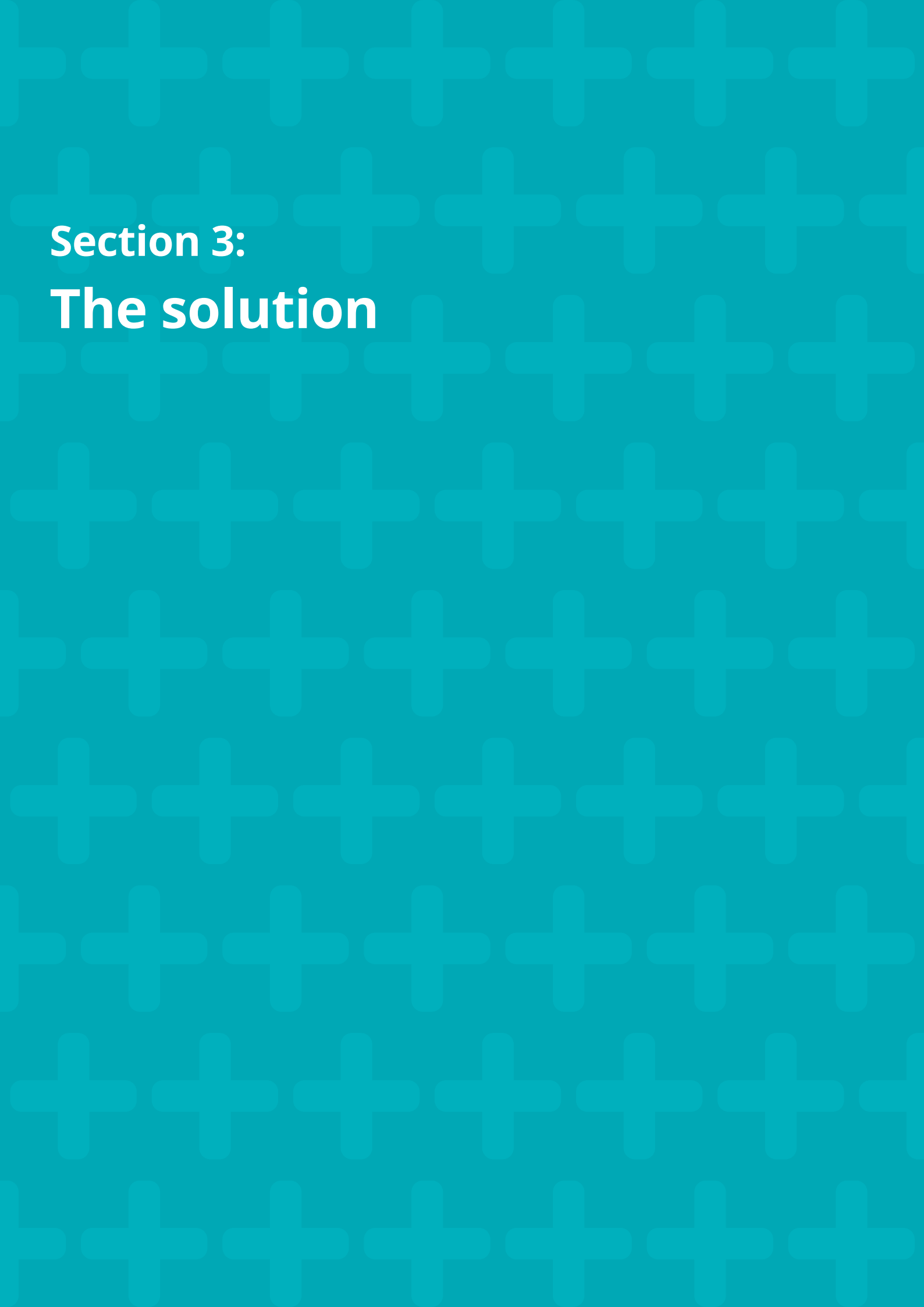


Joseph Siame, a Clinical Officer at Busolwa Dispensary, remembers a time when the HCF had no safe WASH services. When pregnant women came to the facility, they had no choice but to ask a relative to collect water from an outside source for the delivery. **“Also, after baby deliveries, there was no handwashing facility present so we could not wash our hands properly. Sometimes we used to request the clients to hold the utensil with water and pour it to wash our hands. Mind you, this is the same water that was brought by the clients,”** Joseph said. In one instance, Joseph recalls a baby who was born at the Busolwa Dispensary being wrapped in dirty clothes used in the delivery – this baby then developed life-threatening sepsis. He recalls how women would often give birth at the facility and then leave with a new infection due to the lack of WASH, **“Before the WASH infrastructures were improved, antibiotics were used a lot. You might find that a woman has delivered a baby, and at that time because the toilets were not safe. A patient leaves with infections, like UTIs, which forces her to come back to the HCF and for us to prescribe her with antibiotics,”** Joseph said. But now, everything has changed. **“Let me tell you that things have completely changed after improving the supply of water here in Busolwa. When I leave home before I enter the healthcare facility I wash my hands with clean water and soap because water is always available,”** Joseph said.



Joseph argues that with a reliable, safe water supply, they can keep the environment of the HCF clean and improve public health. He is grateful for the WASH investment at Busolwa but pleads with the government and development partners to replicate the WASH infrastructures in all HCFs across the country.





Section 3:

The solution

Investment in WASH helps to break the cycle of transmission of microorganisms in HCFs and reduce the incidence of HCAs.

"Improving WASH in healthcare facilities is central. We catch infections either from the environment we are in or from our own bodies. We need to reduce that risk." – Dame Sally Davies¹²

Investing in WASH reduces antibiotic resistance as it decreases the demand for antibiotics. Appropriate WASH also breaks the chain of infection as it reduces the spread of infections, reducing sickness and the opportunity for a resistant infection to become dominant.

Universal access to water and sanitation alone is expected to lead to a 60% reduction in diarrhoeal illnesses treated with antimicrobials. Maintaining hygiene through hand-washing by clinicians in healthcare settings can decrease the infectious diseases and the use of antimicrobials by 40%.³³

