Global report on infection prevention and control

Executive summary

World Health Organization

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Contents

Foreword

The importance of preventing infection and antimicrobial resistance (AMR) in health care is being recognized increasingly in many national and global health efforts. Over the years, the central role infection prevention and control (IPC) has been reflected in the emerging priorities of the World Health Organization's Member States, and their partners. IPC action is acknowledged as playing a prominent role in curbing emerging and ongoing threats in health-related activities ranging from water, sanitation and hygiene and health worker and patient safety to preventing specific conditions, such as AMR and sepsis. It is critical to the provision of high-quality and safe health care, and lies at the core of health emergency preparedness and response. As such, IPC has played a decisive role during the COVID-19 pandemic, and its correct application continues to save lives everywhere around the globe.

This global report on IPC is the first of its kind. It provides a global situation analysis of how IPC programmes are being implemented in countries around the world and highlights the harm to patients and health workers caused by health care-associated infections (HAIs) and AMR. The report also addresses the impact and cost-effectiveness of IPC and it indicates approaches, resources and strategic directions to support countries in their efforts to improve IPC programmes and practices, as a high priority for the health agenda and in connection with other areas of work.

Inadequate IPC places a significant burden on those affected and is a determinant of poor quality care delivery and health services disruption, particularly in lower income settings. The report reveals that high-income countries are more likely to be progressing their IPC work, and are eight times more likely to have a more advanced status of IPC programmes and practices implementation than low-income countries. This demonstrates, once again, that IPC is also a problem of equity and access to quality health care.

Patients afflicted with other conditions and seeking care, or accessing preventive services such as vaccination in good health, find themselves with the risk of being infected with a HAI. Facilities can be the entry point for outbreaks or become amplifiers of pathogen transmission, with subsequent spread of outbreaks to the community. Out of 100 patients hospitalised, seven will be infected with an HAI, the risk doubling and being up to 20 times higher in low- and middle-income countries. The more ill and fragile patients get, the higher becomes the risk of HAIs and their deadly consequences. Deaths are increased two to threefold when infections are resistant to antimicrobials. Moreover, the experience accumulated in the past two years during the COVID-19 pandemic unequivocally shows that both patients and health workers can be at high risk of being infected with SARS-CoV-2 during health care delivery and need to be protected.

IPC is a proven solution that has the ability to avoid most of this harm and incalculable suffering and costs to people and the health system. Compelling evidence shows that up to 70% of HAIs can be prevented by scaling up an array of effective IPC interventions. Investing in IPC is one of the most effective and cost-saving interventions available. In particular, hand hygiene and environmental hygiene in health care facilities were found to be able to more than halve the risk of dying as a result of infections with AMR pathogens, as well as to decrease the associated long-term complications and health burden by at least 40%. Improving hand hygiene in health care settings could save about US$ 16.50 in reduced health care expenditure for every dollar invested. It is also shocking to understand that, during the first six months of the COVID-19 pandemic, access to appropriate personal protective equipment combined with rapid IPC training would have had the potential to avert SARS-CoV-2 infections and related deaths among health care workers globally, while generating substantial net savings across countries worldwide, independently from their income.

However, the striking reality outlined by this report is the limited and inconsistent implementation of IPC programmes globally. Comparing data from WHO 2017–2018 and 2021–2022 surveys, the percentage of countries having a national IPC programme did not improve; furthermore in

2021–2022 only four out of 106 assessed countries (3.8%) had all minimum requirements for IPC in place at the national level. This is reflected in inadequate implementation of IPC practices at the point of care, with only 15.2% of health care facilities meeting all of the IPC minimum requirements, according to a WHO survey in 2019.

Nevertheless, encouraging progress has also been made in some areas, with a significant increase being seen in some key indicators such as the percentage of countries having an appointed IPC focal point, and/or a dedicated budget for IPC and a curriculum for front-line health care workers' training; and/or establishing hand hygiene compliance as a key national indicator.

Given this global picture, the report also outlines priorities for addressing IPC in the national and international health agendas. It is crucial that political commitment be decisive and visible through the engagement of the national and local leadership at its highest levels, the allocation of resources and the establishment of the appropriate regulations and legal frameworks for IPC. This would ensure that at least the WHO IPC minimum requirements are in place in all countries, as a first step towards the full implementation of all IPC core components. Most importantly, IPC should make a difference for health worker and patient safety at the point of care, with optimal practices embedded within the patient pathway and clinical care. This can only happen if adequate standard operating procedures, training, infrastructure, supplies and human resources are available and monitored.

It is time to turn the page on the paradox of hospitals spreading disease, rather than being the curative centres they were designed to be. Investments in IPC improvements are urgently needed. This is the moment for making decisive action on IPC and raising public awareness. This report aims to provide the scientific basis and the motivation for powerful action on IPC.

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Deputy Director-General, WHO

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The WHO global report on infection prevention and control

Over the last decade, major outbreaks such as those due to the Ebola virus disease and the Middle East respiratory syndrome coronavirus (MERS-CoV), and the coronavirus disease 2019 (COVID-19) pandemic, have demonstrated how epidemic-prone pathogens can spread rapidly through health care settings. These events have exposed the gaps in infection prevention and control (IPC) programmes that exist irrespective of the resources available or the national level of income. Furthermore, other less-visible health emergencies are also a compelling reason to address gaps in IPC, such as the silent endemic burden of health care-associated infections (HAIs) and antimicrobial resistance (AMR), which harm patients every day across all health care systems.

This Executive summary provides a synthesis of the first World Health Organization's (WHO) *Global report on infection prevention and control*. Therefore, it highlights the burden of infection and AMR and the related harm to both patients and health workers in health care settings. It presents a global situation analysis of the implementation of IPC programmes as well as an overview of the strategies and resources that are available to improve the situation in countries.

While identifying key gaps and achievements at country and global level, the report sets priorities and offers guidance on the implementation of IPC interventions. It demonstrates the impact and cost–effectiveness of IPC interventions. Moreover, it highlights the importance of integration and alignment of IPC interventions with water, sanitation and hygiene (WASH) strategies in the context of broader efforts to address AMR, health emergencies, and the quality and safety of health care.

IPC provides effective solutions to prevent the risk of infection and AMR in health care.

It is a clinical and public health specialty based on a practical, evidence-based approach that protects patients, health workers and visitors to health care facilities by preventing avoidable infections, including those caused by antimicrobial-resistant pathogens, acquired during the provision of health care services *(1)*. IPC occupies a unique position in the field of patient and health workers' safety and quality of care, as it is universally relevant to every health worker and patient, at every health care interaction.

Guidance and recommendations are available to countries to identify the core components of effective IPC programmes at the national and facility level *(2)* and ensure that they have adequate IPC capacity. These were developed by WHO according to the available evidence and the consensus by experts and professionals from countries and key stakeholders in the field of IPC. Derived from the core components through a consensus-building process, WHO also established international IPC minimum standards, the so-called "minimum requirements" for IPC *(3)*, that all countries and health care facilities should have in place to ensure minimum protection to patients, health workers and visitors.

The report and its executive summary are primarily aimed at those in charge of making decisions and formulating policies in the field of IPC at the national, subnational and facility levels. This includes policy-makers, senior managers, administrators who are managing health budgets, and IPC focal points at national level (Ministry of Health, public health institutes, etc.), and subnational and health care facility levels.

The report is the result of a cross-cutting and multidisciplinary effort, involving staff at WHO headquarters, and in regional and country offices, as well as key partners in the field of IPC. It includes information and data from many sources, including the scientific literature, WHO global databases, WHO surveys using standardized tools, WHO publications and reports published by other institutions. The report also includes a compilation of data and information providing overviews of IPC at the regional level, and diverse examples of IPC programmes at country level.

The problem of unsafe care resulting from HAIs and AMR

No country or health system, however sophisticated, can claim to be free of HAIs.

HAIs are among the most frequent adverse events occurring in the context of health service delivery. These infections, many of which are caused by multidrug-resistant organisms, harm patients, visitors and health workers, and place a significant burden on health systems, including the associated increased costs.

