L.E.K.

Special Report

Asia-Pacific in the Eye of AMR Storm

Nurturing Innovation To Fight Antimicrobial Resistance

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Introduction

The slow and silent tsunami of antimicrobial resistance (AMR) is about to crash upon Asian shores. Arguably, it has already arrived. Worldwide, AMR is thought to be responsible for around 700,000 deaths per year, including 230,000 deaths from multidrug-resistant tuberculosis prevalent in Asia. In the absence of meaningful action, within a single generation (35 years), as many as 300 million people will die prematurely due to AMR. The associated economic cost is in the order of US$100 trillion. Frightening as these statistics may be, it is human nature to prioritize urgent acute threats over slower moving but more devastating peril. COVID-19 remains a potent danger, especially given the threat of new variants. However, it is almost certain that AMR will be far more enduring, far more deadly, and far more costly. Drug resistant hospital-acquired infections account for up to 40% of all deaths in hospitals. The dismal reality of the clinical impact of AMR and its associated costs is reversible. Immediate action to contain the transmission rates, increase patient access to novel therapeutics and prevent the emergence of new AMR strains can substantially curb the human and healthcare cost. This report identifies the challenges undercutting current AMR initiatives in Asia and explores innovative solutions in AMR diagnostics, R&D, and commercialization.

Asia-Pacific in the eye of the AMR storm

Key messages:

- By 2050, APAC will account for almost half of yearly deaths caused by AMR
- Drug-resistant infection costs global healthcare systems up to US$150 billion annually, equivalent to about 10% of total healthcare costs
- The nexus of AMR pathogens and antibiotics use has become increasingly relevant during the COVID-19 pandemic
- New and novel-classes of antibiotics targeting ESKAPE pathogens are needed to keep pace with rising resistance rates; only two novel-class drugs were discovered in the past decade

The health and economic fallout

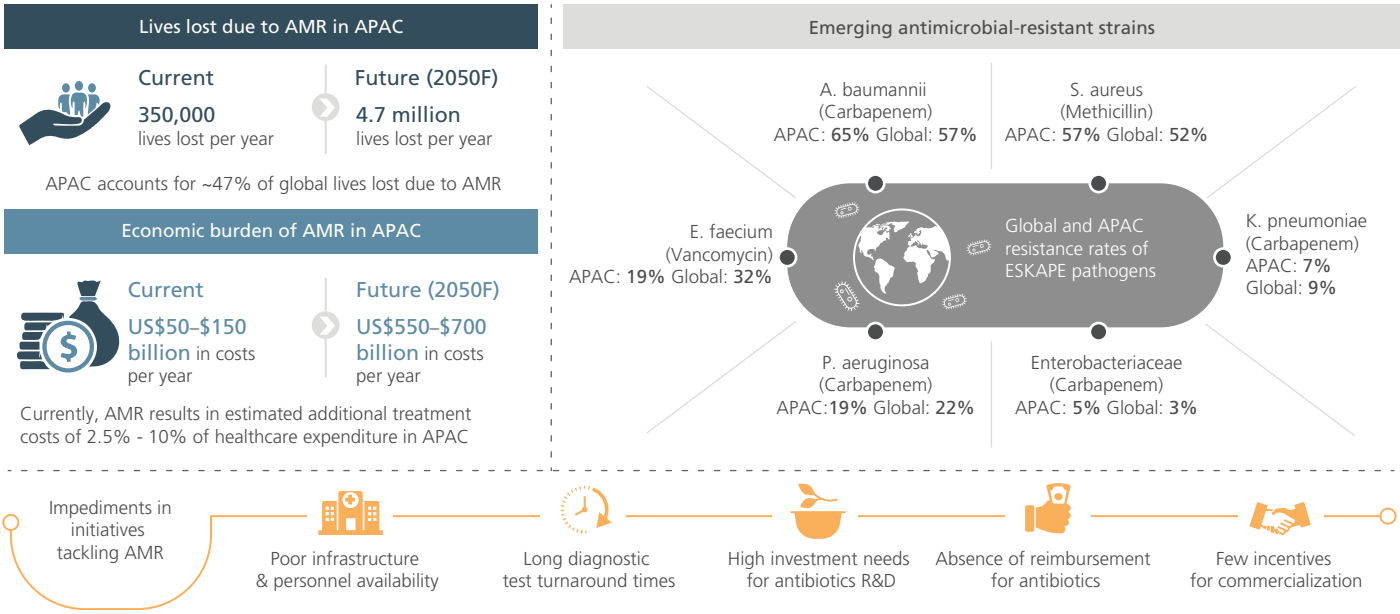
Globally, AMR causes an estimated 700,000 deaths annually. By 2050, the Asia-Pacific (APAC) region is forecast to account for 47% of the AMR-related deaths worldwide, driven by a confluence of factors, including high and rising resistance rates, insufficient healthcare infrastructure, and affordability challenges, particularly in the region's lower-income countries.[1] A study of 50 countries concluded that India and China have the highest resistance to top-priority antibiotics-pathogen pairs, including common strains like *Staphylococcus aureus* and *Escherichia coli*.[2]