By breaking the chains of infection in HCFs, investment in WASH will decrease the demand for antibiotics. Decreasing the use of antibiotics will decrease the rate of resistance developing. With better WASH in HCFs, each resistant infection will spread less, reducing the number of people who get sick, and the opportunity for a resistant infection to become dominant.²

"Before the WASH infrastructures were improved, antibiotics were used a lot. A patient leaves with infections, like UTIs, which forces her to come back to the HCF and for us to prescribe her with antibiotics. UTI was number 2, led only by Malaria. The antibiotic use is lower now because our clinic is clean so both mother and child leave without any infection. So, the antibiotics used and the intake is low. Myself I was using antibiotics twice a month – now, I haven't used antibiotics in 5

months, because the environment is health friendly." – Everlyne Okello, Nurse at Kharumwa Health Centre, Tanzania²⁷

The World Bank found action on AMR to be "one of the highest-yield" development investments available to countries today, and WASH investment is a vital element of that.³⁴
The return on investment in addressing AMR through WASH is very high.

"\$1 per year, over a 25-year period, is required to get everyone safe clean water. It's a one-time investment in infrastructure over a long period. Sometimes you just need to do the simple things well." – Anthony McDonnell¹⁶

According to the WHO, 70% of HCAs can be prevented through good hand hygiene and other cost-effective WASH practices.³⁵ **These investments would not only yield benefits of up to 16 times their value, but would also start paying for themselves within a year and produce savings of around \$1.50 for every dollar invested thereafter,** through a range of immediate and long-term cost savings.⁵ Recurrent costs are only 3% of current Government health spending in LDCs.⁵

Gains include safer deliveries; reduced, preventable, maternal and newborn deaths; greater efficacy in stopping the spread of antibiotic resistance and AMR, cholera, and other infectious diseases; and higher quality of care. In other words, WASH in healthcare is a 'best buy' which produces a huge return on investment.²⁵



Section 4:

Global action

"There are 36% of healthcare facilities that don't have basic water supply. This is not satisfactory. 8% of healthcare facilities don't have toilets either." – Dr Abhiyan Gautam, Ministry of Health and Population, Nepal³⁶