Out of every 100 patients in acute-care hospitals, seven patients in high-income countries (HICs) and 15 patients in low- and middle-income countries (LMICs) will acquire at least one health care-associated infection during their hospital stay *(4, 5)*. Up to 30% of patients in intensive care can be affected by health care-associated infections, with an incidence that is two to 20 times higher in LMICs than in HICs, in particular among neonates *(5, 6)*.

Approximately one in four (23.6%) of all hospital-treated sepsis cases are health care associated. Almost half (48.7%) of all cases of sepsis with organ dysfunction treated in adult intensive care units are acquired in hospital *(7, 8)*.

On the basis of data from 2016–2017, the European Centre for Disease Prevention and Control (ECDC) calculated that 4.5 million episodes of HAIs occurred every year in patients admitted to acute care hospitals in the European Union and European Economic Area (EU and EEA) countries *(9)*. The United States Centers for Disease Control and Prevention (USCDC) estimates that, on any given day, one in 31 hospital patients and one in 43 nursing home residents has a health care-associated infection *(10)*. The problem of infection and spread of AMR does not spare long-term care facilities where ECDC estimated that 4.4 million episodes of health care-associated infections occur every year in EU and EEA countries *(9)*. Similarly, the CDC estimated that, on any given day, one in every 43 nursing home residents has a HAIs *(10)*.

Transmission of SARS-CoV-2, the virus that causes COVID-19, in health care settings has been a major issue throughout the COVID-19 pandemic, especially during the first waves in 2020. Among hospitalized patients with confirmed COVID-19, up to 41% were infected in health care settings, according to different studies *(11)*. The prevalence of infection among health workers varied from 0.3% to 43.3% *(12)*.

The impact of HAIs and AMR on people's lives is incalculable.

In EU and EEA countries, the burden of the six most frequent HAIs in terms of disability and premature mortality was twice the burden of 32 other infectious diseases combined *(13)*.

Mortality among patients affected by health care-associated sepsis was 24.4%, increasing to 52.3% among patients treated in an intensive care unit *(7, 8)*.

Mortality among patients infected with resistant microorganisms is at least two to three times higher than among those infected with sensitive microorganisms *(5, 14–19)*.

In EU and EEA countries, the three most impactful antibiotic-resistant microorganisms, which account for 70% of the burden of AMR (in terms of disability and premature mortality), are typically acquired in health care settings *(20, 21)*.

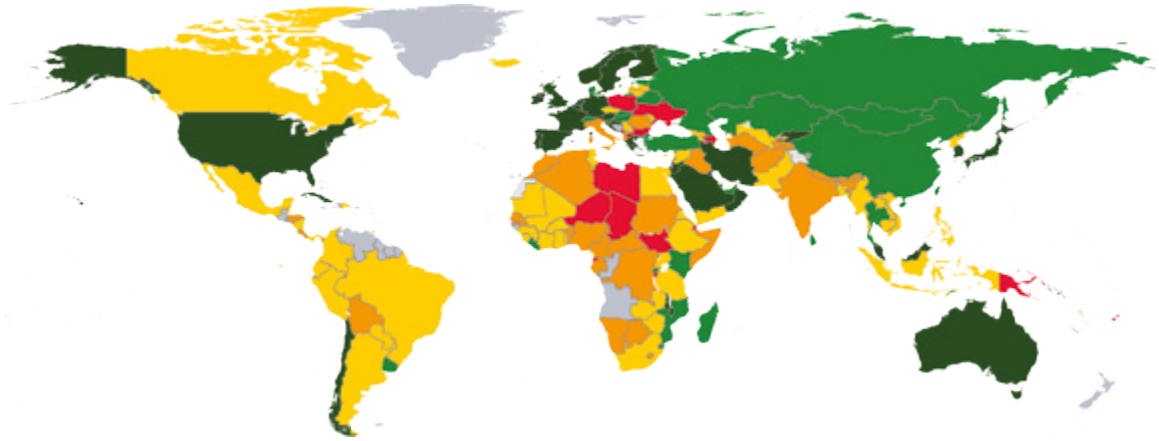
WHO estimates that between 80 000 and 180 000 health care workers lost their lives to COVID-19 globally between the beginning of the pandemic and May 2021 *(22)*.

Situation analysis of the implementation of IPC around the world

IPC implementation at the national level

In 2020–2021, according to the system established to monitor the status of country progress towards the implementation of the AMR global action plan (the Tripartite Antimicrobial Resistance Country Self-assessment Survey or TrACSS), among 162 countries submitting data, 11% of countries reported that they did not have an IPC programme or an operational plan (Fig. 1, A) and 54% that they had national IPC programmes or operational plans that had not been implemented, or that were being implemented only in selected health facilities (Fig. 1, B and C). Only 34% of countries reported having an IPC programme implemented nationwide (Fig. 1, D and E), and only 19% of these had a system to monitor its effectiveness and compliance (Fig. 1, E) *(23)*.

Fig. 1. Country map according to 2020–2021 TrACSS results (indicator 8.1)



- A. No national infection prevention and control (IPC) programme or operational plan is available.
- B. A national IPC programme or operational plan is available. National IPC and water, sanitation and hygiene (WASH) and environmental health standards exist but are not fully implemented.
- C. A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.
- D. A national IPC programme available, according to the WHO IPC core components guidelines and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.
- E. IPC programmes are in place and functioning at national and health facility levels, according to the WHO IPC core components guidelines. Compliance and effectiveness are regularly evaluated and published. Plans and guidance are updated in response to monitoring.
- No response.
- Not applicable.

Source: *(24)*.

In 2021–2022, a detailed global survey on the minimum requirements for national IPC programmes carried out by WHO *(3, 24)* showed that an active IPC programme (a functioning programme with annual workplans and budget) existed in 54.7% (58/106) of countries.

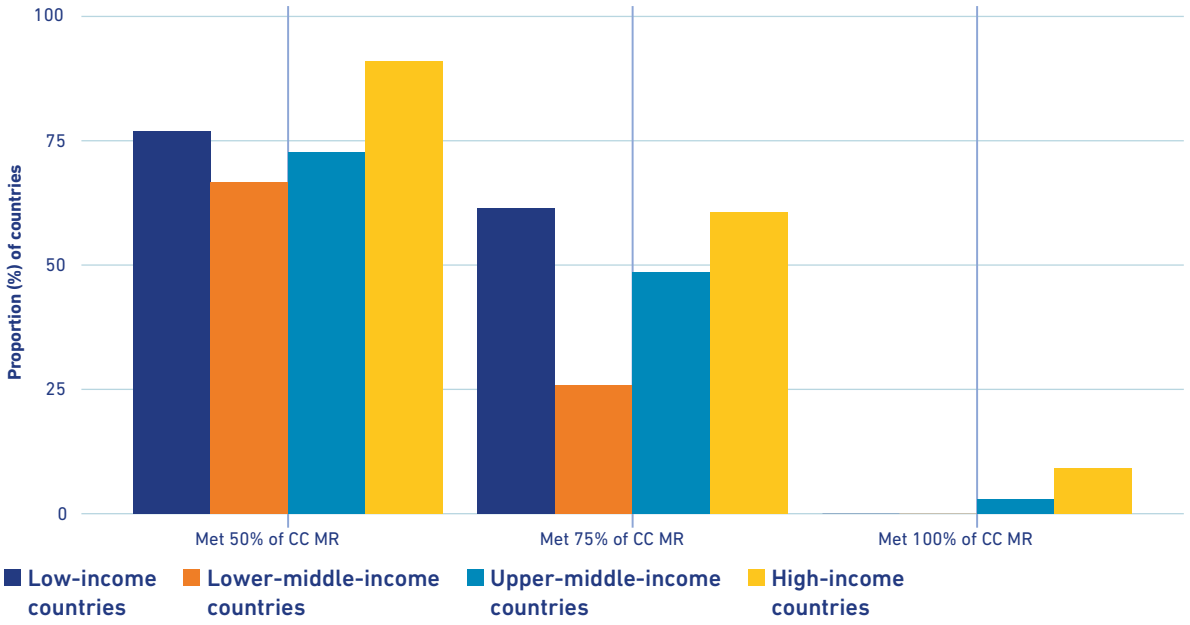
However, only four of the participating countries (3.8%) met all minimum requirements for IPC. According to this survey, relevant gaps were limited availability of a budget specifically dedicated to IPC, limited support at the national level for IPC training roll-out and monitoring of its effectiveness, and lack of expertise to conduct IPC monitoring (WHO, unpublished data).

