Addressing the Impact of Antimicrobial Resistance

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Communicable Diseases Prevention, Control and Elimination
SECTION OUTLINE

01 Estimating the AMR impact:
   - Covid-19
   - One Health
   - Climate Crisis

02 Response: Cost effectiveness

03 Response: Political Commitment

04 Response: National Action Plans

05 Conclusions: the way forward
AMR is invisible ...
but its impact is not!

- In human lives
- In economy
- In development ...
AMR: A GLOBAL THREAT TO HUMAN HEALTH, THE ECONOMY & DEVELOPMENT

The global rise of AMR will have devastating effects on lives and economies

COST (US)
$20 billion annually in the USA
GLOBAL COST PROJECTIONS
$100 trillion globally per year by 2050

Deaths attributable to AMR every year compared to other major causes of death

AN AGGRAVATING CONTEXT FOR AMR ... a “silent” pandemic?

Globalization and Global Changes
Increases in interpopulation connectivity and increases in scale and intensity of action and impact

Demographic Changes
Population growth
Urbanization, increased density
Aging
Increased mobility
Family structures

Social Changes
Institutions, governance, international codes
Cultural diffusion

Economic Activity
Trade and capital mobility
Labor conditions
Wealth creation and distribution
International aid: financial and health care

Impacts on Population Health

Large-Scale and Systemic Environmental Impacts
Degradation of land and water
Depletion of resources
Ecosystem disturbances
Disruption of biogeoophysical systems (e.g., climate system)
2019
4.95 million deaths associated with AMR
1.27 million deaths attributable to AMR

2050
10 million deaths

Figure 2: All-age rate of deaths attributable to and associated with bacterial antimicrobial resistance by GBD region, 2019

Estimates were aggregated across drugs, accounting for the co-occurrence of resistance to multiple drugs. Error bars show 95% uncertainty intervals. GBD = Global Burden of Diseases, Injuries, and Risk Factors Study.
Without effective action, AMR predicted to cause 10 million deaths annually and cost up to US$100 trillion by 2050.

According to the World Bank's report, “of the additional 28.3 million people falling into extreme poverty in 2050 in the high-impact antimicrobial resistance scenario, the vast majority (26.2 million) would live in low-income countries.”

Cost of inaction had been calculated to be at 1.1% to 3.8% decrease of global GDP by 2050. To put things into perspective, the consequences of climate change are predicted to cause a 1.0% to 3.3% global GDP by 2060.

Antimicrobial resistance will affect the poorest countries the most. Compared to the financial crisis in 2008-2009 a high AMR scenario will affect almost all of us harder. And it will affect the poorest countries the most.

ANTIMICROBIAL RESISTANCE AND POVERTY ON NATIONAL LEVEL

▪ A significant proportion of the increased healthcare expenditure is directly incurred to the national economy and the country’s GDP. Additional healthcare costs linked to inpatients with antibiotic resistance infection, often due to required additional nursing and medical care, are becoming unbearable for both LMICs and high-income countries health expenditure budgets.

▪ The cost toll due to antibiotic resistance reaches far beyond the health sector.
  ▪ workforce economic outcomes directly, via decreased productivity, labor supply, and unemployment
  ▪ drains out monetary resources from household income and tax revenues while creating an additional need for social services.

In OECD countries it is estimated that additional costs posed by antibiotic resistance per inpatient is equivalent to $10k-40k.

Source: Cecchini et al. ANTIMICROBIAL RESISTANCE IN G7 COUNTRIES AND BEYOND: Economic Issues, Policies and Options for Action. OECD. 2015
ANTIMICROBIAL RESISTANCE AND POVERTY ON INDIVIDUAL LEVEL

AMR strikes hardest at the poor.

- **1/3 of the world’s population** do not have a safe toilet;
- **more than 660 million people** do not have access to clean drinking water,
- **1 in 8 people** currently defecates in the open.

→ higher transmission of infections → greater antibiotic consumption → AMR & infections becoming harder and more expensive to treat. Increasing price for 2nd, 3rd-line treatment for MDROs.

- **India**: cost for treating a resistant bacterial infection is more than a years’ income for a rural worker. In addition to these direct costs for treatment, mortality and morbidity can drive the patient and family deeper into poverty due to loss of income. While a short-term loss of income may be possible to overcome, longer-term disability is more difficult, and loss of a family supporter may be devastating.