"1 in 3 of our healthcare facilities don't have what they need to clean hands where care is provided." – Hon. Madalitso Kazombo, First Deputy Speaker, Parliament of Malawi³⁷

"Just 1% of healthcare facilities have basic waste management practices." – Dr Abhiyan Gautam, Ministry of Health and Population, Nepal³⁶

A global response is needed to address the current WASH crisis in healthcare settings. All countries should invest in sufficient funds to create and maintain infrastructure, practices and behaviours to curb the spread of resistant infections, and the unsustainable use of antibiotics. Interventions must be cost effective and sustainable, to encourage uptake by LMICs and attract investment.¹⁸

Financing

The estimated cost of achieving universal access to WASH in existing HCFs in the world's 46 LDCs is around \$9.6 billion³⁵ – an average of just \$0.65 per person per year.

A recent analysis commissioned by WaterAid found that \$960 million annually up to 2030 of additional funding is required.³⁸

Given Governments have the ultimate responsibility to uphold the health and dignity of their citizens and play a critical role in delivering public services, they must be considered the primary source for mobilising funds for WASH in HCFs. LDCs could reasonably be expected to fund \$355 million of this

annually from internal sources. That would leave \$601 million of catalytic funding³⁸ annually up to 2030 required from external financing.

Figure 3. Funding that can be reasonably expected from development partners for WASH in HCF per year.

Donor Country	US\$ millions per year	WaterAid conducted a country-by-country fair share analysis, given its relative economic power, to ascertain the amount wealthy countries can each be expected to contribute to fill the external funding gap for WASH in HCFs. The analysis focused on the 30 member countries of the Organisation of Economic Cooperation and Development Development Assistance Committee (OECD DAC) as the most credible grouping of donors using the Gross National Income (GNI) ⁱ to apportion the costs of WASH in HCF across donor countries. GNI is preferred over Gross Domestic and Gross National Product, because GNI accounts for net income from abroad, which is considerable for wealthy countries.
Australia	16.6	WaterAid research and analysis, 2023.
Austria	5.2	
Belgium	6.6	
Canada	21.5	
Czech Republic	3	
Denmark	4.5	
EU	0	
Finland	3.3	
France	32.7	
Germany	47.4	
Greece	2.4	
Hungary	1.9	
Iceland	0.3	
Ireland	4.1	
Italy	23.2	
Japan	55.8	
Korea	19.8	
Lithuania	0.7	
Luxembourg*	0.6	
Netherlands	11	
New Zealand	2.7	
Norway	5.5	
Poland	7	
Portugal	2.7	i GNI is preferred over Gross Domestic and Gross National Product, because GNI accounts for net income from abroad, which is considerable for wealthy countries.
Slovak Republic	1.2	
Slovenia	0.7	
Spain	15.6	
Sweden	7	
Switzerland	8.7	
United Kingdom	34.5	
United States	254.9	
TOTAL	601	

Based on the relative economic power of the most credible grouping of donor countries, WaterAid research and analysis shows that the G7 countries have by far the largest share of annual funding required at \$470 million, or 78% of total funding needed. At \$34.5 million annually the UK's fair share is 6% of the total annual funding needed – which is just 0.3% of its overseas aid budget.

In addition to direct funding in WASH in HCFs, the issue needs to be embedded in broader domestic and international health programmes – both bilateral and multilateral. Key multilateral mechanisms include:

- **The Pandemic Fund:** The Pandemic Fund was developed with broad support from members of the G20 and beyond. Over \$1.4 billion in financial commitments have already been announced – [including £25 million from the UK](#). The Pandemic Fund finances critical investments to strengthen pandemic prevention, preparedness, and response capacities at national, regional and global levels, with a focus on LMICs – and is viewing activities relating to AMR as part of this. The Pandemic Fund will help focus and sustain high-level attention on strengthening health systems.
- **The Global Financing Facility for Women, Children and Adolescents (GFF).** The GFF's primary focus is on strengthening primary healthcare to improve reproductive, maternal, newborn, child and adolescent health and nutrition in 36 low- and lower-middle-income countries. The importance of WASH in HCFs as part of strong primary care makes GFF well placed to fill funding gaps for WASH in HCFs, if country Governments prioritise it, and is already funding WASH in HCFs in some countries.