Conversely, a high percentage of countries (75%) reported that multimodal improvement strategies (that comprise several components or elements implemented in an integrated way with the aim of improving an outcome and changing behaviour), which are considered the gold standard, were included in national IPC guidelines and IPC education and training as the best implementation approach. A similar percentage of countries stated that their national IPC focal point was

responsible for coordinating support for interventions aimed at improving IPC at the facility level (WHO, unpublished data).

Across all surveys and data sets mentioned in the global report, there is a significant positive association between the World Bank income level of a country and the implementation of IPC at the national level. This can be seen in Fig. 2 related to the findings of the 2021–2022 WHO global survey on national IPC programmes (WHO, unpublished data).

Fig. 2. Proportion of countries meeting IPC minimum requirements, by World Bank level of income



CC MR: core components minimum requirements.
Source: WHO global survey on IPC minimum requirements at the national level, July 2021–January 2022 (WHO, unpublished data).

Comparing data on IPC implementation at the national level across years

Reviewing data from TrACSS *(23)* over the past years, there has been little improvement in the implementation of IPC national programmes in LMICs. Indeed, from 2018 to 2021, the only significant statistical association indicating IPC improvement was observed for HICs progressing from levels D to E of the TrACSS classification (WHO, unpublished data) (Fig. 3).

Compared with low-income countries (LICs), HICs were more than eight times as likely to have a more advanced IPC implementation status; compared with upper-middle-income countries, they were five times as likely to have a more advanced IPC implementation status (WHO, unpublished data).

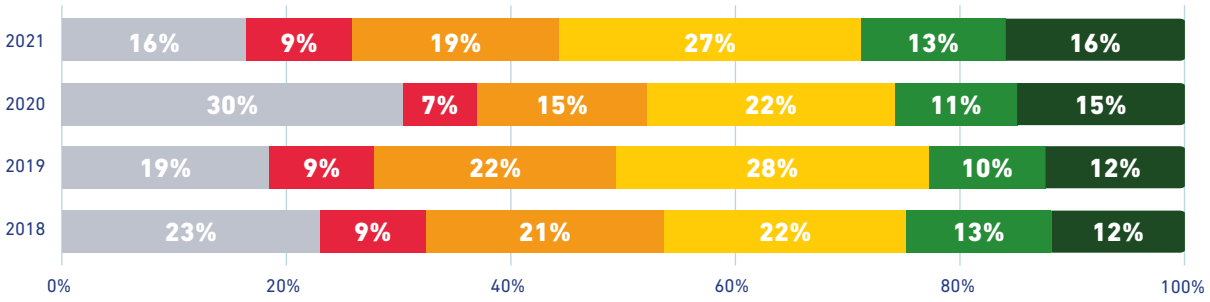
When data from the WHO national IPC global surveys on national IPC programmes conducted in 62 countries in 2017–2018 *(25)* and in 2021–2022[2], are compared, the following key findings emerge (WHO, unpublished data).

- The percentage of countries having a national IPC programme remained relatively stable between 2017–2018 (64.5%) and 2021–2022 (61.3%). However, there was a significant increase in the percentage of countries that have appointed at least a trained IPC focal point (21% vs 72.6%, P<0.001).

[2] Afghanistan, Argentina, Bahrain, Benin, Bolivia (Plurinational State of), Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Chad, Chile, China, Côte d'Ivoire, Denmark, Ecuador, Ethiopia, Finland, Georgia, Germany, Ghana, Guinea, Guyana, Iran (Islamic Republic of), Iraq, Italy, Jamaica, Jordan, Kenya, Kuwait, Kyrgyzstan, Liberia, Malawi, Malaysia, Malta, Mauritania, Mexico, Netherlands, Nicaragua, Nigeria, Norway, Oman, Panama, Paraguay, Peru, Philippines, Qatar, Republic of Moldova, Saudi Arabia, Serbia, Singapore, Spain, Sudan, Suriname, Sweden, Thailand, Trinidad and Tobago, Tunisia, Uganda, United Arab Emirates, United States of America, and Zimbabwe.

- There was a significant increase in the proportion of countries having a dedicated budget for IPC between 2017–2018 (25.8%) and 2021–2022 (48.4%, *P*=0.02); however there is still considerable potential for improvement.
- The percentage of countries having an in-service IPC curriculum significantly increased, from 58.1% to 85.5% (*P*=0.003). However, in 2021–2022, only 41.5% of the countries reported that the national IPC programme was able to provide support for these training activities.

Fig. 3. IPC programmes levels according to TrACSS results from 2018 to 2021



A. No national IPC programme or operational plan is available.

B. A national IPC programme or operational plan is available. National IPC and WASH and environmental health standards exist but are not fully implemented.

C. A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.

D. A national IPC programme available is according to the WHO IPC core components guidelines and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.

E. IPC programmes are in place and functioning at national and health facility levels, according to the WHO IPC core components guidelines. Compliance and effectiveness are regularly evaluated and published. Plans and guidance are updated in response to monitoring.

No response.

Numbers are percentages of countries (*N*=194) answering A to E for that year of survey.
Source: *(24)*.

IPC implementation at the health care facility level

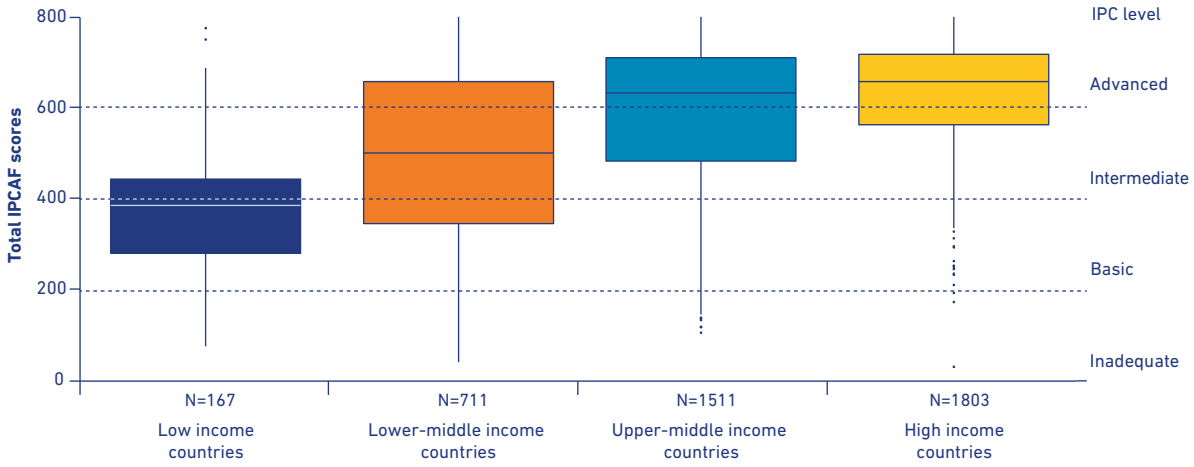
In 2019, according to a WHO global survey involving 4440 health care facilities in 81 countries across all six WHO regions and at all income levels, the level of implementation of IPC core components ranged from "inadequate" to "advanced" (Fig. 4) *(26)*.

Significant differences in the level of implementation of IPC programmes were observed according to the country level of income. There were significantly lower scores in LMICs compared with HICs.

LICs scored at a "basic" level of IPC implementation on average. HICs had more developed IPC in place for all core components, while lower income countries had notably limited implementation of IPC guidelines, training and education, monitoring, audit, feedback and HAIs surveillance (Fig. 5) *(26)*.

