



# Making hygiene matter in the home and community setting

A review of the impact of hygiene behaviour change during COVID-19 and learnings for the future





## MISSION STATEMENT

The Global Hygiene Council (GHC) is committed to driving worldwide behaviour change in hygiene practices to reduce the burden of common infectious diseases.

## INTRODUCTION

Following the publication of a position paper by the GHC, *'Reducing Antibiotic Prescribing and Addressing the Global Problem of Antibiotic Resistance Through Targeted Hygiene in the Home and Community Setting'*, in the *American Journal of Infection Control* (September 2020), the GHC convened a meeting of global experts in 2022. The purpose of the meeting was to explore the vital role that hygiene practices, including handwashing, disinfection of contact surfaces and the use of masks for protection against airborne viruses, play in protecting the public from the SARS-CoV-2 virus and ensure that learnings from the COVID-19 pandemic help shape future public health policies and recommendations in infection prevention and pandemic preparedness.

Home and everyday life settings provide multiple opportunities for the spread of infections and include locations where hygiene is not mandated, including workplaces, public transport, gyms and shopping centres. Poor hygiene is a major factor in the transmission of community-based infections.<sup>1</sup> The sources of harmful microbes in everyday living environments are mainly infected people, pets/domestic animals or contaminated food and water.<sup>1</sup> Pathogenic organisms are continually shed into the environment from these sources, and microbiological evidence shows that the critical routes for the transmission of pathogens are via the hands, hand and food contact surfaces, cleaning utensils and the air (respiratory hygiene).<sup>2,3</sup>

Infectious diseases are a leading cause of death globally,<sup>3</sup> are often unpredictable in their nature, including emerging infectious diseases, and can potentially lead to endemics, epidemics and pandemics.<sup>4</sup> In addition, the prevalence of drug-resistant infections exacerbates the risk and severity of infections (e.g. sepsis).<sup>5</sup>

As outlined in the GHC's Position Paper, hygiene in the home and community is not addressed in the majority of National Action Plans (NAPs) on AMR.<sup>6</sup> It is the aim of the GHC that by leveraging learnings from COVID-19, the role of hygiene in the home and community is recognised as critical to preventing the incidence and spread of infectious diseases, eliminating the need for antimicrobials and reducing the threat and impact of AMR.

The GHC experts agreed that whilst hygiene is universal, various challenges are faced globally, including sub-optimal access to wash and sanitation facilities and poverty-related disparities. This is particularly the case in low- and middle-income countries (LMICs) but also in high-income countries (HICs). The experts also highlighted that countries face disparities within regions, specifically amongst disadvantaged populations in urban and rural areas. These challenges have been considered throughout this paper.

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*Infectious disease outbreaks have no boundaries. They can happen anytime and anywhere. A predicted rise in the risk of endemics, epidemics and pandemics coincides with the rise in antimicrobial resistance (AMR), often termed the silent pandemic. There has never been a greater need to reduce the spread of infectious diseases using effective hygiene practices to safeguard public health.*

”

– PROFESSOR EMERITA & GHC CHAIR,  
ELIZABETH SCOTT







# SUMMARY OF GHC RECOMMENDATIONS

The outcome of the expert meeting was the proposal of **four key pillars for change**, which outline the GHC experts' recommendations and suggested steps for improving and sustaining the adoption of appropriate hygiene practices.

It is the GHC's aspiration that these pillars for change will inform the global public health agenda, drive change in public health policies, ensure better preparedness for future pandemics, decrease AMR and deliver better health outcomes globally.

## The four pillars for change – as identified by the GHC

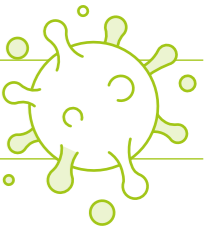
The expert committee identified four areas of guidance for governments and health authorities to consider in the development or revision of public health policies:

1		<p><b>Build on lessons learned from the COVID-19 pandemic</b></p> <p>Link lessons learned from the implementation of hygiene practices in previous pandemics, such as handwashing, mask wearing and surface disinfection, to provide policy guidance for future public health campaigns and infection, prevention and control policies.</p>
2		<p><b>Mainstream AMR-sensitive infection prevention and control tools</b></p> <p>Direct more focus on infection prevention and investment in new antimicrobials, vaccinations and antimicrobial stewardship. NAPs on AMR should be adapted to include hygiene and Water, Sanitation and Hygiene (WASH) recommendations for home and community settings.</p>
3		<p><b>Quantify the economic benefits of hygiene</b></p> <p>Consider hygiene education and access to appropriate hygiene facilities as a critical and cost-effective solution for facilitating hygiene behaviour change and protecting against the spread of infectious diseases in schools, at workplaces and throughout communities.</p>
4		<p><b>Establish strong hygiene habits</b></p> <p>Make public communications campaigns easy to understand and built on evidence-based approaches. Highlight the personal impact that changing hygiene behaviour has on the health of families and communities with respect to reducing the risk of infection.</p>

# 1

## THE ROLE OF HYGIENE IN CONTROLLING THE SPREAD OF COVID-19

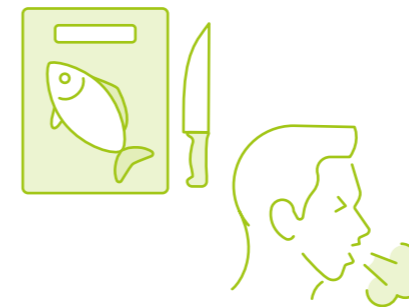
### Exploring the vital role of hygiene practices during a pandemic



COVID-19 highlighted the vital role that hygiene practices, including handwashing with soap and mask wearing, play in protecting us from infectious diseases.<sup>7</sup>

Poor hygiene is considered a major factor in the transmission of community-based infections; these include gastrointestinal infections, such as diarrhoea; respiratory tract infections, such as colds; skin infections, such as those caused by *Staphylococcus aureus*; and eye infections, such as trachoma.<sup>1,8</sup> Hygiene in home and everyday life settings should be managed through a risk-based approach, recognising that not one intervention is 100% effective and that a combination of interventions is required to minimise the risk of spread of infection.<sup>9</sup>

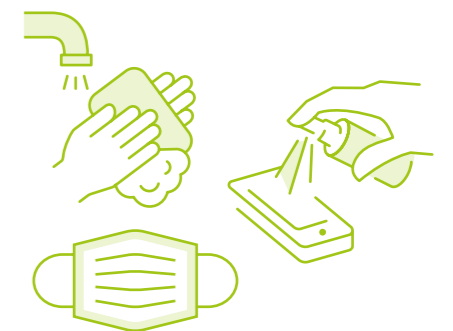
#### It is important to highlight:



**When hygiene is important**  
(e.g. handling raw food, when someone is ill)<sup>10</sup>



**What surfaces are high risk/fomites**  
(e.g. hands, surfaces)<sup>10</sup>



**How to practice targeted hygiene**  
(e.g. handwashing with soap and water, disinfecting surfaces, mask wearing)<sup>10</sup>

**To protect against future pandemics, including the threat of AMR, there is a need for greater public awareness of the role of targeted hygiene practices in preventing infections within home and community settings. Future public health campaigns and infection prevention and control policies should include clear and practical information on evidence-based practices, as well as ensuring adequate access to clean water and hygiene resources (e.g. soap) to help prevent the spread of infections, including those that are drug resistant.**

<sup>10</sup>A guide for conducting a risk management (targeted) approach to hygiene in home and everyday life settings has been developed by the International Scientific Forum on Home Hygiene, available at: <https://www.ifh-homehygiene.org/online-learning/breaking-chain-infection-our-homes-and-everyday-lives-practical-approach-encourage>.

*Hygiene practices in the community can reduce the risk of infection and the need for antibiotics<sup>11</sup>*



AMR has already reached pandemic proportions.

**In 2019, it was estimated that:**

**1.27 million** people died directly from drug-resistant infections<sup>12</sup>

**4.95 million** deaths were indirectly associated with AMR<sup>12</sup>

The highest burden of AMR occurs in LMICs, such as those in sub-Saharan Africa where **255,000** deaths were due to AMR in 2019, and children are particularly at risk. A high number of those infections were attributable to antimicrobial-resistant microorganisms, many of which were previously treatable.<sup>12</sup>

However, HICs also face high levels of AMR, notably with *Escherichia coli*, which frequently causes kidney infections, and *Staphylococcus aureus*, which can cause bloodstream infections.<sup>13</sup>

**Evidence shows that interventions to promote handwashing can reduce the incidence of common infections that usually require antimicrobials, with good hand hygiene practices resulting in:**



In addition to hand hygiene, other hygiene-related public health measures (e.g. mask wearing) employed during the COVID-19 pandemic appear to have reduced antimicrobial use at a community level.<sup>16,17</sup> This may have reduced selection pressure for AMR; however, further studies are required to confirm this.