Effective investment

For greatest impact, investments should be in support of countries' own plans and aligned with costed national road maps on WASH in HCFs.^{13, 25} They should also be supported by intervention assessments.¹⁸ Embedding WASH and IPC (including minimum standards) into regular health sector planning, budgeting and programming – domestic and international – is critical to ensuring that they get the attention they need.^{23, 33}

Countries must also regularly monitor and review progress in improving WASH services, practices and the enabling environment.²⁵ Interventions should encourage system-wide, cross-Governmental approaches and incorporate community and patient-focused accountability mechanisms.⁵

"You have to make sure you have data. Evaluating what you have done. What are the countries doing themselves. Good data on the impact and cost may help persuade the countries to do what their public need." – Dame Sally Davies¹²

Further evidence is needed to understand where the spread of disease is greatest, so that interventions can be prioritised³⁹ and a 'best buy' approach to reducing infectious disease burden and antibiotic resistance can be taken.⁴⁰

International support is most likely to be effective if it works with national infrastructure, and international research programmes have proven to most effective where they encourage established and proven partnerships between institutions – particularly in the field of research and innovation.¹⁸

Given the disproportionate impact that inadequate WASH has on women and girls as

patients and health workers, all programmes should aim to empower women and girls and engage health workers.⁵

Governance and regulation

Following the COVID-19 pandemic, there has been growing recognition and consensus that new norms and governance mechanisms are needed to ensure the world is adequately prepared to prevent, respond to and recover from future health threats and shocks.

In December 2021, the World Health Assembly took the historic decision to develop a Pandemic Accord. This legally binding international instrument, under the WHO constitution, will strengthen global and national capacities for pandemic prevention, preparedness and response. Negotiations are being led by an Intergovernmental Negotiating Body, composed of representatives from WHO's 194 Member States, including the UK.⁴³

Although negotiations on the text of the accord are at an early stage, it is already clear that AMR and a One Health approach will be key elements. This will provide an important opportunity to leverage international consensus to create a stronger mandate for actions to both prevent and contain the spread of antibiotic resistance, including embedding WASH as a primary tool for preventing the spread of resistant infections in healthcare settings. The Pandemic Accord negotiation process is an important opportunity to move WASH beyond being seen as a social determinant of health towards a deeper understanding of its critical role as a primary tool for prevention.

Given the role of the private sector in delivering healthcare in so many countries, LDC Governments have a role in improving domestic regulation of the private healthcare system when it comes to WASH and the use of antibiotics.¹³

Many private sector investors are taking the threat of AMR very seriously.²³ The international private sector has a role in supporting efforts to improve WASH – as Unilever has in its partnership with FCDO, and in ensuring their operations do not exacerbate the problem. Some witnesses called for AMR to be embedded within corporate Sustainable Disclosure Requirements (SDR) and the UK Green Taxonomy, requiring all principal financial regulators (FCA, PRC, MPC, PRA) to explicitly incorporate AMR risks in developing countries and at home into their activities.²³



Sipwe travelled to give birth at the mother's shelter, where the nearest source of water is a 25-minute walk away. Sikachapa in Kazungula District, Zambia. May 2022.

WaterAid / Cynthia Matonhodze

Section 5:

UK Government's role

"Making WASH and AMR a global priority for the FCDO would play into the UK's national strengths, and it is an area where the UK can continue to greatly improve global health." – Anthony McDonnell²

The UK has demonstrated a world leading and innovative approach to tackling antibiotic and AMR domestically and internationally.