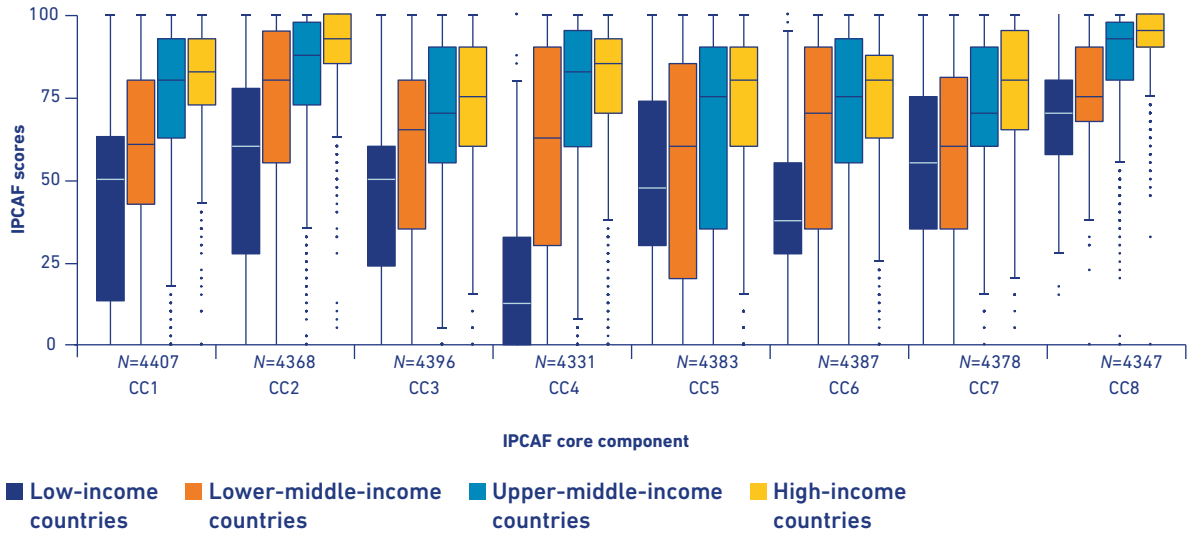
At the facility level, IPC minimum requirements must be in place to provide at least the minimum protection and safety to patients, health workers and visitors *(3)*. The 2019 survey showed that only 15.2% of participating facilities met all indicators designated as IPC minimum requirements, whereas 92.9% met at least half of these indicators.

Fig. 4. Overall IPC scores, by World Bank income levels of countries participating in the 2019 WHO global survey on IPC programmes at the facility level



IPCAF: infection prevention and control assessment framework; IPC: infection prevention and control.
Source: *(26)*.

Fig. 5. IPC scores, by core component and World Bank income level of countries participating in the 2019 WHO global survey on IPC programmes at the facility level



IPCAF: infection prevention and control assessment framework; CC1: IPC programmes; CC2: National and facility level IPC guidelines; CC3: IPC education and training; CC4: HAI surveillance; CC5: multimodal improvement strategy for implementing IPC activities; CC6: IPC monitoring, audit and feedback; CC7: Workload, staffing and bed occupancy at the facility level; CC8: Built environment, materials and equipment for IPC.
Source: *(26)*.

No facility in any LIC had all the IPC minimum requirements in place, and only 18.9% of tertiary specialized health care facilities in HICs had implemented all of them *(26)*.

Even where IPC programmes are in place, they are often not able to function appropriately and sustainably in an enabling environment. In 2019, IPC programmes existed in almost all secondary and tertiary health care facilities. However, particularly in LMICs, the facilities lacked full-time IPC professionals, an allocated IPC budget, routine microbiological laboratory support, and appropriate workload, staffing and bed occupancy *(26)*.

A facility without access to water should not be called a "health care" facility, yet many are in this condition worldwide.

The 2020 global WASH report provided a striking picture: 1.8 billion people were using health care facilities that lacked basic water services and 800 million people were using facilities with no toilets. And yet implementing WASH services in health care facilities across the 46 least-developed countries would require relatively modest investments (US$ 6.5 to US$ 9.6 billion until 2030) *(27, 28)*.

Despite the surge in response to the COVID-19 pandemic, not all essential IPC human resources, supplies and products are available two years into the pandemic. The lack or limited availability of personal protective equipment (PPE) was reported in three WHO pulse surveys carried out in 2020 and 2021 on the continuity of essential health services during the COVID-19 pandemic. Moreover, the lack of IPC supplies and poor application of best practices were shown to be major reasons for the disruption of essential health services in 44% of countries in 2020 and 26% of countries in 2021 *(29, 30)*. In the least developed countries, the situation with such shortages and gaps is particularly acute. An estimated 50% of health care facilities lacked basic water supplies, 63% lacked basic sanitation services, 26% lacked hand hygiene facilities at points of care, and 60% of health care facilities did not have systems to safely manage health care waste *(29)*.

Among COVID-19 facilities assessed by WHO in 10 countries of the African Region[3] in June–July 2021, three quarters of the hospitals (74%) reported that they had available all the essential IPC guidelines for COVID-19, whereas only about one quarter of the primary care facilities (26%) had them. Training on IPC practices and use of PPE was provided in 60% of hospitals while supportive supervision activities were present in only 47% of hospitals. In primary care facilities, there was insufficient training (provided in only 46% of facilities) and supportive supervision (34%) *(30)*.

The same study reported that there continues to be a shortage of PPE required to provide care to COVID-19 patients (surgical masks, respirators, gloves, face shields, goggles and gowns), with only 20% of primary facilities and 27% of hospitals having all items available for staff. In addition, implementation of a COVID-19-safe environment (that is, a dedicated entrance for screening, a separate room for a patient with suspected COVID-19, etc.) was in place in only about one quarter of primary care facilities and about one third of hospitals *(30)*.

These recent data highlight again that limited progress has been achieved in some countries despite the momentum created by the pandemic, and that there are major gaps in IPC in primary care. These gaps hamper the quality and safety of care provided at this critical level of the health system and can have detrimental consequences as regards the trust of the community in health care.

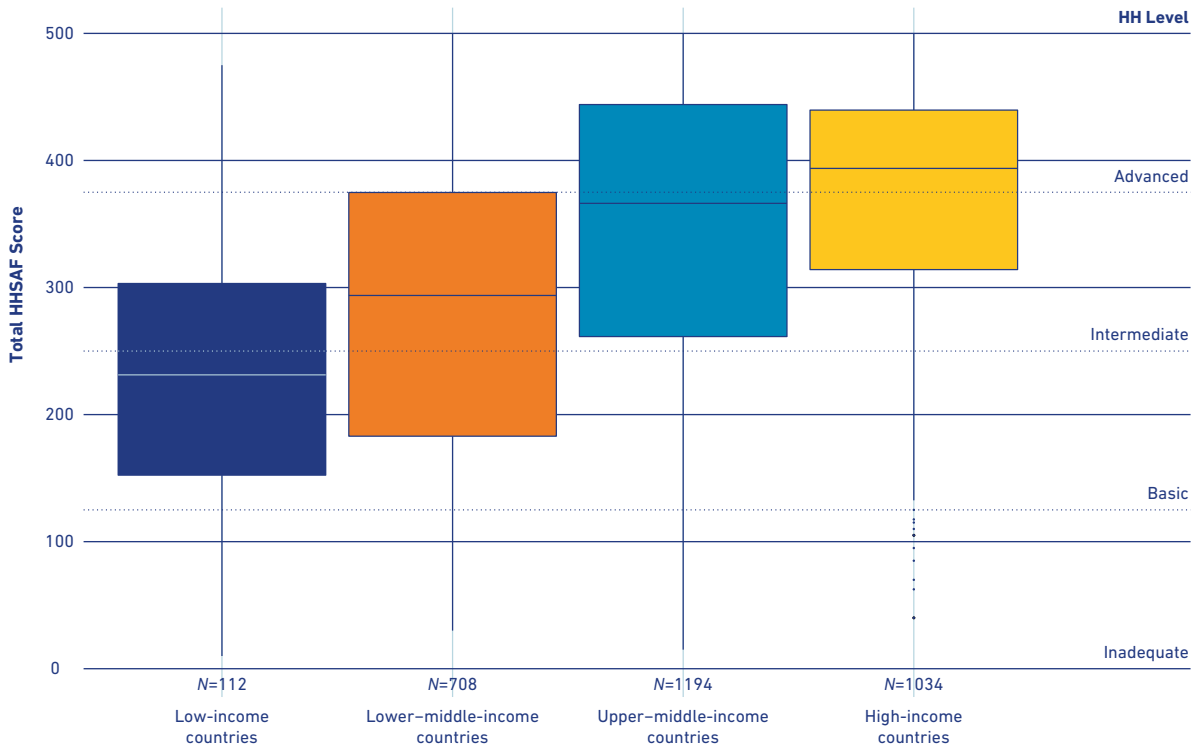
Implementation of hand hygiene programmes at the health care facility level

Appropriate hand hygiene can save lives. Such hand hygiene practices prevent infections, generate economic savings and are therefore a minimum requirement for IPC in all health care facilities. However, available evidence shows that compliance with hand hygiene recommendations during health care delivery remains suboptimal around the world, with an average of 59.6% compliance levels in intensive care units up to 2018, and extreme differences between HICs and LICs (64.5% vs 9.1%) *(31)*. In studies systematically reviewing different periods, the average hand hygiene compliance level – in the absence of specific interventions aimed at improving compliance – was found to be 40% up to 2009, and 41% between 2014 and 2020. In the absence of such interventions, the level of compliance with appropriate hand hygiene guidelines averaged 40% to 50%, but was seen to be as low as 20%, even in HICs *(32, 33)*.

