**Supplementary data**

**Table S1. Questionnaire**

|  |  |
| --- | --- |
| **Which country are you responding on behalf of?** | [Drop-down list with countries, including “prefer not to respond”] *Official GLASS country list publically available here, and categorised by income level:* |

*Please indicate your* ***perceptions*** *of the impact of COVID-19 (i.e. from large decrease to large increase) in the following areas since the start of the COVID-19 epidemic to date in your country.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **1. Do you think there has been an impact on funding for AMR activities as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Availability of funding for AMR surveillance at the national level |  |  |  |  |  |  |
| Availability of funding for AMR surveillance at the local (facility) level |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **2. Do you think there has been an impact on partnerships and oversight for AMR activities as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Ability to work with existing AMR partnerships, e.g. international, regional laboratory or facility networks |  |  |  |  |  |  |
| Ability to create new AMR partnerships, e.g. international, regional laboratory or facility networks |  |  |  |  |  |  |
| Oversight and accountability by national AMR coordinating body of ongoing AMR activities |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **3. Do you think there has been an impact on diagnostics and laboratory testing for AMR as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Number of clinical cultures, i.e. workload of routine microbiology (culture, susceptibility testing) |  |  |  |  |  |  |
| Number of screening cultures to detect multidrug resistant organisms |  |  |  |  |  |  |
| Turn-around time of antimicrobial susceptibility results |  |  |  |  |  |  |
| Ability to carry out routine laboratory quality management activities |  |  |  |  |  |  |
| Ability to carry out molecular testing, including Whole Genome Sequencing, for multidrug resistant organisms |  |  |  |  |  |  |
| Ability to provide training for laboratory personnel |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **4. Do you think there has been an impact on laboratory supplies and equipment for AMR activities as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Availability of quality laboratory reagents/consumables for bacteriology and antimicrobial susceptibility testing |  |  |  |  |  |  |
| Ability of laboratories to service their machines and equipment, e.g. repairs, compliance and updates |  |  |  |  |  |  |
| Access to advanced technologies e.g. molecular testing for multidrug resistant organisms |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **5. Do you think there has been an impact on the availability of staff responsible for AMR activities as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Availability of public health staff to respond to routine AMR activities, e.g. reporting, outbreak response, including healthcare associated infections, foodborne/enteric infections, sexually transmitted diseases |  |  |  |  |  |  |
| Availability of medical doctors for AMR activities, e.g. stewardship, infection prevention and control |  |  |  |  |  |  |
| Availability of nursing staff for AMR activities, e.g. stewardship, infection prevention and control |  |  |  |  |  |  |
| Availability of infection control focal persons for AMR activities |  |  |  |  |  |  |
| Availability of environmental/cleaning service workers |  |  |  |  |  |  |
| Availability of laboratory staff for AMR diagnostics and testing |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **6. Do you think there has been an impact on AMR data information systems as a result of COVID-19 in your country in terms of the following:** | Large change | Moderate change | No change | Do not know |
| Changes to procedures and infrastructure of *laboratory* information systems for AMR reporting |  |  |  |  |
| Changes to procedures and infrastructure of *hospital clinical* information systems for AMR response |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **7. Do you think there has been an impact on patient-case mix as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Chronically ill inpatient admissions |  |  |  |  |  |  |
| Intensive care unit admissions |  |  |  |  |  |  |
| Outpatient visits |  |  |  |  |  |  |
| Emergency department visits |  |  |  |  |  |  |
| Hospital length of stay |  |  |  |  |  |  |
| Occupancy rate of hospital intensive care unit beds |  |  |  |  |  |  |
| Non-urgent or elective surgical procedures |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **8. Do you think there has been an impact on infection prevention and control (IPC) practices as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Compliance with hand hygiene, e.g. 5 Moments for hand hygiene |  |  |  |  |  |  |
| Availability of alcohol-based hand rub |  |  |  |  |  |  |
| Availability of personal protective equipment, e.g. masks, respirators, gowns, gloves |  |  |  |  |  |  |
| Inappropriate IPC practices e.g. double or triple gowning/gloving, performing hand hygiene over gloved hands |  |  |  |  |  |  |
| Ability to cohort patients by multidrug resistant organism status |  |  |  |  |  |  |
| Ability to carry out appropriate IPC practices at long-term care facilities |  |  |  |  |  |  |
| Ability to provide IPC training for health care workers |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **9. Do you think there has been an impact on antibiotic consumption as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| Total prescribing of antibiotics |  |  |  |  |  |  |
| Availability of antibiotics, i.e. Antibiotic supply chain |  |  |  |  |  |  |
| Consumption of [WHO *access*](https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/)antibiotics, i.e. first- or second-line treatment for common infections |  |  |  |  |  |  |
| Consumption of [WHO *watch*](https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/) antibiotics, i.e. treatment for limited group of syndromes, should be monitored |  |  |  |  |  |  |
| Consumption of [WHO *reserve*](https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/)antibiotics, i.e. “last resort” to treat multi- or extensively-drug resistant bacteria |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **10. Do you think there has been an impact on antimicrobial resistance rates as a result of COVID-19 in your country in terms of the following:** | Large decrease | Moderate decrease | No impact | Moderate increase | Large increase | Do not know |
| *Escherichia coli* |  |  |  |  |  |  |
| *Klebsiella pneumoniae* |  |  |  |  |  |  |
| *Acinetobacter spp.* |  |  |  |  |  |  |
| *Staphylococcus aureus* |  |  |  |  |  |  |
| *Streptococcus pneumoniae* |  |  |  |  |  |  |
| *Salmonella* spp. |  |  |  |  |  |  |
| *Shigella* spp. |  |  |  |  |  |  |
| *Neisseria gonorrhoeae* |  |  |  |  |  |  |
| Multi-drug resistant healthcare-associated infections |  |  |  |  |  |  |
| Multi-drug resistant infections at long-term care facilities |  |  |  |  |  |  |
| ***Please provide any further information you may have in this area (e.g. explaining a particular increase/decrease, examples/data):***  Free text response | | | | | | |