While it notes the need for all countries to make speedier progress, the 2021 AMR Preparedness Index ranks the UK highest among the countries it examines, due to its relatively impressive performance across a range of metrics including its national strategy and levels of investment. Domestically, it has championed a range of innovative approaches, such as the first-of-its-kind antibiotic 'subscription' model and support for early-stage research into new AMR treatments, such as the funding it provides for the North-West based Infection Innovation Consortium.²³

According to a 2021 AMR Preparedness Index report:

"The UK is also seen as a unique leader on the international stage. From the commissioning of the O'Neill report in 2014, an effort by then PM David Cameron to raise the profile of the issue globally, to the Global AMR Innovation Fund (GAMRIF), the UK has been heavily committed to ensuring global stakeholders remain committed to tackling this issue. Like its predecessor Germany, the UK has also made AMR a priority for its 2021 G7 presidency."⁴²

"Britain's role is about thought leadership and research. It's also about equity and fairness. It's about making a contribution. We need to evaluate what we do and what others do." – Dame Sally Davies¹²

In a letter to the APPG on Antibiotics, then FCDO Minister, Amanda Milling, stated that the UK has supported community WASH programmes in more than 20 countries, as a result, 62.6 million people in developing countries have gained access to clean water or better sanitation. A partnership on hand-hygiene with Unilever has reached over 1.2 billion people in 37 countries with handwashing messaging, including training 460,000 health and other key workers on hygiene practices. In December 2021, the FCDO published approach papers on Health Systems Strengthening and Ending the Preventable Deaths of Mothers, Babies and Children by 2030, which highlights the importance of WASH services to global health and stresses the need for WASH services in primary HCFs.⁴³

Furthermore, the UK was a founding member of the Global Taskforce on WASH in HCFs.⁴⁴ Building on the 2014 AMR Review, it has led much of the diplomatic global effort around AMR, particularly in the G7, G20 and at the UN General Assembly.² The Fleming Fund was established by the UK Government in 2014 to improve global surveillance systems for AMR.²

The UK Government has made a commitment to improve WASH services to address AMR.

The UK Government has recognised the necessity of access to improved WASH services, particularly in HCFs, to slow the spread of AMR within its AMR review and the 5-Year National Action Plan¹⁵ on AMR (which we are now halfway through). The action plan was updated in April 2022, with a renewed commitment to act on WASH globally.

Importantly, O'Neill's AMR review states that:

We recommend interventions that are not specific to AMR but happen to help address drug resistance, such as good general disease surveillance and better water and sanitation. These costs are part of normal investment to

Section 5:

UK Government's role

achieve good healthcare and so are not part of the package of global costs we describe here.⁴⁵

There is clear consensus that increasing global access to WASH to tackle antibiotic resistance is a priority action in the national and global interest, yet a significant funding gap remains. And the funding gap for WASH in HCFs in LDCs is not currently being considered alongside efforts to tackle antibiotic resistance.⁵

Gaps in response

A range of questions were raised by respondents in written evidence and oral evidence sessions around whether the UK Government has driven forward existing initiatives such as the Fleming Fund, with sufficient force.

In response to the COVID-19 pandemic, Unilever and the UK Government's FCDO joined forces to limit the spread of the virus in LMICs, forming the Hygiene and Behaviour Change Coalition (HBCC). The coalition committed £100 million – £50 million of FCDO funding alongside £50 million of in-kind support from Unilever, including products (soaps, sanitisers, etc), commercial assets and expertise. Between March 2020 and December 2021, this award-winning public-private partnership reached more than 1.2 billion people with lifesaving behaviour change messaging, hygiene products, and access to training and education. The partnership showcases the UK's ability to respond rapidly to global health threats with effective responses grounded in public health basics, such as handwashing with soap.

– *WaterAid and BSAC*⁵

Polling by YouGov for WaterAid indicates that:⁴⁶

53% of the British public list WASH as one of their top three most important ways of spending UK official development assistance.

A more substantial gap is around the UK's support to WASH in healthcare in the most vulnerable countries. There is the misalignment between the UK's domestic and global policy efforts to tackle AMR and the declining amount of UK development assistance going to WASH. Despite the initiatives noted above, FCDO funding for WASH has fallen from £206 million in 2018 down to just £71 million in 2021.⁵ This is despite the fact that there is strong public support for prioritising investment in WASH, both in the UK and globally.⁴⁶ WASH is also among the top COVID-19 recovery and pandemic preparedness priorities for the public across many G7 and G20 countries.