In 2019, the WHO global survey on hand hygiene programmes in 3206 health care facilities in 90 countries showed an intermediate implementation level (350/500 points) overall, with significant differences according to the income level of participating countries ("advanced" in HICs and "basic" in LICs) (Fig. 6), showing a disparity between hand hygiene practice implementation in resource-rich and resource-poor settings *(34)*.

[3] Burundi, Cameroon, Democratic Republic of the Congo, Ghana, Kenya, Mali, Namibia, Senegal, Seychelles, and Zambia.

Fig. 6. Overall weighted HHSAF scores, by country and World Bank income levels



N=3048; HH: hand hygiene; HHSAF: hand hygiene self-assessment framework.
Source: *(34)*.

Alcohol-based handrub products, the most efficient means to achieve appropriate hand hygiene, were reported to be available in only 17% of facilities in LICs (vs 75% of facilities in HICs) and the recommended consumption of at least 20 litres of handrub per 1000 patient-days was achieved in only 9% of LIC facilities compared with 36% of facilities in HICs *(34)*.

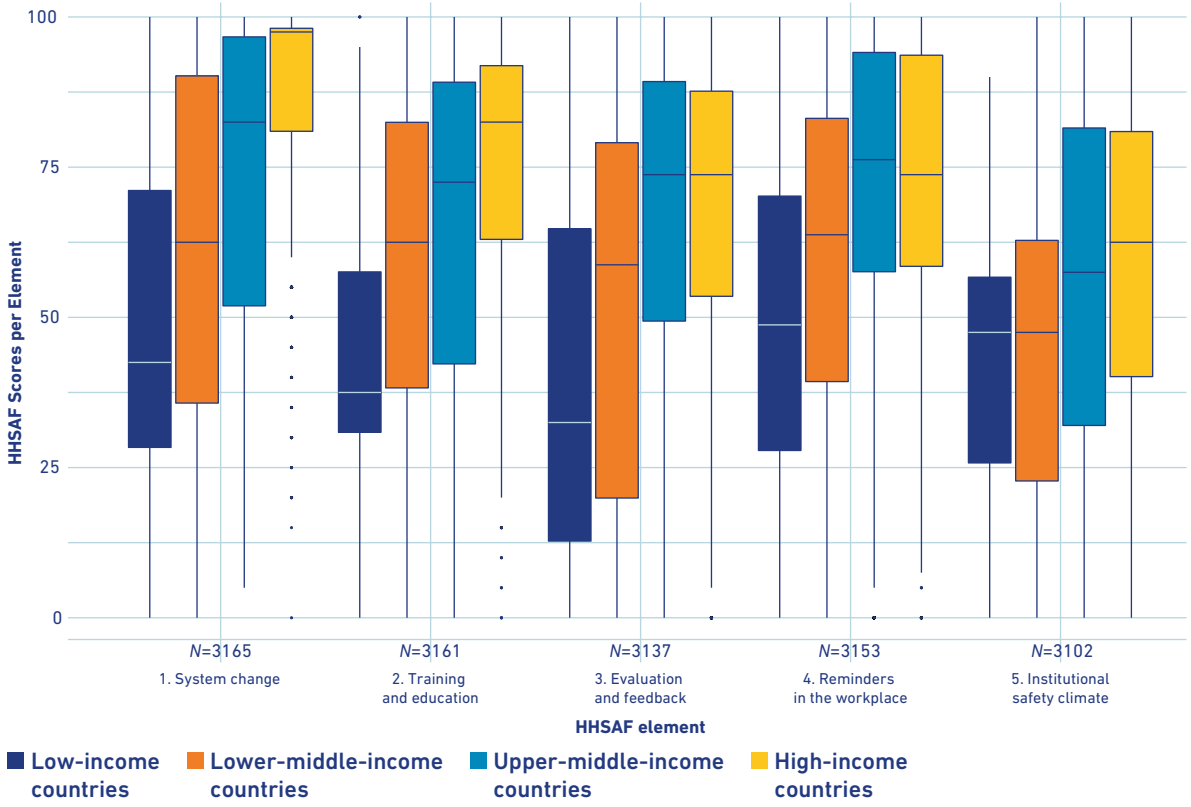
The 2020 WHO global progress report on WASH in health care facilities revealed that one in three facilities lacked hand hygiene supplies (either soap and water or alcohol-based handrubs) at the point of care *(27)*.

The availability of resources seems to be an important driver in the implementation of appropriate hand hygiene. However, a sustained improvement of hand hygiene practices is possible only in an enabling organizational environment and institutional culture (the so-called "institutional safety climate") – and yet, within multimodal hand hygiene improvement strategies, the element scoring lowest was having an institutional safety climate for hand hygiene (Fig. 7) *(34)*.

The scores for all five elements of the WHO multimodal hand hygiene improvement strategy were consistently directly proportional to country income level: the higher the income level, the higher the scores.

These differences were significant for elements related to "System change" and "Training and education". "Evaluation and feedback" in LICs was the lowest-scoring element across the survey (Fig. 7). This suggests (confirming findings from other studies) that LICs do not monitor IPC-related indicators adequately, despite these being IPC core components and minimum requirements *(34)*.

Fig. 7. Weighted element-specific scores for the five elements of the HHSAF survey, 2019, by World Bank income level



HHSAF: hand hygiene self-assessment framework.
Source: *(34)*.

Situation and challenges in implementing the minimum requirements for IPC programmes in WHO regions

The COVID-19 pandemic has exposed many challenges and gaps in IPC in all regions and countries, including those that had the most advanced IPC programmes. However, it has also provided an unprecedented opportunity to make a situation analysis and rapidly scale up outbreak readiness and response through IPC practices, and to strengthen IPC programmes across the health system.

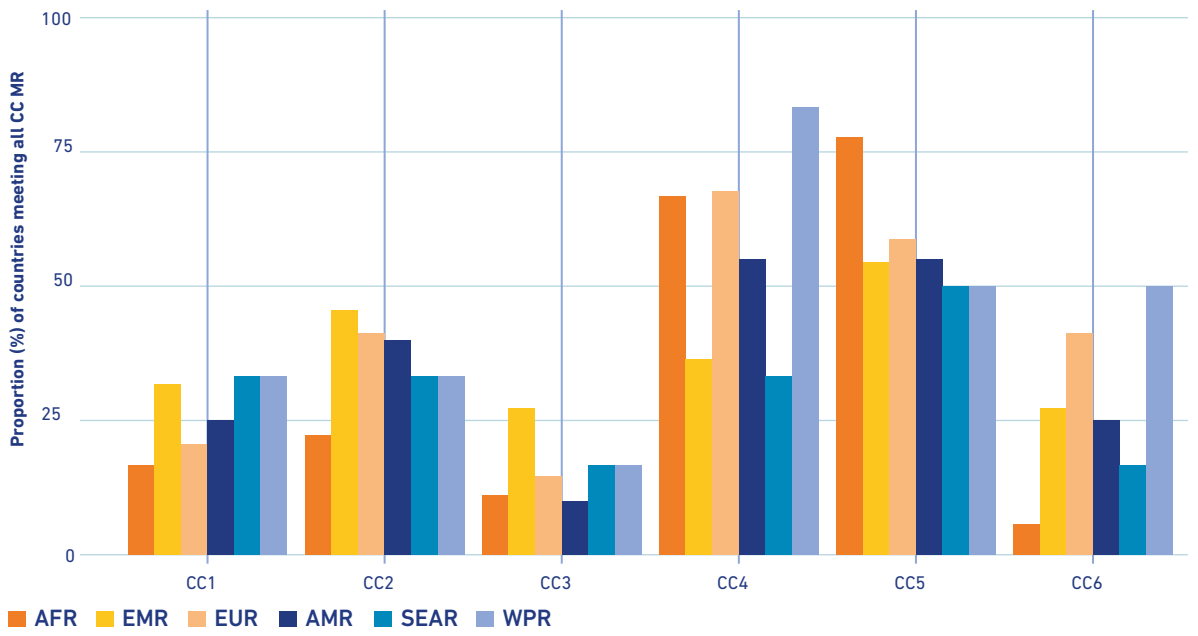
The 2021–2022 WHO global survey on national IPC programmes revealed remarkable differences in the implementation of the minimum requirements for IPC programmes across WHO regions (Fig. 8) (WHO, unpublished data).