|  |  |
| --- | --- |
| 1. **Do you have any success stories you are able to share e.g. solutions to AMR challenges or opportunities to improve AMR control during the COVID-19 crisis?** | Free text response |

|  |  |
| --- | --- |
| 1. **What do you predict will be the long-term impacts on AMR?** | Free text response |

|  |  |
| --- | --- |
| 1. **Do you have any suggestions for improvements to the impact that the COVID-19 pandemic is having on AMR activities?** | Free text response |

|  |  |
| --- | --- |
| 1. **Do you have any other comments?** | Free text response |

* **Our country would like to be acknowledged in any relevant publications.**

**Table S2. Coding framework for free-text responses from survey**

|  |  |
| --- | --- |
| Funding for AMR activities | 1. Reduction in funding for AMR activities as result of COVID-19    1. COVID-19 funding prioritised over AMR    2. Funding for AMR activities delayed due to COVID-19 2. Solution to funding AMR activities during COVID-19 pandemic    1. Leverage of COVID-19 for funding of AMR activities 3. Mixed picture/directions in terms of funding for AMR activities 4. No impact on funding for AMR activities 5. No budget or funding for AMR activities in the first place 6. Unable to assess whether COVID-19 has had an impact on funding for AMR activities due to lack of data 7. Prioritisation of COVID-19 activities, but no specific comment on funding for AMR activities |
| Partnerships and oversight for AMR activities | 1. Reduction/worsening in partnerships and oversight for AMR activities due to COVID-19    1. Networking/partnerships    2. International development/support    3. Strategy /NAP/oversight 2. Increase/improvement in partnerships and oversight for AMR activities due to COVID-19    1. Networking/partnerships 3. There was no AMR system in the first place (i.e. no partnerships and oversight for AMR activities that could be affected) 4. Other aspect of AMR that does not relate to partnerships or oversight    1. Reduction/worsening       1. Due to partners or funders shifting focus    2. Increase/improvement |
| Diagnostics and laboratory testing for AMR | 1. Reduction/delay in diagnostics and laboratory testing for AMR    1. Due to prioritisation of COVID-19    2. Due to reduced need 2. Increase in diagnostics and laboratory testing for AMR 3. Solutions in relation to diagnostics and laboratory testing for AMR 4. There was no AMR system in the first place (i.e. no diagnostics and laboratory testing for AMR that could be affected) 5. Activities relating to AMR generally affected (not specifically relating to laboratories) 6. Laboratory training    1. Reduction    2. Increase 7. Increase in general laboratory resources (link to AMR unclear) |
| Laboratory supplies and equipment for AMR activities | 1. Reduction/impact on laboratory supplies and equipment for AMR activities    1. Due to reliance on import/travel    2. Due to fewer patients 2. Increase in laboratory supplies and equipment for AMR activities 3. Few laboratory supplies and equipment for AMR activities available before COVID-19 pandemic 4. No impact on laboratory supplies and equipment for AMR activities |
| Availability of staff responsible for AMR | 1. Reduction in availability of staff responsible for AMR    1. Laboratory staff    2. Public health staff    3. Infectious disease specialists    4. Medical staff    5. Nursing staff    6. Cleaning staff 2. Solutions found for addressing reduced staff that are responsible for AMR 3. There was no AMR system in the first place (i.e. there were no staff responsible for AMR that could be affected) 4. Other staff-related activities 5. Other indirect staff-related increased    1. Increased Infection Prevention and Control (IPC) activities    2. Increased cleaning in healthcare facilities 6. Reduction in general AMR activities (no particular comment about staff responsible for AMR) |