Section 6:

Conclusion and recommendations

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Conclusion and recommendations

The UK's current and historic leadership on global health security means the Government is uniquely placed to lead global efforts to combat antibiotic resistance through universal access to WASH in HCFs. This will be achieved by leading international advocacy; providing its fair share of additional financing; advocating for additional financing from others; and ensuring all its programmes recognise and tackle the problem.

Detailed recommendations are as follows:

Adequately fund WASH in HCFs as part of the global antibiotic resistance prevention agenda

- **Leverage existing UK contributions and new opportunities in multilateral development financing to make WASH a core element, including:**

- Advocating the use of Pandemic Fund money to ensure HCFs have adequate WASH services. This is a critical building block of resilient health systems, helping to prevent infections, deliver quality care and ensure patient and health worker safety.
- Working to increase awareness of the impacts and potential benefits of scaling-up funding for WASH in HCFs in The Global Financing Facility for Women, Children and Adolescents.

- **Ensure FCDO programmes, current and new, that aim to help strengthen global health security, such as the Advancing Health Security for Africa Programme, support progress on WASH in HCFs as a core component.**

- **Provide funding to catalyse progress in countries with costed roadmaps for universal WASH access in HCFs.** For example, Malawi requires an investment of \$7–9 million to implement its WASH in HCFs roadmap. The

UK's annual fair share of the external financing gap for WASH in HCFs is \$34.5 million.

- **Explore innovative financing mechanisms that help leverage additional funding:**

- Learning from the UK's experience of founding GAVI and Unitaids to explore opportunities for leveraging additional investment from elsewhere.
- Building on the UK's existing Unilever partnership, encourage greater private sector investment in this area.
- Working with investors to uphold corporate standards that ensure companies are playing a positive role in tackling antibiotic resistance and AMR.

Ensure investment in WASH in HCFs is used effectively to help prevent antibiotic resistance

- **Develop and action an implementation plan for FCDO's *Ending Preventable Deaths and Health System Strengthening* papers – particularly the WASH elements – to deliver sustainable health improvements in flagship countries. The plan should include clear milestones for WASH in HCFs and hand hygiene.**
- **Take a 'WASH in all policies' approach to maximise the impact of FCDO's broader programmes by integrating WASH in HCFs into those programmes and applying an 'AMR lens' to all relevant bilateral and multilateral programmes, including those of British International Investment, as proposed in the UK's five-year action plan on AMR.**

Take the lead on international advocacy to improve WASH in HCFs to help prevent antibiotic resistance

- **Promote the importance of WASH in HCFs as a critical element of tackling antibiotic resistance and AMR and global health security internationally**, including at the 2024 UN General Assembly High Level Meeting on AMR, UN 2023 Water Conference, G7, G20, Global Leaders' Group on AMR, and the negotiations on an International Accord on Pandemic Prevention, Preparedness and Response. This could be done by:
 - Ensuring WASH in HCFs is on the agenda for all key meetings.
 - Advocating attention to WASH in HCFs in the working group meetings.
 - Being vocal about WASH in HCFs in the health and development working groups in the G7 and G20 processes.
 - Advocating additional financing for WASH in HCFs by all countries.
- **Advocate strong commitments to improving WASH in HCFs in the WHO Pandemic Preparedness Instrument.**



Constance's newborn baby was born at a clinic that does not have clean water on site. Sikachapa, Kazungula District, Zambia. May 2022.

WaterAid / Cynthia Matonhodzi

Appendix A:

List of witnesses

First oral evidence session, 19 October 2022

Pacharo Matchere, training manager for Christian Health Association of Malawi. She is a nurse and midwife by profession. She has experience working in healthcare facilities but, as a training manager, also brings a broader, strategic perspective on the issues covered by the inquiry. CHAM members make up 30% of Malawi's healthcare facilities and they run 11 of Malawi's 16 healthcare training facilities.

Abigail Herron, Global Head of ESG Strategic Partnerships, Sustainable Finance Centre for Excellence, Aviva Investors. Abigail leads responsible investment engagement across all asset classes and markets at Aviva Investors. She compliments this work with public policy advocacy in the UK, EU, OECD and UN on a spectrum of issues relating to sustainable finance. Abigail co-founded the 'Superbugs and Super Risks' series of reports on antibiotic resistance.