Table 1 illustrates the main common challenges and gaps in implementing the WHO core components for IPC encountered in all regions, at national and/or facility level.

The 2021–2022 WHO global survey on national IPC programmes revealed remarkable differences, some significant gaps and limited progress over time, across WHO regions in the implementation of the IPC core components, in particular regarding the minimum requirements for each core component (WHO, unpublished data).

However, compared with previous surveys improvements were also reported by countries in the following areas: having an appointed IPC-trained national focal point, a budget dedicated to IPC and in-service IPC curriculum; developing national IPC guidelines and a national programme or plan for HAI surveillance; using multimodal strategies for IPC interventions; and establishing hand hygiene compliance as a key national indicator (WHO, unpublished data).

Fig. 8. Proportion of countries meeting all reported IPC minimum requirements, by core component, across WHO regions



CC MR: core components minimum requirements; AFR: WHO African Region; AMR: WHO Region for the Americas; SEAR: WHO South-East Asia Region; EMR: WHO Eastern Mediterranean Region; EUR: WHO European Region; WPR: WHO Western Pacific Region.
Source: WHO global survey on IPC minimum requirements at the national level, July 2021–January 2022 (WHO, unpublished data).

Table 1. Common challenges and gaps in IPC in all regions, by WHO Core Component

Core Component	Challenges and current gaps
CC1. IPC programmes	• Competing interests/programmes and services • Lack of financial investments in IPC • Lack of institutionalization, leadership and weak legal frameworks • Limited integration of IPC into other programmes
CC2. National and facility level IPC guidelines	• Lack of guidelines and technical documents according to international standards • Developing IPC guidelines is a demanding process requiring specific expertise • Lack of templates to develop national and facility-level guidelines
CC3. IPC education and training	• Lack of IPC experts and mentors • Lack of standardized IPC curricula, including within pre-graduate courses (e.g. medicine, nursing, midwifery) and in-service training, and for post-graduate specialization • Lack of career pathways and development for IPC professionals
CC4. HAI surveillance	• Lack of expertise among auditors • Need for high financial investment
CC5. Multimodal strategies for implementing IPC activities	• Work practices, behaviours and organization that do not conform to international standards
CC6. IPC monitoring, evaluation and feedback	• Limited translation of monitoring plans into real activities • Limited use of data for action
CC7. Workload, staffing and bed occupancy at the facility level	• Chronic general problem of poor staff/patient ratio (insufficient nurses, and doctors and other professionals) • Lack of human resources dedicated to IPC activities • Health care-associated infections not included within occupational health policies
CC8. Built environment, materials and equipment for IPC	• Weak capacity of microbiology laboratories • Inadequate supplies and infrastructure, including WASH • Procurement and distribution difficulties up to the point of care • Cost and market limitations in LMICs

CC: Core component; HAI: health care-associated infections; IPC: infection prevention and control; LMICs: low- and middle-income countries; WASH: water, sanitation and hygiene.

Based on the momentum created by the COVID-19 pandemic, there has been country engagement and progress in scaling up actions to improve IPC implementation, but sustainability in the longer term should be ensured.

At this point, based on the momentum created by the COVID-19 pandemic, there is clear country engagement and progress in scaling up actions to put in place minimum requirements and core components of IPC programmes, which is being strongly supported by WHO and other key players. Sustaining and further expanding this progress in the longer term is a critical need that requires urgent attention and investments.

The impact and economic side of IPC

A range of IPC interventions have been shown to be highly effective in preventing the occurrence of HAIs.

Analyses pooling together the results of studies from systematic reviews, calculated that IPC interventions can achieve a significant reduction in the rates of HAIs (in particular of catheter-associated bloodstream infections, catheter-associated urinary tract infections, surgical site infections and ventilator-associated pneumonia) in the range of 35–70%, irrespective of the level of income of a country *(35-37)*.

Whether implemented as a stand-alone intervention or integrated into multifaceted interventions, hand hygiene has been highlighted as the most effective single measure to reduce the transmission of microorganisms/pathogens and infection in health care settings *(38, 39)*.

IPC is highly cost–effective and a "best buy" for public health as an approach to reducing infections and AMR in health care, improving health, and protecting health care workers *(19, 40)*.

Available evidence shows that enabling and ensuring appropriate hand hygiene was cost-saving in all populations tested, from health workers to visitors. Screening at patient admission followed by decolonization from potentially harmful microorganisms was consistently found to be cost-saving or cost-effective, especially when carrying out the selective screening of at-risk patients (WHO, unpublished data).

Landmark institutional reports, such as those of the World Bank and the Organisation for Economic Co-operation and Development (OECD), confirmed the positive return on investment from implementation and enforcement of appropriate IPC measures, particularly hand hygiene *(40)*.

According to OECD, the implementation of a package including improved hand hygiene, antibiotic stewardship programmes and enhanced environmental hygiene in health care settings would reduce the health burden of AMR by 85%, while producing savings of 0.7 euros per capita per year *(39)*.

Hand hygiene and environmental hygiene in health care facilities in particular, were found to be the most cost-saving interventions: implementing these would more than halve the risk of dying as a result of infections with AMR pathogens, as well as decreasing the associated long-term complications and health burden by at least 40% *(40)*.

These IPC interventions were affordable in all settings, including low-resourced ones. In particular, improving hand hygiene in health care settings could save about US$ 16.5 in health care expenditure for every US dollar invested *(40)*.

Rapid availability of appropriate PPE, combined with an immediate scale-up of IPC training, could have had the potential to save lives and costs at the start of the COVID-19 pandemic.

A recent modelling study by OECD and WHO indicated that, during the first six months of the COVID-19 pandemic, the availability and rational use of appropriate PPE combined with rapid IPC training could have averted SARS-CoV-2 infections and related deaths among health care workers globally, while generating substantial net savings in all countries tested. Enhancing hand hygiene was also shown to be cost–effective in most regions (WHO and OECD, unpublished data).

More research is needed to increase the evidence on the cost–effectiveness of IPC interventions, especially in LMICs. Indeed, only a limited number of studies exist on the cost–effectiveness of IPC interventions, and most of them have been carried out in HICs.

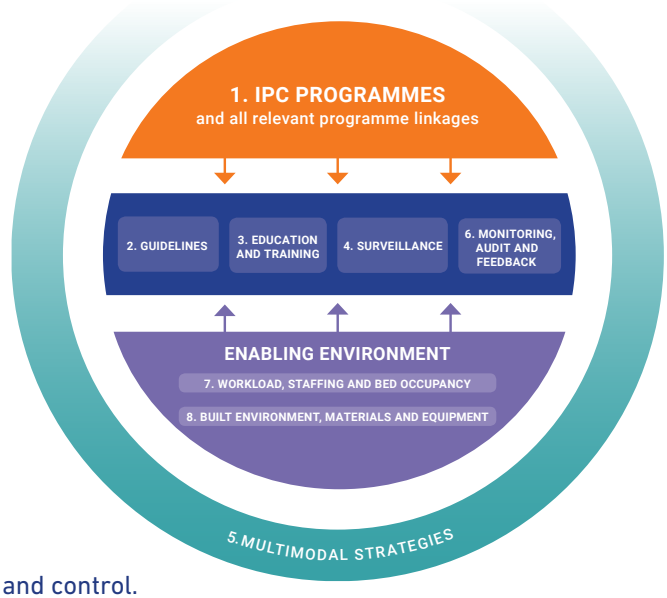
Solutions to improve IPC

Given the evidence reported above, IPC is a tried-and-true solution that is effective and cost-saving, and it ensures patient and health workers' protection and high-quality care. This is why, over the past 20 years, WHO has invested in developing policies, recommendations and implementation strategies and tools to support IPC improvement worldwide.