| AMR data information systems | 1. Reduction in data transfer 2. Less (external) interest in AMR data 3. Innovation/solutions found for AMR data information systems 4. Unspecified changes to reporting 5. No impact on AMR data information systems as a result of COVID-19 6. No or barely any AMR data information systems system in place to start with (i.e. no AMR data information systems that could be affected) |
| Patient-case mix | 1. Patient-case mix affected by COVID-19    1. Increase in patients       1. ICU    2. Increased length of stay in hospitals    3. Reduction in patients       1. Non-urgent and elective care       2. Emergency care       3. General patients 2. Changes to respond to the patient-case mix challenge    1. Reorganisation/changes of services    2. Changes to staffing 3. Hospitals generally affected by COVID-19 (unspecified) |
| Infection prevention and control (IPC) | 1. IPC) practices increased/improved    1. Delivery of IPC training    2. Awareness    3. Hand hygiene compliance    4. Use of alcohol hand rub    5. Personal protective equipment 2. Mixed IPC picture in country 3. Solutions found for improving IPC practices 4. Challenges to/weaknesses of IPC practices    1. Ability to cohort patients 5. Lessons learnt in relation to IPC practices 6. Unknown impact of COVID-19 on IPC practices |
| Antibiotic consumption | 1. Increase in prescribing/demand of antibiotics due to COVID-19 2. Reduction in prescribing/demand of antibiotics due to COVID-19    1. Due to fewer patients in hospitals    2. Due to fewer people getting sick (non-COVID-19) 3. No impact on prescribing/demand of antibiotics due to COVID-19 4. Unable to assess impact of COVID-19 on antibiotic consumption    1. Due to not using use AWaRe classification    2. Due to lack of available data 5. Impact of COVID-19 on supply of antibiotics    1. Not known    2. Reduced |
| Antibiotic resistance | 1. Increase    1. High dependency/intensive care unit (ICU) settings 2. Decrease in resistance of some antibiotics/in some healthcare settings Community settings    1. Reduction in MROs 3. No impact of COVID-19 on antibiotic resistance 4. No data available on impact of COVID-19 on antibiotic resistance 5. Suggested reasons for reduction in resistance    1. Reduced consumption    2. More hand washing/better IPC/distancing    3. Less screening due to lack of staff    4. Reduced reporting of antibiotic resistance    5. Fewer patients in hospital    6. Fewer samples available |
| Success stories | 1. Success stories during COVID-19 pandemic    1. Good responsiveness to AMR /COVID-19    2. Good coordination between actors to address COVID-19 and AMR    3. Improved IPC, hygiene, distancing    4. COVID-19 helped to identify gaps in IPC    5. Improved public understanding of infectious diseases and epidemiology    6. Antimicrobial stewardship integrated into COVID-19    7. Acquirement of equipment relevant to AMR    8. Delivery of training (on various topics)    9. Making something of AMR and COVID-19 to improve on both areas    10. Managed to continue activities/making improvements to AMR despite pandemic    11. Reduced antimicrobial consumption    12. Identification of areas needing to be improved in relation to AMR    13. COVID-19 has made it easier to control antibiotic prescribing 2. No success story available in relation to efforts to reduce AMR during COVID-19 pandemic |
| Prediction of long-term impacts | 1. Prediction of negative long-term impacts of COVID-19 on AMR    1. Increased prescribing/consumption of antibiotics    2. Increased use of non-prescribed antibiotics (self-prescribing)    3. Increased resistance of antibiotics /MDR    4. Inability to detect resistance (diagnostics    5. Less prioritisation of AMR projects/activities    6. Worsening of antimicrobial stewardship    7. Exposure to drug-resistant viruses    8. Less AMR surveillance    9. Staff fatigue and therefore unable to respond to AMR threats    10. Increased burden of infections    11. AMR threatens health systems    12. Financial tightening as result of COVID-19    13. Impact mainly on developing countries' economies and health 2. Prediction of positive long-term impacts