The economic impact of AMR on APAC is equally profound. In India alone, additional treatment costs for multi-drug-resistant tuberculosis (TB) are estimated at 1% of the country's total health expenditures, amounting to US$900 million.[3] Such a figure is equivalent to feeding approximately 60 million people for a whole month. Another recent study suggests that Thailand incurs US$0.5 billion-$2.3 billion annually in additional treatment costs due to drug-resistant nosocomial infections[4] — around 2.5%-10% of the healthcare expenditure. Extrapolating the Thailand experience to the APAC context suggests a regional AMR cost burden in the range of US$50 billion-$150 billion in annual healthcare expenditure. Left unaddressed, AMR-related costs in Asia are projected to rise to US$550 billion-$700 billion by 2050,[3] absorbing 0.8%-1% of regional GDP.

COVID-19 as a catalyst for AMR

AMR risks have risen during the COVID-19 pandemic, caused by a higher incidence of secondary bacterial co-infections and a resulting surge in antibiotics use, as well as disruptions to long-term treatment procedures.[5] In countries where data are available,

Figure 1
Burden of AMR in Asia-Pacific and factors impeding impact of initiatives



Source: World Economic Forum; World Bank AMR report 2017; Organisation for Economic Co-operation and Development (OECD); Antimicrobial Testing Leadership and Surveillance (ATLAS); L.E.K. research and analysis

it is estimated that between 5% and 31% of hospitalized COVID-19 patients have suffered a bacterial super-infection.[6] Microbial analyses of isolates from these hospitalized patients indicated the presence of carbapenem-resistant *Acinetobacter baumannii, Pseudomonas aeruginosa and Klebsiella pneumoniae*, which are categorized by World Health Organization (WHO) as a critical threat.[7] Carbapenems are used as last-resort antibiotics in tertiary hospitals,[8] and the poor antibiotics susceptibility of resistant *A. baumannii* strains could result in increased risk of fatalities. Adverse impacts of these bacterial co-infections include the following:

- A higher incidence of hospital-acquired resistant infections in immune-compromised patients with COVID-19 increases the complexity of therapeutics and heightens the risk of mortality.
- Constrained hospital resources focused on containing COVID-19 mortality may limit diagnostic procedures prior to prescription, resulting in unnecessary antibiotics use. A WHO survey revealed that of the 72% of hospitalized COVID-19 patients who received antibiotics, only 8% were later proven to have a bacterial or fungal co-infection.[9] This could potentially cause selective pressure (increase the proportion of resistance traits), accelerating the emergence of AMR strains.[10]

The need for new and novel-class drugs targeting ESKAPE pathogens

Among the many emerging AMR strains, the so-called ESKAPE pathogens (an acronym of the six antibiotics-resistant bacteria listed in Table 1) are most responsible for the global AMR-related mortality and financial burden.

With only two novel-class drugs having been discovered in the past 10 years, there is an urgent need to accelerate the development of novel-class antibiotics to keep pace with rising resistance rates. Novel-class drugs with diverse and novel modes of action reduce the selective pressure accelerating emerging resistant strains. Furthermore, of the 292 diverse antibacterial agents (including novel-class and new antibiotics) in development, only six (3.7%) are being developed in Southeast Asia, indicating low R&D focus in the region.[11]

These priority pathogens are particularly identified as posing the greatest risk in the APAC context and should be the focus of any concerted effort to contain the spread of AMR, including new investment in relevant R&D.