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*AMR is not the next pandemic. It's not the silent pandemic. It's here and it's here to stay. Inaction today will compromise the health of future generations.*

”

– PROFESSOR SABIHA ESSACK, SOUTH AFRICAN RESEARCH CHAIR IN ANTIBIOTIC RESISTANCE AND ONE HEALTH, PROFESSOR OF PHARMACEUTICAL SCIENCES AT THE UNIVERSITY OF KWAZULU-NATAL

GHC experts at the meeting agreed that in order to maintain the efficacy of antimicrobials, AMR-sensitive interventions, such as hygiene practices to prevent infections, should be considered alongside AMR-specific interventions, such as antimicrobial stewardship and the development of new antimicrobials.

Although access to clean water, improved sanitation and adequate hygiene (WASH) are key tools in reducing AMR, only **11 of 77** national AMR action plans on the World Health Organization (WHO) website include WASH in community settings.<sup>7</sup>



It has been predicted that by ensuring everyone has somewhere to wash their hands with soap and water, the spread of infections in epidemics would be reduced by up to **20%**.<sup>18</sup>

**The deadliest pandemics of the 20<sup>th</sup> and 21<sup>st</sup> centuries:**

**1918–1919: Spanish Flu**

**Deaths: 40–50 million<sup>19</sup>**

**1981–Present: HIV/AIDS**

**Deaths: 40.1 million<sup>20</sup>**

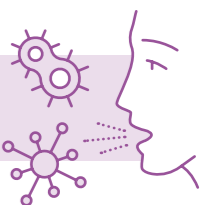
**2019: AMR**

**Deaths: 4.95 million<sup>21</sup>**

**2020–Present: COVID-19**

**Deaths: 6.5 million<sup>22</sup>**

**Hygiene is key to preventing transmission.**



AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus.

# 3

## THE IMPACT OF HYGIENE AND THE ECONOMY

Exploring the global cost of infectious diseases and the economic benefits of hygiene interventions



According to the International Monetary Fund, the economic cost of COVID-19 is likely to be **US\$12.5 trillion by 2024**.<sup>23</sup> While it is relatively easy to calculate the economic loss from people not working due to the pandemic, the long-term impact of our physical health on gross domestic product is more difficult to determine. Emerging infectious diseases are associated with huge financial consequences. **It is estimated that a single emerging infectious disease costs the global economy US\$30–50 billion.**<sup>24</sup>

### 2014

Poor hygiene in the workplace cost the French economy **€14.5 billion**, (US\$14.74 billion); the majority of this cost was due to the time employees spent searching for clean toilets;<sup>25</sup> and this **lost time was the equivalent of 2.3 days per worker per year.**<sup>25</sup>

### 2020

Lost productivity in Germany resulting from employees' inability to work due to illness amounted to **€87 billion** (US\$88.45 billion); **absenteeism rates were estimated to be 17.1 days per employee per year.**<sup>26</sup>

Presentations and discussions at the GHC meeting highlighted both the economic and other benefits of good hygiene practices in the community, including:

- ✓ The benefits derived from investing in hygiene promotion are greater than the costs associated with hygiene promotion itself. With a monthly base benefit–cost ratio of 2.1, every US\$1 invested in hygiene promotion yields a return on investment of ~US\$2.<sup>27,28</sup>
- ✓ Each increase of just 1% in hand hygiene compliance could save nearly US\$40,000 in methicillin-resistant *Staphylococcus aureus*-related costs per year<sup>29</sup>
- ✓ With regard to prevention against infectious diseases in children, such as those with tuberculosis and *Haemophilus influenzae* type b, handwashing may be a highly cost-effective strategy together with other strategies, including vaccination<sup>30</sup>



The evidence presented demonstrated that hygiene behaviour-change programmes can significantly reduce infections and lead to significant savings for governments, healthcare systems and corporations as well as improve health outcomes for the individual.