In the aftermath of the devastating outbreak of Ebola virus disease in West Africa, 2016 represented a turning point in the history of IPC with the publication of comprehensive, evidence-based and consensus-based WHO guidelines on the core components of effective IPC programmes *(2)*, which benefited from the input of many IPC stakeholders and field implementers from around the world.

Eight core components were identified, six of which are relevant for both the national and health care facility levels, and two (core components 7 and 8) should be implemented at the facility level (Fig. 9).

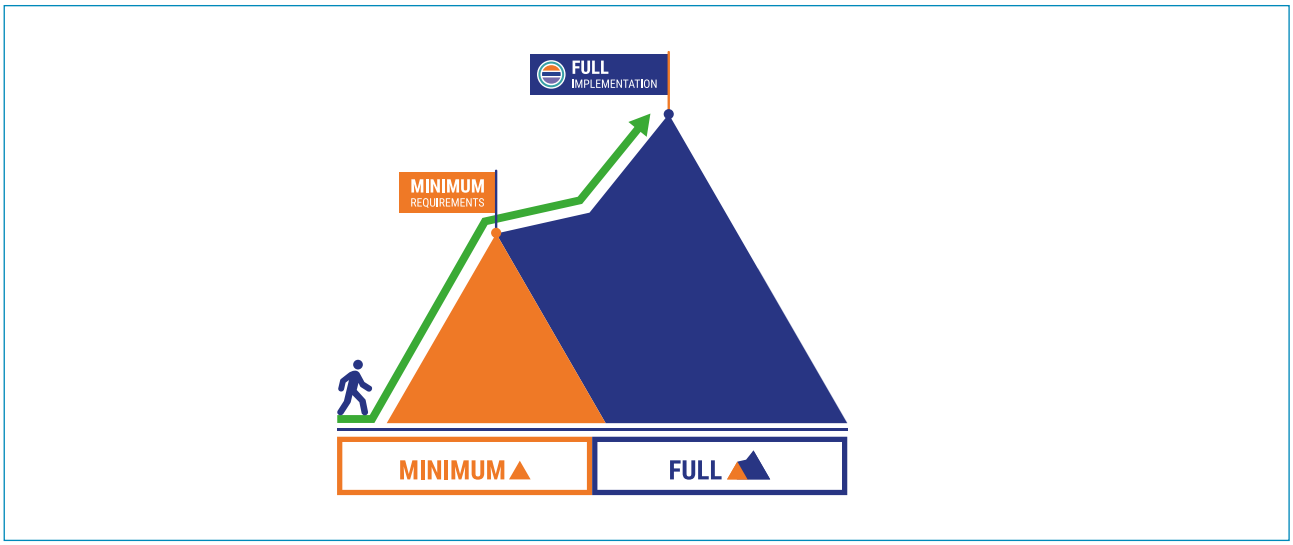
Fig. 9. The eight core components of IPC programmes



IPC: infection prevention and control.
Source: *(2)*.

Recognizing that the fulfilment of all IPC core components takes time and that countries may be at different stages of progress, with different capacities, available opportunities and resources, in 2019 WHO identified the IPC "minimum requirements" which represent the starting point for undertaking the journey to build strong and effective IPC programmes at the national and facility level (Fig. 10) *(3)*. These were directly derived from the IPC core components through a consensus-building process involving IPC stakeholders, experts and field implementers from around the world. The IPC minimum requirements should be in place in all countries and health care facilities to support further progress towards full and sustained implementation of all IPC core components.

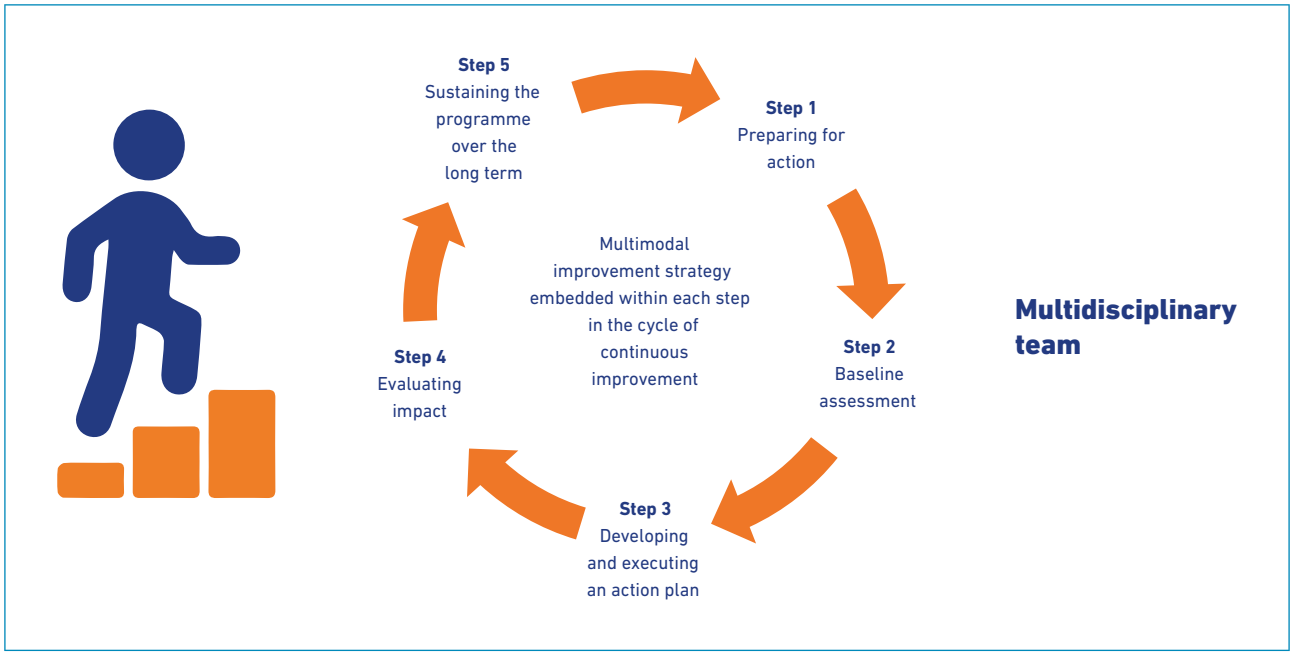
Fig. 10. Minimum versus full requirements to achieve effective IPC programmes



Source: *(3)*.

Whether applying the minimum requirements or full requirements, the implementation of the IPC core components should always be tackled using a stepwise approach, based on a careful assessment of the status of the IPC programme and local activities and developing, implementing and sustaining a plan for improvement. To undertake this process, WHO proposes a five-step cycle of implementation (Fig. 11) to support any IPC improvement intervention or programme, based on implementation and quality improvement science *(41, 42)*.