Table 1
Priority level of ESKAPE pathogens for R&D of New Antibiotics

Priority for R&D of New Antibiotics	Pathogen	Antibiotic resistance
Critical	*Acinetobacter baumannii*	Carbapenem-resistant
	Pseudomonas aeruginosa	Carbapenem-resistant
	Enterobacterales	Carbapenem-resistant, 3rd generation cephalosporin-resistant
	*Klebsiella pneumoniae**	Carbapenem-resistant
High	*Staphylococcus aureus*	Oxacillin/Methicillin-resistant, vancomycin intermediate and resistant
	Enterococcus faecium	Vancomycin-resistant

Note: *Part of Enterobacterales in the WHO priority pathogens list for R&D of new antibiotics. Multi-drug-resistant Mycobacterium tuberculosis is omitted from the list of priority pathogens since there is existing dedicated funding and initiatives to address this bacterial strain.[12,13]

Source: Antimicrobial Testing Leadership and Surveillance (ATLAS), L.E.K. Consulting research and analysis

AMR initiatives in Asia: Inhibitors, progress and potential

Key messages:

- Concerted action is needed to overcome severe limitations hindering effective AMR management in Asia:
  - Few Asian governments have introduced the necessary commercial incentives to induce the launch of novel-classes of antibiotics and diagnostics
  - New and novel-class antibiotics development requires heavy investment in R&D, further constrained by the slow adoption of novel-class drugs and diagnostics
  - Inadequate infrastructure and lack of trained personnel for widespread integration of diagnostics in the workflow settings of Asia's hospitals and clinics result in empiric therapy being continued for the duration of treatment
- AMR management initiatives currently underway in Asia are insufficient to bring about game-changing improvements in drug development R&D, diagnostic stewardship and novel drug commercialization

Current AMR management initiatives

AMR management initiatives can be categorized into three broad focus areas: (a) antimicrobial stewardship (AMS) programs, (b) R&D initiatives and (c) the commercialization of novel-class antibiotics. There are several examples of successful AMR management initiatives in Asia:

AMS: A national campaign to promote AMS in China was launched in 2011 through goal setting for antibiotics use and monitoring.[14] The result was a substantial reduction in antibiotics use for both inpatients and outpatients within a year, from 68% to 58% and 25% to 15%, respectively.[15]

R&D: In 2020, pharmaceutical manufacturers from Japan, the U.S. and the EU pledged US$1 billion in donations, as part of the AMR Action Fund investment in startups working to develop two to four new antibiotics for AMR infections within 10 years.[16] This helped ease the financial barrier to drug development.

Commercialization: In 2017, the European Medicines Agency (EMA), the U.S. Food and Drug Administration (FDA), and the Japanese Pharmaceutical and Medical Device Agency (PMDA) agreed on common regulatory approaches and clinical trial design for antibiotics. The tripartite agreement aims to align on requirements for the clinical development of antibiotics and reduce the time between the launches of antibiotics in different countries.[17] In this way, harmonized clinical trial designs were developed for drugs for indications such as urinary tract infections and gonorrhea.

Asian AMR management impediments

Several interrelated circumstances act to inhibit and deter the development of AMR management solutions in Asia.