\*Return on investment refers to the cost saving associated with morbidity and mortality reductions, time savings and aesthetic benefits (i.e. improved cleanliness and improvements in social standing).

# 4

## SUSTAINING AND ENCOURAGING EFFECTIVE HYGIENE BEHAVIOURS

Utilising evidence-based approaches to shape hygiene intervention strategies



During the pandemic, governments and health authorities introduced a range of hygiene measures (e.g. handwashing, physical distancing and mask wearing) to control the scale of outbreaks. Messaging was heavily disseminated but changed over time and was often contradictory, leading to public exhaustion.<sup>31</sup>

In the expert meeting, it was highlighted that when the threat posed by the pandemic decreased, adherence to domestic and personal hygiene practices, such as handwashing, declined sharply.<sup>32</sup> This underlines the urgent need to provide clear and coherent messaging on the importance of sustained everyday hygiene practices to help reduce the incidence and outbreaks of infectious diseases.

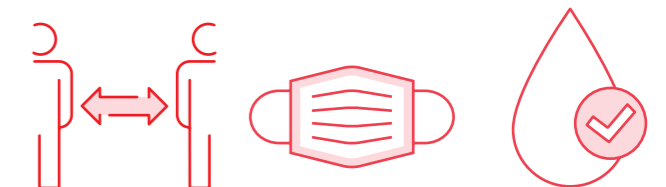
To encourage people to adopt good hygiene behaviours, interventionists need to consider the reasons why the desired behaviours are not already occurring. Theory-informed interventions need to be considered with the application of implementation science to improve interventions.<sup>33</sup>

The **COM-B model** is one example of a behavioural theory framework and describes **capability (C)**, **opportunity (O)** and **motivation (M)** as three components capable of changing **behaviour (B)** generally.

It is important to recognise that refinement of theoretical frameworks may be required to ensure context is appropriate to application.<sup>33</sup>

At the meeting, it was of the experts' opinion that interventions targeting behavioural components are more likely to be effective in changing momentary behaviour and creating long-lasting habits.

Brief examples of how the **COM-B model extends to hygiene behaviours** are provided below:




# HYGIENE PILLARS FOR CHANGE

As a result of the meeting, the GHC is recommending four pillars for change, highlighting steps for improving and sustaining the adoption of appropriate hygiene practices within home and community settings.


The GHC calls on governments, policy makers and health authorities to adopt and implement the recommendations below when responding to existing and future infectious disease threats, including AMR:



**1 Build on lessons learned from the COVID-19 pandemic** 


*Recognising the importance of sustaining the hygiene momentum and awareness in home and community settings created by the COVID-19 pandemic to protect future global health*

- ✓ Provide funding for additional research into the potentially positive health effects of pandemic policy implementation, including the impact of hygiene behaviours in the home and community – such as handwashing, mask wearing and indoor air quality – on reducing infections
- ✓ Link lessons learned from previous pandemics to provide policy guidance for future public health campaigns and infection, prevention and control policies:
  - Work collectively on the implementation and rigorous evaluation of evidence-and theory-informed intervention development and delivery of hygiene and public health programmes. Emphasis should be given to assessing specific messages, messengers, strategies and context around the impact of hygiene on preventing the spread of infectious diseases
  - Evaluate the impact that interventions to promote hygiene and other public health measures have on an individual’s momentary behaviour and longer-term habits and whether interventions that change behaviour also reduce the spread of infectious diseases
  - Ensure WASH remains a priority on the public health agenda to prevent the incidence and dissemination of infectious diseases

**2 Mainstream AMR-sensitive infection prevention and control tools** 


*Reducing the risk of infection transmission, including drug-resistant infections, through hygiene*

- ✓ Direct greater focus on infection prevention in addition to investment in new antimicrobials, vaccinations and antimicrobial stewardship
- ✓ Adapt NAPs on AMR to include hygiene and WASH recommendations for home and community settings. These recommendations should explain how infections can be spread (hand to hand, hand to surface, through the air) and include infection prevention and control (IPC) methods, such as targeted surface cleaning of high-frequency contact fomites, handwashing with soap and water, indoor air quality/ventilation and mask wearing. These changes should be made in parallel with recommendations for healthcare environments
- ✓ Communicate the importance of infection prevention through appropriate hygiene practices with public-facing AMR and antimicrobial use awareness campaigns
- ✓ Provide fit-for-purpose innovation, which requires the input of multiple stakeholders, including (but not limited to) community members, industry, scientists and policy makers