- As a result of these pressures, AMR negatively impacts the economic performance of an individual which ultimately endangers progress towards SDG1 on ending poverty.
CLIMATE CRISIS, ENVIRONMENT AND AMR

<table>
<thead>
<tr>
<th>Factor – climate change</th>
<th>Bacterial infections</th>
<th>Viral infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme weather events</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Increase in global temperature</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>Droughts</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Floods</td>
<td>+</td>
<td>+/-</td>
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[https://www.youtube.com/watch?v=_S6xJ6M_BZI](https://www.youtube.com/watch?v=_S6xJ6M_BZI)

COP27 y RAM – evento satélite


COVID-19 & AMR

Sharing vulnerable patients:

Underlying risk factors, use of steroids, chronic respiratory diseases, severe patients in ICUs ...

Initially, bacterial infections in 50% of COVID-19 deaths.

Antibiotic use (94%-100%) higher than the reported incidence of secondary infection (7-10%).

During the COVID-19 pandemic, hospitals were overloaded: impact on health care-associated infections.

Clinical trials with azithromycin and hydroxychloroquine.

COVID-19 HAS FUELED THE AMR PANDEMIC

- Emerging AMR pathogens and mechanisms
  Increases in *Candida auris* infections, multiple carbapenemase harboring bacterial strains, among others.

- Outbreaks and geographic spread of AMR of public health importance to non-endemic areas
  Geographic spread of certain types of carbapenemase such as OXA-48 and NDM producers to new areas where they had not been detected before.

- Overall increases in reports of multidrug resistant pathogens
  Overall increases in multidrug resistant organisms, particularly carbapenemase-producing Enterobacteriaceae.

- Higher burden of AMR
  Increased mortality, longer hospital stays, increased costs to health systems

*The use of antibiotics in SARS-CoV-2 patients during the COVID-19 pandemic has exceeded the incidence of secondary infections and coinfections, suggesting inappropriate and excessive prescribing.*
<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}<em>{\text{KPC}} + \text{bla}</em>{\text{NDM}}$ (in 2 $K. \text{pneumoniae}$), and $\text{bla}<em>{\text{OXA-48}}$-like + $\text{bla}</em>{\text{NDM}}$ (in 1 $E. \text{coli}$)</td>
</tr>
<tr>
<td>Ecuador</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}<em>{\text{KPC}} + \text{bla}</em>{\text{NDM}}$ (in 1 $K. \text{pneumoniae}$) and $\text{bla}<em>{\text{OXA-48}}$-like + $\text{bla}</em>{\text{NDM}}$ (in 1 $E. \text{coli}$)</td>
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<tr>
<td>(INSPI “Dr. L. Izquieta Perez”)</td>
<td>Jan-Feb 2021</td>
<td></td>
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<tr>
<td>Venezuela</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}<em>{\text{KPC}} + \text{bla}</em>{\text{NDM}}$ (in 1 $K. \text{pneumoniae}$)</td>
</tr>
<tr>
<td>(Inst. Nac. de Higiene “Rafael Rangel”)</td>
<td>Oct 2021</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}<em>{\text{IMP}} + \text{bla}</em>{\text{NDM}}$ (in 1 Enterobacter cloacae complex)</td>
</tr>
<tr>
<td>(INCIENSA)</td>
<td>Dec 2021</td>
<td></td>
</tr>
<tr>
<td>Belize</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}_{\text{NDM}}$ (in 4 $K. \text{pneumoniae}$ and 2 $E. \text{coli}$)</td>
</tr>
<tr>
<td>(Central Medical Lab)</td>
<td>Jan-May 2021</td>
<td></td>
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<tr>
<td>Dominica</td>
<td>PANDEMIC</td>
<td>Fist detection of $\text{bla}_{\text{NDM}}$ (in 2 $K. \text{pneumoniae}$ and 1 $E. \text{coli}$)</td>
</tr>
<tr>
<td>(Princess Margaret Hospital Medical Lab)</td>
<td>Dec 2020 - Mar2021</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>PANDEMIC</td>
<td>First detection of $\text{bla}_{\text{OXA-48}}$-like (in 22 $K. \text{pneumoniae}$ and 1 $E. \text{coli}$)</td>
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<tr>
<td>(Inst. de Salud Pública)</td>
<td>Apr-Jul 2021</td>
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PROGRESS ON ADDRESSING AMR RELATES CLOSELY TO MULTIPLE SDGS

- Agreed in 2015 by the 193 Member States of the UN, the new global agenda with Sustainable Development Goals (SDGs) offers an ambitious 15-year trajectory for the world’s sustainable development. If unchecked AMR threatens to undermine the achievements gained during the preceding Millennium Development Goals and can make the realization of many SDGs impossible.