1. Inadequate infrastructure and a lack of trained personnel
   - A lack of trained staff and limited funding for running diagnostic tests on a regular basis — due mainly to the cost of consumables — curb the utilization of existing diagnostic setups in tertiary hospitals.
   - Global surveillance platforms, in general, have limited outreach in Asia because of the poor diagnostic capacity and capabilities in individual countries to monitor and report AMR. Only around 3% of the total number of surveillance sites reporting into Global Antimicrobial Resistance Surveillance System (GLASS) are from APAC.[18] Additionally, concerns about the cross-border sharing of isolates for surveillance purposes has limited the participation from Asian countries.
   - Budget constraints and a lack of sufficiently qualified clinicians and scientists limit the establishment of dedicated stewardship teams (comprised of pharmacists, nurses and infectious disease experts) in healthcare centers, resulting in a lack of monitored antibiotics use and compliance with published treatment guidelines.
2. Long diagnostics turnaround times which limit the adoption of point-of-care (POC) diagnostics in hospital workflows
   - Most POC tests require a 6-to-24-hour turnaround time. The long lead time for definitive pathogen identification and susceptibility information discourages the use of diagnostics prior to prescription. The low adoption of these diagnostic tools in hospitals and clinics discourages further investment in R&D for affordable POC diagnostics.
3. The high cost of R&D into novel-class antibiotics
   - Antibiotics R&D involves greater complexity in drug discovery than other small molecule drugs. The observed lead success rate in other therapeutic areas is 10 times higher,[19] resulting in higher R&D expenses and lengthy development times for antibiotics versus other therapeutics.
   - The notable absence of risk-shared AMR funding pools for R&D means that costs are largely borne by the pharma companies, limiting the overall investment outlook.

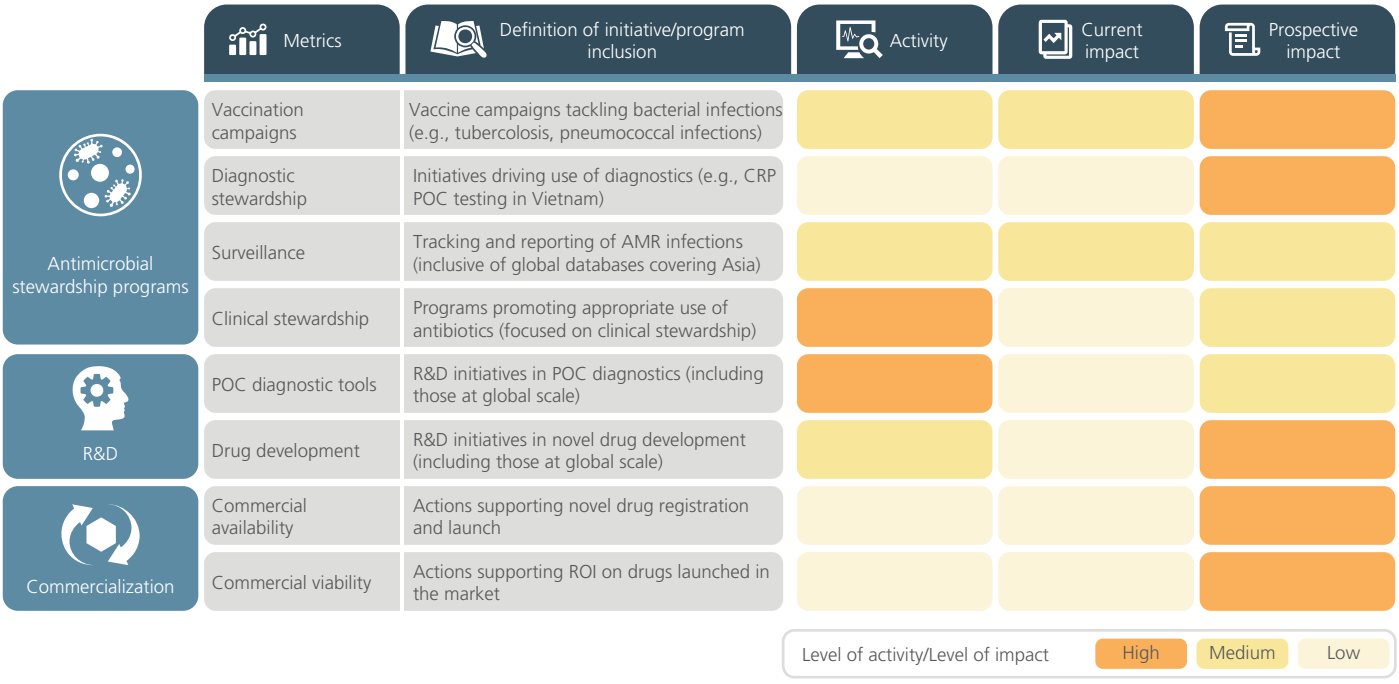
4. The low adoption of novel-class drugs and slow inclusion in guidelines of antibiotic agents
   - The limited adoption of new antibiotics further limits R&D investment. Due in part to the absence of government funding in support of reimbursement schemes for these new therapies in several Asian countries, the result is a vicious cycle of low return on investment (ROI) and meager investment in R&D.
   - Part of the reason why there is a low adoption of novel antibiotics is also due to the slow inclusion of these agents in the international or country antimicrobial guidelines. Physicians and sometimes even reimbursement bodies will rely on clinical guidelines for their practices and judgements, so an inclusion of the novel antibiotics in the guidelines, will not only direct and optimize the use of these agents, but also increase the confidence in using them while these decisions are supported by scientific societies.
5. A lack of commercial incentives for novel-class antibiotics/diagnostics
   - Few Asian markets provide commercial support for novel-class antibiotics/diagnostics. Pharmaceutical heavyweights like Novartis, Sanofi and AstraZeneca have eschewed antibiotics R&D since 2018, citing limited commercial opportunity and low ROI.[20]
   - Novel drugs included in formularies (reimbursement lists) or price settings are often benchmarked against high-volume, low-cost generic drugs, disregarding the clinical and societal benefits of these typically more expensive new drugs.