**3 Quantify the economic benefits of hygiene** 

*Recognise the cost of pandemics and economic benefits of hygiene practices*

- ✓ Provide funding for academic and research institutions to carry out prospective research on the economic benefits of investing in hygiene initiatives
- ✓ Leverage key findings from existing and prospective research when developing and building on existing public health policies and initiatives that ensure everyone has access to good hygiene facilities and information. This would serve as a critical and cost-effective solution to protecting the population from the spread of infectious diseases
- ✓ Consider hygiene education and access to appropriate hygiene facilities as a critical and cost-effective solution for protecting against the spread of infectious diseases in schools, at workplaces and throughout communities

**4 Establish strong hygiene habits** 

*Changing habits starts with the opportunity to shape behaviours*

- ✓ Drive more investment towards physical and structural infrastructure to ensure that communities around the world can easily access clean water, soap or sanitiser at the appropriate times and places
- ✓ Direct more effort to communicate information about how and when to adopt new hygiene behaviours, with messaging that is easy to understand, appropriate for the target population and encourages a shift towards sustainable hygiene habits
- ✓ Develop messaging to highlight the personal impact that changing hygiene behaviour has on the health of families and communities with respect to reducing the risk of infection
- ✓ Launch public communications campaigns building on an understanding of evidence-based approaches

**Driving hygiene-related behavioural change requires the collective efforts of stakeholders from all levels of society. Join the GHC in driving worldwide positive behavioural change in hygiene practices to reduce the burden of common infectious diseases and AMR and protect against future pandemics.**

## EXPERT CONTRIBUTORS

The GHC would like to thank all experts (listed below) who attended the scientific meeting for their invaluable contributions in developing the hygiene pillars for change.



**PROFESSOR EMERITA ELIZABETH SCOTT**  
(Simmons University, USA)

Professor Scott is an applied microbiologist with expertise in hygiene and infection control issues in home and community settings. She is committed to developing infection control strategies that can be deployed to protect against community-based infections and reduce antibiotic resistance. Professor Scott has served as a scientific advisor on responsible consumer hygiene practices for the Alliance for the Prudent Use of Antibiotics and as an advisor to WHO Europe on housing and health. She is also Deputy Chairperson and a serving member of the scientific board of the International Scientific Forum on Home Hygiene.



**PROFESSOR SALLY BLOOMFIELD**  
(International Scientific Forum on Home Hygiene, UK)

Professor Bloomfield is a consultant in hygiene and infectious disease prevention and is Chairperson and a member of the scientific advisory board of the International Scientific Forum on Home Hygiene. She is an acknowledged expert in home hygiene, with more than 30 years' experience in hygiene research and education. Professor Bloomfield was an honorary professor at London School of Hygiene and Tropical Medicine, London, UK, in 2003–2019. She is also an Honorary Fellow of the Royal Society for Public Health.



**PROFESSOR SABIHA ESSACK**  
(University of KwaZulu-Natal, South Africa)

Professor Essack is the South African Research Chair in Antibiotic Resistance and One Health and a Professor of Pharmaceutical Sciences at the University of KwaZulu-Natal. She is a leading expert in AMR and serves as a member of various international organisations expert groups and advisory boards, including the WHO Strategic and Technical Advisory Group for Antimicrobial Resistance (STAG-AMR), the International Centre for Antimicrobial Resistance Solutions (ICARS), the Joint Programming Initiative on AMR (JPIAMR) and the AMR Commission of the International Federation of Pharmacists (FIP).



**PROFESSOR MATTHEW FREEMAN**  
(Emory University, USA)

Professor Freeman is an infectious and tropical disease expert and Asa Griggs Candler Professor at the Gangarosa Department of Environmental Health at Rollins School of Public Health, Emory University. Professor Freeman's research interests include designing theory-informed interventions of WASH to mitigate the burden of enteric and neglected tropical diseases and understanding drivers behind behaviour change and programme sustainability for WASH initiatives.