Timothy Walsh, Professor of Medical Microbiology, University of Oxford. Professor Tim Walsh has been studying AMR mechanisms for over 20 years, has published over 310 papers and publishes regularly in Nature and Lancet journals. He is director of BARNARDS, the lead Gates Foundation project on AMR, examining the burden of neonatal sepsis. Walsh has also been appointed as a lead microbiologist to the Fleming Fund expert advisory panel – a £265 million AMR capacity building programme and is country lead for scoping and implementation in Nigeria, Pakistan and Bangladesh. He is also advisor to the UN AMR committee, Chinese CDC and MSF.

Anthony McDonnell, Senior Policy Analyst, Center for Global Development. Anthony McDonnell is a senior policy analyst in CGD's global health team and is the technical lead for CGD's working group on A Grand Bargain

for Antimicrobial Procurement. Before joining CGD he worked as research associate at ODI and senior health economist at the University of Oxford. He started working in global health as the Head of Economic Research for the UK's independent review into AMR. He co-wrote a book on the topic of AMR.

Second oral evidence session, 1 November 2022

Hon. Madalitso Kazombo, first deputy speaker of the Parliament of Malawi. Hon. Kazombo joined front line politics in 2014 as Member of Parliament for Kasungu East, a rural constituency with a population of over 100,000 people. He became the first Deputy Speaker of Parliament in Malawi at the age of 38 and is a member of the ruling party. As a politician, he has supported many development projects ranging from infrastructure, education, health, women small scale business projects, electricity and agriculture. He is a champion for WaterAid Malawi to advance the issues of water, sanitation and hygiene.

Dr Abhiyan Gautam, Deputy Health Administrator, Epidemiology and Diseases Control Division, Department of Health Services, Ministry of Health and Population, Nepal. Dr Gautam works as chief of the Epidemiology and Outbreak Management Section and is national manager of outbreak and response; and is former national focal point of Female Community Health Volunteer (FCHV) programme. He also monitors social health security programmes of Nepal. He previously worked for the WHO in Nepal as a Surveillance Medical Officer for infectious diseases and as a New Vaccine and Immunisation Programme Support Officer.

Appendix B:

List of written submissions received

- AMR and Infection Prevention Norwegian Institute of Public Health
- Aviva Investors
- Centre for Antibiotic Resistance Research at University of Gothenburg (CARE)
- Centre for Disease Dynamics, Economics Policy
- Center for Global Development
- FCDO
- Gama Healthcare Ltd
- Indian Institute of Public Health Gandhinagar, Gujarat
- Médecins Sans Frontières
- Mott MacDonald
- UNICEF
- University of Oxford
- WaterAid Bangladesh
- WaterAid Tanzania frontline health workers
- WHO

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17. Professor Timothy Walsh, University of Oxford during Oral Evidence Session, October 2022.
18. Professor Timothy Walsh, University of Oxford, written evidence to the inquiry, May 2022.
19. Mott MacDonald, written evidence to the inquiry, September 2022.
20. Pacharo Matchere, The Christian Health Association of Malawi during Oral Evidence Session, October 2022.
21. Maddy Pearson & Clare Chandler (2019) *Knowing antimicrobial resistance in practice: a multicountry qualitative study with human and animal healthcare professionals*, *Global Health Action*.
22. Guy Braverman, Gama Healthcare Ltd, written evidence to the inquiry, May 2022.
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45. Dr Tedros Adhanom Ghebreyesus, World Health Organization, written evidence, May 2022
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47. All figures, unless otherwise stated, are from YouGov Plc. Total sample size was 1,781 adults. Fieldwork was undertaken between 11th – 12th August 2022. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).



◀ Everlyne Okello, Nurse, demonstrates the old pump at Kharumwa Health Centre, Nyang'wale District, Tanzania. May 2022.



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Front cover images:

Avelina Alfred holds her newborn baby in a ward that now has clean water for deliveries. Nkome Dispensary, Geita District, Tanzania. June 2019.

Elizabeth Nyanga was forced to collect water for her daughter-in-law at the birth of her grandchild due to lack of clean water at the HCF. Sikachapa in Kazungula District, Zambia. May 2022.