of COVID-19 on AMR    1. Reduction in antibiotic consumption/improved rational use of antibiotics    2. Improved antimicrobial stewardship    3. Strengthening of One Health approach    4. Improved diagnostic capacity    5. Improved IPC    6. Improved global health system (preparedness)    7. Implementation of national action plans    8. Reduced/maintained resistance    9. Improved health-seeking behaviours    10. Improved surveillance    11. Improved awareness amongst decision makers of laboratories    12. Highlight AMR/epidemics as an issue    13. More focus on travel-associated infections in future 3. Prediction of long-term impacts of COVID-19 on AMR depends on duration of pandemic 4. No prediction of long-term impacts of COVID-19 on AMR |
| Suggestions for improvements | 1. Suggestions for improvements to the impact of COVID-19 on AMR activities    1. Activities to improve prevention of AMR       1. Focus on IPC across whole health system       2. Continue with biosafety and biosecurity       3. Ensure AMR is in all health policies       4. Increase resiliency of AMR programmes for future threats       5. Strengthen health systems       6. Better global coordinated resource mobilisation       7. Improve preparedness so pandemics have less impact on AMR       8. Improve compliance with AMR-relevant guidelines       9. Improve patient equity    2. Increased advocacy for AMR in order to receive more funding and resources    3. More public awareness of AMR and AMR-relevant areas    4. Focus on surveillance    5. Increased external support to countries       1. Support and engagement from WHO          1. On AMR & COVID-19          2. Capacity building for diagnostic facilities       2. Support with impacts of COVID-19 on AMR       3. Technical support       4. Financial support       5. Shift in external support from surveillance to research and development       6. Development of resources          1. Guidelines for the prudent use of antibiotics during a pandemic          2. National recommendations for treatment of suspected bacterial pneumonia at early stage    6. Increased resources for particular areas of AMR       1. IPC       2. Lab diagnostics       3. Surveillance       4. Antimicrobial stewardship       5. Laboratory supplies       6. Training of staff in particular AMR-relevant areas       7. Strengthened Water, Sanitation and Hygiene (WASH)       8. Research and development of new antibiotics    7. Focus on AMR in areas affected by COVID-19       1. Improved education about prescribing of antibiotics to patients with COVID-19       2. Training on IPC in COVID-19 settings    8. Support to improve quality of life of people who have had an infection    9. Technology and other advancements       1. Genomic surveillance of COVID-19 offers opportunities for AMR       2. Support more efficient ways of working (e.g. electronic prescribing and surveillance systems, use of artificial intelligence (AI))    10. Better communication        1. Between laboratory staff and physicians        2. More engagement between National Focal Point (NFP) and AMR teams in hospitals, including rewarding them for their work    11. Research/analysis        1. Survey on antimicrobial use in Sub-Saharan countries        2. Research on prescribing of antibiotics and antiviral for patients with COVID-19        3. Studies on risk factors and potential role of infections in COVID-19        4. Research opportunities for AMR 2. No suggestions for improvements to the impact of COVID-19 on AMR activities |
| Miscellaneous | 1. Country priorities    1. Find ways to make use of COVID-19 resources for AMR    2. Commitment to tackle AMR in their country    3. Training in staff awareness on AMR    4. Miscellaneous (includes regular auditing of antimicrobial use, monitoring of unnecessary use of antibiotics, better prescribing) 2. Miscellaneous impact of COVID-19 on AMR activities    1. The currently imposed sanctions in [country] are major threat to AMR work 3. AMR is having less of an impact now than at start |