- 2 priority pathogens in bloodstream infections to track progress in addressing AMR.
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OECD Health Policy Studies

Stemming the Superbug Tide

JUST A FEW DOLLARS MORE

Predicted deaths due to antimicrobial resistance 2015-2050
AMR mortality rate per 100,000 persons

<table>
<thead>
<tr>
<th>Country</th>
<th>AMR Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>18.17</td>
</tr>
<tr>
<td>United States</td>
<td>8.98</td>
</tr>
<tr>
<td>France</td>
<td>8.61</td>
</tr>
<tr>
<td>Poland</td>
<td>6.13</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.27</td>
</tr>
<tr>
<td>Germany</td>
<td>2.64</td>
</tr>
<tr>
<td>Iceland</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Source: OECD (2018), Stemming the Superbug Tide: Just A Few Dollars More
Key results

• Between 2015-2050, 2.4 million people will die in Europe, North America and Australia due to superbug infections

• 75% can be avoided by spending US$2 per person/year

• Most cost-effective interventions: hospital hygiene, hand hygiene, and antimicrobial stewardship

The investment in these policies would pay for itself in one year!

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AMR CONTINUES RECEIVING INTERNATIONAL ATTENTION

G20 Call to Action on AMR (Bali, 2022), Ministry of Health statement on leading by example in the implementation of its NAPs.

A HIGH PRIORITY FOR THE G7

- During the 2021 G7, G7 Finance Ministers agreed to support “global health threats, including the silent pandemic of antimicrobial resistance (AMR).”
- All G7 members committed to expediting their implementation of existing strategies, outlined in their respective AMR Action Plans.

ONE HEALTH QUADRIPARTITE COLLABORATION

To consolidate, develop and harness the cooperation and effectiveness to address the threats at the human-animal-plant-ecosystem interface, particularly preventing further zoonotic pandemics and AMR, by means of a strengthened "One Health" approach.
The Global Leaders Group on Antimicrobial Resistance

Impact:

Global consensus on reducing the use of antimicrobials in food production

Facilitation of CODEX negotiations

Advocating for a high-level meeting on AMR at the UN General Assembly 2024
THE CARIBBEAN TAKES A STAND AGAINST AMR

DECLARATION: CARICOM-SICA
MARCH 5, 2022

JOINT DECLARATION OF SAN PEDRO
IV SUMMIT OF HEADS OF STATE AND GOVERNMENT of the Caribbean Community (CARICOM) and of the Central American Integration System (SICA)
3 March 2022

We, the Heads of State and Government of the Caribbean Community (CARICOM) and of the Central American Integration System (SICA), meeting in San Pedro, Ambergris Caye, Belize on 3 March 2022, on the occasion of the IV CARICOM-SICA Summit:

ACKNOWLEDGE that these are exceptional times characterized by recurrent and new multidimensional challenges, including socioeconomic challenges brought about by the climate crisis, the COVID-19 pandemic and antimicrobial resistance.

Consider that our geographic proximity, shared values, commitment to regional solidarity and multilateralism are the bases for our regional partnership.

Prime Minister @miaamottley & I also discussed the silent pandemic of #AntimicrobialResistance. I’m deeply grateful for her leadership on this cause & for chairing the Global Leaders Group. We can already see significantly more awareness since she took on this role.

Tedros Adhanom Ghebreyesus
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Building on Member States’ mandates

http://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_13-en.pdf?ua=1


http://apps.who.int/iris/bitstream/10665/193736/1/9789241509763_eng.pdf?ua=1
AMR National Action Plans
Moving from plans to implementation is challenging!

- Following the Global Action Plan on AMR, **170 countries** have now developed a national action plan (NAP) on AMR.

- Implementation of NAPs is often fragmented, siloed, not costed and budgeted. **Only 17 (10%) of the responding countries have made financial provisions in their national budget for AMR NAPs.**

- **24% of countries** say their NAP is being implemented effectively (among them 26% from the EURO Region)

- Interdependence of various AMR interventions is not being considered in NAP implementation.