**ASSISTANT PROFESSOR KELLY SCHMIDTKE**  
(Warwick Medical School, UK; University of Health Sciences and Pharmacy in St. Louis, USA)

Dr Schmidtke is an honorary fellow of Warwick Business School and an assistant professor at the University of Health Sciences and Pharmacy in St Louis. Dr Schmidtke is the current lead in the GHC behaviour change programme. Her research interests include the enhancement of human health, wealth and well-being using light-touch and low-cost mechanisms and the application of psychological principles to experimental philosophy and real-world interventions.



**DR RICHARD SHAUGHNESSY**  
(University of Tulsa, USA)

Dr Shaughnessy is Programme Director of Indoor Air Quality Research at the University of Tulsa. His research interests include particulate matter, air cleaner evaluation, indoor chemistry, school and flooring studies, asthma/housing research, ozone-initiated indoor reaction and the resolution and remediation of bioaerosol-related problems.



**PROFESSOR DR THOMAS SZUCS**  
(University of Basel, Switzerland)

Prof. Dr Thomas Szucs is Director of the European Center of Pharmaceutical Medicine/Institute of Pharmaceutical Medicine at the University of Basel. His core research interests and teaching specialties include pharmacoconomics, pharma policy, health services research, health technology assessment and personalised medicine/pharmacogenetics.



## ABOUT THE GHC

The GHC is a body of leading global experts in hygiene and associated disciplines with over 50 years of insight. The experts focus on generating and synthesising scientific evidence to raise awareness of how appropriate hygiene practices can help to prevent the spread of infections and thereby impact global public health.

Using expert scientific opinion, the GHC advocates the use of responsible hygiene practices in home and community settings to help reduce the spread of infection, shape public health policy and improve outcomes at a global and local level.

The GHC provides evidence-informed responses to global hygiene crises and gives advice to stakeholder organisations and policy makers around the world to better protect the public from the spread of common infectious diseases.



The GHC is supported by an unrestricted grant from Dettol.