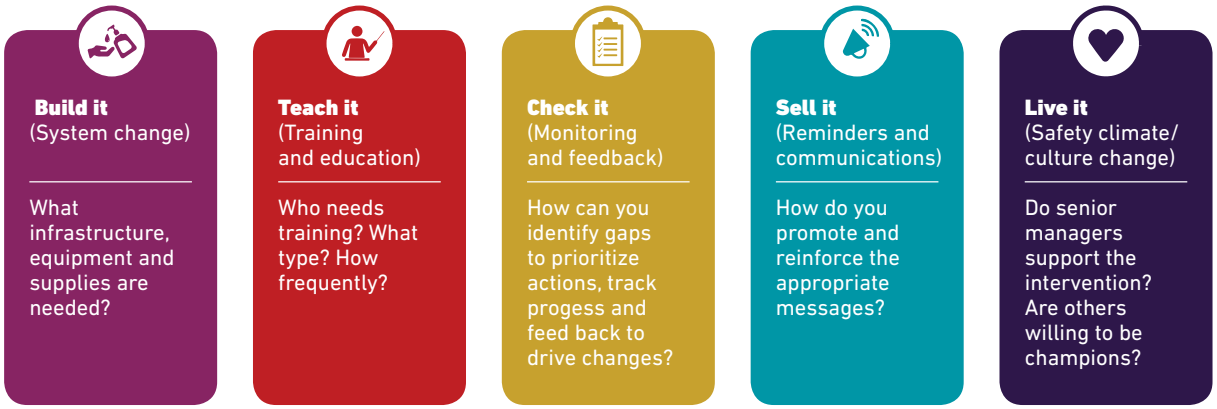
Fig. 11. The five-step implementation cycle to IPC improvement



Based on compelling evidence and its own research especially in the field of hand hygiene, WHO recognized that multimodal improvement strategies are the gold standard approach to implementing IPC interventions in the field *(38, 40, 43, 44)*.

Scientific evidence and lessons from implementation science suggest that targeting only one element (that is, using a unimodal strategy) is more likely to result in improvements that are short-lived and not sustainable *(2, 38, 40)*. The WHO multimodal improvement strategy for IPC comprises the following five elements: system change; training and education; monitoring and feedback; reminders and communications; and a safety climate/culture change. In other words, the strategy involves building the right system, teaching the right things, checking the right things, selling the right messages, and ultimately "living" IPC throughout the entire health system *(41–44)* (Fig. 12).

Fig. 12. Multimodal thinking



The five-step cycle and the multimodal improvement strategy can be applied to any IPC intervention. WHO has adapted them to interventions for injection safety, the prevention of surgical site infections *(45, 46)*, and the prevention and control of carbapenem-resistant organisms *(47, 48)*.

IPC and WASH interventions in health care facilities are complementary and IPC Core Component 8 inherently includes WASH standards and strategies which WHO and UNICEF have developed *(49, 50)*. These strategies represent another excellent example of multimodal strategy and a step-wise approach perfectly aligned with those of WHO for IPC (Fig. 13) *(51)*.

Fig. 13. Eight practical steps for WASH improvement

Source: *(51)*.

To ensure IPC implementation and optimize operations in the context of outbreaks, WHO developed a practical framework of actions for strengthening IPC within outbreak preparedness, readiness and response (Fig. 14) *(52)*. This framework provides a stepwise approach to IPC outbreak management, and is accompanied by a toolkit providing helpful resources.

Fig. 14. IPC at the core of outbreak preparedness, readiness and response

IPC: infection prevention and control.
Source: *(52)*.

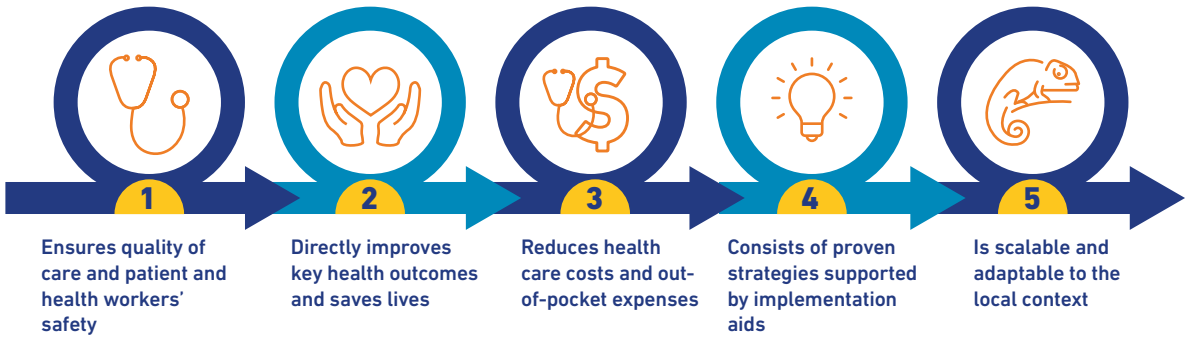
Directions and priorities for countries

The report provides a situation analysis of the status of IPC programmes worldwide and highlights that, although some progress has been made (especially in the past two years), the implementation of IPC programmes is still lagging.

The report makes it clear that there are at least five main reasons for investing in IPC *(53)* (Fig 15).

IPC is indeed at the core of a number of other major global health priorities, including health emergencies and the International Health Regulations, patient and health worker safety, AMR action plans, sepsis prevention, WASH, andintegrated people-centred, high-quality care.

Fig. 15. Five main reasons for investing in IPC



Further, the overarching focus on quality essential health services as part of a primary health care-driven approach to universal health coverage is well-served by strong IPC at all levels of the health system.

IPC is included in a number of existing resolutions and action plans adopted by the World Health Assembly. Furthermore, the implementation and monitoring of IPC programmes contribute to achieving the Sustainable Development Goals (especially goals 3.1–3.3, 3.8, 3.d.2, and 6) *(54)*.

Within the global report, WHO provides some key directions and priorities to accelerate efforts and progress at the local, national and global levels (Fig. 16). These priorities can be summarized in the following main three areas.

1. **Political commitment and policies** to scale up and enforce the core components of IPC programmes and the related minimum requirements, including through sustained financing, legal frameworks and accreditation systems.
2. **IPC capacity-building and creation of IPC expertise** as a clinical and public health specialty, including through IPC training and continuous education across different levels and health disciplines, and career pathways for IPC professionals. Embedding IPC within all clinical pathways is critical to influence the quality of health care delivery.
3. **Development of systems to monitor, report, and act** on key indicator data. This should include surveillance of HAI and emerging sentinel pathogens, monitoring of a range of IPC and WASH indicators, and efficient management of the supply chain.

Across these three areas, integration and alignment with other programmes, coordination among government sectors and collaboration with the most critical stakeholders are paramount.

No country or health system, even the most developed or sophisticated, can claim to be free of HAIs and AMR. Equally, there is no need for anyone to be unnecessarily exposed to infection during health care delivery as a result of suboptimal IPC practices, or because of a lack of equipment or standard operating procedures.

It has never been more urgent to prevent HAIs and AMR now and in the future.

Fig. 16. Critical priorities for IPC in national and international health agendas

1 Functional IPC programmes	• Dedicated budget • Trained IPC professionals
2 IPC minimum requirements	• At national and facility levels in all countries • Demonstrated by M&E of key IPC and WASH indicators
3 Decisive and visible political commitment and leadership engagement	• At the highest levels • Allocation of national and local health budgets • Establishing targets for IPC investment
4 Regulations and legal framework	• To enforce IPC requirements and policies through accreditation and accountability systems • Reporting of key IPC performance indicators and targets
5 Integration and alignment with other programmes	• Specific IPC programme that horizontally integrates/aligns with existing ones
6 Embedding IPC within the patient pathway and clinical care	• Tools and SOPs to support IPC understood and practiced at the point of care in all clinical areas • Workflow, human factors, ergonomics to be considered
7 IPC training and education at all levels	• Implementation of accredited IPC curricula (pre- & postgraduate, in-service) • Based on the WHO IPC core competencies
8 Human resources and career pathway for IPC	• IPC professionals: - with a recognized career pathway - empowered with a clear mandate and authority - accountable for implementation and reporting impact
9 Surveillance of HAIs and AMR in health care	• Functioning and quality-controlled systems for HAI and AMR surveillance • Connected with existing platforms (e.g. GLASS) • Existing standardized surveillance protocols (e.g. ECDC PPS)
10 Quality diagnostics	• Access to quality laboratory diagnostics and services
11 Monitoring IPC programmes	• Using standard M&E approaches • Regular assessments and feedback to health workers • WHO Global IPC Portal as a protected and confidential solution
12 Using data for action and communications	• Use of data for action and development of local, tailored IPC improvement plans • Tailored and consistent communications from authoritative source, based on science

ECDC: European Centre for Disease Prevention and Control; GLASS: Global Antimicrobial Resistance and Use Surveillance System; IPC: infection prevention and control; M&E: monitoring and evaluation; PPS: point prevalence study; WASH: water, sanitation and hygiene.

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