Progress and priorities for AMR management

While there have been ongoing efforts and initiatives to address the problem of AMR in Asia, a greater coordinated effort is needed to reverse the rising emergence of AMR strains. Low to medium to levels of activity are evident in select focus areas such as diagnostic stewardship, R&D in drug development and the commercialization of novel drugs (Figure 2). Given the potential high impact, these are identified as priority areas for implementation of AMR initiatives.

For example, this assessment shows improving commercial availability and commercial viability are important areas for taking prompt actions based on low activity and high prospective impact.

Figure 2
Current progress and prospective impact of AMR focus areas in APAC



Source: AMR Industry Alliance; Foundation for Innovative New Diagnostics (FIND); Wellcome Trust; UK Research and Innovation (UKRI); Global Antibiotic Research and Development Partnership (GARDP); Alliance for Prudent Use of Antibiotics (APUA); PubMed; ScienceDirect; L.E.K. research and analysis
Note: CRP — C-reactive protein, POC — point-of-care
ROI — return on investment

Breakthrough AMR solutions for Asia

Key messages:

- Three game-changing solutions were identified that could help overcome the region's critical AMR funding and infrastructure impediments:
  - AMR bonds can provide upfront working capital to build diagnostic capability and capacity
  - Multilateral AMR funding can unlock investment in R&D and the manufacture of novel-class drugs and diagnostics
  - Pull incentives (minimum revenue guarantee incentive models) can enable the commercialization of novel drugs and diagnostics, allowing judicious use in select cases while mitigating affordability challenges