Source: K. Van Weenkenzen, WHO

✓ Based on TrACSS data (Tracking Annual Country Self Assessment)
Multisector coordination on AMR

### TrACSS 2022 - AMR multisector coordination mechanisms (MCM)

![Graph showing multisector coordination mechanisms (MCM) over 6 years]

### Multi-sector Coordination Over 6 Years

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>No response</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>14%</td>
<td>11%</td>
<td>32%</td>
<td>9%</td>
<td>16%</td>
<td>17%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2021</td>
<td>16%</td>
<td>7%</td>
<td>35%</td>
<td>12%</td>
<td>11%</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>30%</td>
<td>5%</td>
<td>26%</td>
<td>12%</td>
<td>10%</td>
<td>16%</td>
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<td></td>
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<td></td>
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<tr>
<td>2019</td>
<td>18%</td>
<td>10%</td>
<td>33%</td>
<td>15%</td>
<td>8%</td>
<td>15%</td>
<td></td>
<td></td>
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<tr>
<td>2018</td>
<td>21%</td>
<td>12%</td>
<td>40%</td>
<td>10%</td>
<td>3%</td>
<td>14%</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>23%</td>
<td>20%</td>
<td>42%</td>
<td>7%</td>
<td>4%</td>
<td>5%</td>
<td></td>
<td></td>
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</table>

Source: WHO, TRACCS 2022 Webinar

6 year: Increase in functional MCM over the past years (C-E) but has slowed since 2019. Most common response over years has been that committees have been established with government leadership, but not yet functional (B).

<table>
<thead>
<tr>
<th>Description</th>
<th>Year</th>
<th>MCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A No formal multi-sectoral governance or coordination mechanism on AMR exists.</td>
<td>2017</td>
<td>23%</td>
</tr>
<tr>
<td>B Multi-sectoral coordination mechanism on AMR established with Government leadership.</td>
<td>2017</td>
<td>20%</td>
</tr>
<tr>
<td>C Formalized Multisector coordination mechanism with technical working groups established with clear terms of reference, regular meetings, and funding for working group(s) with activities and reporting/accountability arrangements defined.</td>
<td>2017</td>
<td>42%</td>
</tr>
<tr>
<td>D Joint working on issues including agreement on common objectives.</td>
<td>2017</td>
<td>7%</td>
</tr>
<tr>
<td>E Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action plan.</td>
<td>2017</td>
<td>4%</td>
</tr>
</tbody>
</table>
AMR Multisector Coordination – sectors involved

TrACSS 2022 - Sectors involved in AMR multisector coordination mechanism

Similar pattern of sector participation across previous

- Human Health: 99%
- Terrestrial Animal Health: 95%
- Food Safety: 79%
- Environment: 65%
- Aquatic Animal Health: 64%
- Food Production: 54%
- Plant Health: 51%
- Other: 13%

Percentage of countries saying 'yes' sector is involved

Source: WHO, TRACCS 2022 Webinar

95% (157/166)
Of countries have human health and terrestrial animal health sectors involved in their MCM

25% (42/166)
Countries have all sectors involved in AMR MCM

‘Other’ most frequently includes academia and research institutions
For human health, 147 (~90%) countries report having regulations on antimicrobial sale, only 74 (~45%) of these countries report monitoring total sales of antimicrobials at a national level.

- Legislation doesn’t always translate to practice. Monitoring of existing legislation is an area that needs improvement.

Source: WHO, TRACCS 2022 Webinar
LATIN AMERICAN AND CARIBBEAN NETWORK FOR ANTIMICROBIAL RESISTANCE SURVEILLANCE – ReLAVRA+

- Expanded to include Caribbean NRLs in 2020
- Horizontal cooperation between PAHO, Argentina (MoH, Food safety authorities), CARPHA, and 14 CARICOM Member States* to strengthen capacity for AMR diagnosis and surveillance
  - 12 countries joined a laboratory external quality assurance program led by the Malbran Institute, Argentina
  - Virtual trainings in specimen collection, AST, etc.
  - On-site trainings in Argentina

*Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Kitts, and Nevis, Saint Vincent and the Grenadines, Saint Lucia, Suriname, and Trinidad and Tobago
Klebsiella pneumoniae imipenem non susceptible

Molecular AMR diagnostics are complementary to phenotypic testing
In surveillance, can help confirm the mechanisms responsible for certain resistance and improve our understanding of AMR dissemination