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## REFERENCES

1. Scott E. Community-based infections and the potential role of common touch surfaces as vectors for the transmission of infectious agents in home and community settings. *Am J Infect Control*. 2013;41(11):1087–1092.
2. International Scientific Forum on Home Hygiene. Containing the burden of infectious diseases is everyone's responsibility. 2018. Available at: <https://www.ifh-homehygiene.org/review/containing-burden-infectious-diseases-everyones-responsibility-call-integrated-strategy>. (Accessed: September 2022).
3. International Scientific Forum on Home Hygiene. Developing and promoting hygiene in home and everyday life to meet 21<sup>st</sup> Century needs. July 2021. Available at: <https://www.ifh-homehygiene.org/developing-and-promoting-hygiene-home-and-everyday-life-meet-21st-century-needs/> (Accessed: October 2022).
4. World Health Organization. The Top 10 Causes of Death. Available at: <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death> (Accessed: September 2022).
5. McArthur DB. Emerging Infectious Diseases. *Nurs Clin North Am*. 2019;54(2):297–311.
6. The Wellcome Trust. What are drug-resistant infections? Available at: <https://wellcome.org/news/what-are-drug-resistant-infections> (Accessed: September 2022).
7. Essack S. Water, sanitation and hygiene in national action plans for antimicrobial resistance. *Bull World Health Organ*. 2021;99(8):606–608.
8. Kim DY, et al. COVID-19 Pandemic: Public Health Risk Assessment and Risk Mitigation Strategies. *J Pers Med*. 2021;11(12):1243.
9. Taylor R, et al. Universal health coverage post-2015: putting people first. *Lancet*. 2014;384(9960):13–19.
10. The House. Hygiene Resilience in Public Health. Available at: <https://www.politicshome.com/members/article/hygiene-resilience-in-public-health-time-for-a-fundamental-rethink> (Accessed: October 2022).
11. Azor-Martinez E, et al. Effectiveness of a Hand Hygiene Program at Child Care Centers: A Cluster Randomized Trial. *Pediatrics*. 2018;142(5):e20181245. doi: 10.1542/peds.2018–1245.
12. The Lancet. Antimicrobial resistance: time to repurpose the Global Fund. *Lancet*. 2022;399(10322):335.
13. Institute of Health Metrics. The latest estimates of global anti-microbial resistance show urgent policy action is needed to save lives. 2022. Available at: <https://www.healthdata.org/news-release/latest-estimates-global-anti-microbial-resistance-show-urgent-policy-action-needed-save> (Accessed: October 2022).
14. Bloomfield SF, et al. The effectiveness of hand hygiene procedures in reducing the risks of infections in home and community settings including handwashing and alcohol-based hand sanitizers. *Am J Infect Control*. 2007;35(10):S27–64.
15. Aiello A, et al. Effect of Hand Hygiene on Infectious Disease Risk in the Community Setting: A Meta-Analysis. *Am J Public Health*. 2008;98(8):1372–1381.
16. Kitano T, et al. The Impact of COVID-19 on Outpatient Antibiotic Prescriptions in Ontario, Canada; An Interrupted Time Series Analysis. *Open Forum Infect Dis*. 2021;8(11):ofab533.
17. Högberg LD, et al. Decrease in community antibiotic consumption during the COVID-19 pandemic, EU/EEA, 2020. *Euro Surveill*. 2021;26(46):2101020.
18. WaterAid. Economic report: unlock trillions of dollars with clean water, decent toilets and hygiene. 2021. Available at: <https://www.wateraid.org/us/media/economic-report-unlock-trillions-of-dollars-with-clean-water-decent-toilets-and-hygiene> (Accessed: April 2022).
19. World Economic Forum. A visual history of pandemics. 2020. Available at: <https://www.weforum.org/agenda/2020/03/a-visual-history-of-pandemics> (Accessed: March 2022).
20. World Health Organization. HIV: Fact Sheet. Available at: <https://www.who.int/news-room/fact-sheets/detail/hiv-aids> (Accessed: October 2022).
21. Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet*. 2022;399(10325):629–655.
22. Worldometer. Coronavirus Statistics. Available at: <https://www.worldometers.info/coronavirus/> (Accessed: October 2022).
23. Reuters. IMF sees cost of COVID pandemic rising beyond \$12.5 trillion estimate. 2022. Available at: <https://www.reuters.com/business/imf-sees-cost-covid-pandemic-rising-beyond-125-trillion-estimate-2022-01-20/> (Accessed: October 2022).
24. Global Virome Project. Global Costs of Emerging Infectious Diseases: an Economic Case for the Global Virome Project. 2018. Available at: <http://livescience.ecohealthalliance.org/predict/reports/2018-04-16-edi-economic-case-for-the-GVP.pdf> (Accessed: October 2022).
25. Melvin J. The Local. Poor hygiene 'costs French economy €14.5bn'. 2014. Available at: <https://www.thelocal.com/20140226/lack-of-hygiene-cost-french-economy-145-bn-in-2013/> (Accessed: October 2022).
26. The Federal Institute for Occupational Safety and Health. Economic costs due to incapacity for work. 2022. Available at: [https://www.baua.de/DE/Angebote/Publikationen/Praxis/A14.pdf?\\_\\_blob=publicationFile&v=2](https://www.baua.de/DE/Angebote/Publikationen/Praxis/A14.pdf?__blob=publicationFile&v=2) (Accessed: October 2022).
27. Whittington D, et al. Setting Priorities, Targeting Subsidies among Water, Sanitation, and Preventive Health Interventions in Developing Countries. *World Dev*. 2012;40(8):1546–1568.
28. COVID-19 Hygiene Hub. What is known about returns on investment in hygiene? 2020. Available at: <https://resources.hygienehub.info/en/articles/4785903-what-is-known-about-returns-on-investment-in-hygiene> (Accessed: October 2022).
29. The Global Handwashing Partnership. Handwashing Handbook. Why Handwashing, Economic Impact. Available at: <https://globalhandwashing.org/about-handwashing/why-handwashing/economic-impact/> (Accessed: October 2022).
30. Jamison DT, et al. Disease Control Priorities: improving health and reducing poverty. *Lancet*. 2018;391(10125):150–204.
31. Mengfei G, et al. COVID-19 Message Fatigue: How Does It Predict Preventive Behavioral Intentions and What Types of Information are People Tired of Hearing About? *Health Commun*. 2022;1–10. doi: 10.1080/10410236.2021.2023385 [Epub ahead of print].
32. Bradley Corporation. Healthy Handwashing Survey. 2020. Available at: <https://www.bradleycorp.com/handwashing> (Accessed: October 2022).
33. Haque SS and Freeman MC. The applications of implementation science in Water, Sanitation, and Hygiene (WASH) research and practice. *Environ Health Perspect*. 2021;129(6):065002.





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