Regional strategy

— Build capacity for molecular characterization and WGS
— Group of experts to establish standards, systems & framework for data sharing; pathogen prioritization
— Create a regional support hub for countries with no in-country capacity
— Foster multidisciplinary interpretation of results (+epidemiological data) to guide public health action
— Make the case for investment in molecular techniques

Endorsed by PAHO Member States on June 20, 2022
Global Strategy on Infection Prevention and Control

Draft resolution proposed by Bosnia and Herzegovina, Botswana, Colombia, Jordan, Kenya, Kingdom of Saudi Arabia, Lebanon, Norway, Oman, Philippines, Qatar, United Arab Emirates, United States of America and Vanuatu

The Seventy-fifth World Health Assembly,

PP1 Having considered the report by the Director-General on infection prevention and control as part of the universal health coverage and communicable disease agendas towards 20301.

PP2 Recalling the resolutions WHA48.7 (1995) 2 on the International Health Regulations, WHA58.27 (2015) 3 on infection prevention and control as objective 3 of the Global Action Plan on Antimicrobial Resistance (AMR), WHA69.1 (2016) 4 on quality care for all, WHA70.7 (2017) 5 on infection prevention and control as part of prevention of sepsis, WHA72.6 (2019) 6 on infection prevention and control as strategy 3.3 of the global patient safety action plan 2021–2030, WHA72.7 (2019) 7 on infection prevention and control as part of water, sanitation and hygiene, WHA73.1 (2020), 8 WHA73.8 (2020), 9 and WHA74.7 (2021) 10 on infection prevention and control as...
OTHER AMR ACHIEVEMENTS DURING THE COVID-19 PANDEMIC IN THE CARIBBEAN

Belize shared lessons learned from its NAP implementation in global launch of WHO handbook

3 Caribbean countries participated in a pooled secondary analysis of point prevalence surveys of antimicrobial use to inform subregional gaps

Caribbean countries participated in multisectoral dialogue between governments, NGOs, CSOs and the community on social participation in AMR response

11 Caribbean countries participated in a regional consultation and contribute to the development of the PAHO roadmap for the roll-out of the WHO antimicrobial stewardship policy

Belize and Trinidad and Tobago Caribbean countries started sharing AMR aggregated surveillance data following improvements in local lab capacity for AMR diagnosis. Trinidad and Tobago also shared isolate-level bloodstream infections data for the first time.
In 2022, Haiti received online training in the use of WHONET to standardize the collection of AMR data.

In 2022, Trinidad and Tobago used WHONET to send data to WHO GLASS.

A Laboratory Information Management System for microbiology developed by the Wellcome Trust and the University of Oxford is currently being piloted in Dominica, in 2022.

In May 2021, Jamaica became the first country in the Americas to pilot test the WHO Costing and Budgeting Tool for AMR NAPs, with the participation of the Ministry of Health and Wellness, Ministry of Agriculture and Fisheries, and the Inter-American Institute for Cooperation on Agriculture.
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One-word responses to question on ‘the biggest AMR challenge at country level’ (WHO AMR global webinar with > 600 participants from 120 countries)

Morning Session

Afternoon Session
THE WAY FORWARD

Better data to respond to information needs for AMR interventions and national priorities

- Improve AMR surveillance data quality, completeness and geographic representativeness
- Set up enhanced isolate-level surveillance (bacterial and fungal pathogens)
- Continue building NRL and local clinical lab capacity, increasing the use of new molecular technologies

- Integrate lab & IPC,
- Leverage surveillance to estimate AMR burden,
- Evaluate impact of interventions

- Integrate AMR and AMC data across sectors to better understand AMR emergence and spread in humans, animals, environment
- Set up integrated One Health AMR surveillance of foodborne pathogens

- Increase data use among national and local stakeholders
- Inform patient and AMS
- Disseminate epidemiological findings
- Contribute to GLASS

- Translate evidence for decision-makers, advocate for AMR prioritization,
- Assess cost-effectiveness of interventions,
- Evaluate resources needed to sustain AMR efforts and return on investment
Thanks to everyone who made this presentation possible:

RELAVRA+
PAHO AMR team, in WDC and in the countries
Technical and financial partners
All the people who contribute to the continued effectiveness of antimicrobials in Latin America and the Caribbean
“We’re committed to creating a better, more sustainable future for our people, communities, animals and our planet”

Marcos Espinal
Director, Communicable Diseases and Environmental Determinants of Health
Join us on World Hand Hygiene Day 2023

https://www.who.int/campaigns/world-hand-hygiene-day/2023