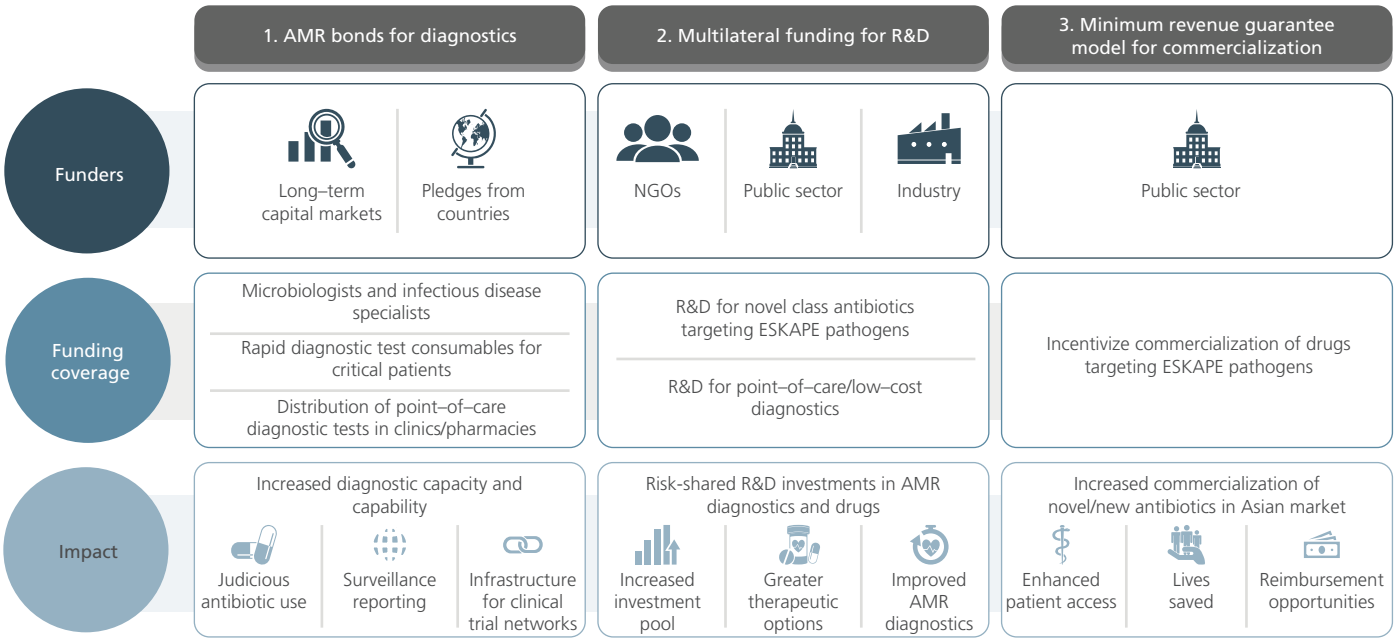
Three complementary strategies — AMR bonds, multilateral funding and minimum revenue guarantees — can help resolve funding bottlenecks and drive progress in diagnostic stewardship, R&D and commercialization (Figure 3).

AMR bonds for diagnostics

Description: Drawing inspiration from, and parallels to, the vaccine bonds issued by The Global Alliance for Vaccines and Immunizations (GAVI), a similar approach could be used to fund AMR diagnostic tools in Asia. The diagnostic tools include funding for operating expenses of rapid diagnostics and dissemination of POC diagnostics in outpatient clinics and pharmacies as part of diagnostic stewardship efforts. Coordination of the issuance of AMR bonds would involve several stakeholders:

- Investors: Capital markets investors would expect stable, long-term returns.
- Donors: National pledges/contributions would repay the interest and provide returns to the investors.
- Recipients: An audit of diagnostic capabilities and stewardship would prioritize recipient countries. Concurrently, a minimum standard of affordable diagnostics also needs to be established.

Figure 3
Three proposed strategies to kick-start initiatives in AMR



Source: GAVI Vaccine Alliance; PubMed; L.E.K. interviews, research and analysis

Funding coverage: The working capital raised from AMR bonds can be utilized to build diagnostic capacity and capability across APAC:

- Employ specialized microbiologists and infectious disease specialists assigned to tertiary hospitals. Singapore implemented 24/7 microbiological labs by expanding its team of microbiologists to run pathogen identification and antimicrobial susceptibility tests, reducing the time taken to start definitive or targeted treatment decisions (especially for overnight cases).[21]
- Cover diagnostic test consumable costs for critical patients in tertiary hospitals in emerging APAC markets. Companies such as Amplex Diagnostics (Eazyplex system, Germany)[22] and First Light Diagnostics (USA)[23] are working on antibiotics susceptibility test (AST) kits with test result turnaround times in hours instead of days, further reducing lag time and facilitating adoption.
- Disseminate POC AMR tests in outpatient/local clinics, which is often where patients are prescribed with first and second lines of treatment, particularly in countries with limited tertiary hospital infrastructure. In select emerging APAC countries, like Thailand,[24] the population tends to rely on pharmacies for uncomplicated conditions. Encouraging POC tests prior to dispensing antibiotics in these scenarios can further support judicious antibiotics use.

Impact of AMR bonds:

- Having increased personnel enables sufficient support for diagnostic test workflows and encourages appropriate adherence to treatment guidelines/judicious antibiotics use.
- Covering the consumable cost of rapid diagnostics encourages greater use of the tests, particularly in countries facing affordability challenges. Increased rapid diagnostic use can guide treatment decision-making, which is especially important for critical patients with hospital-acquired infections.
- POC tests in outpatient/local clinics and pharmacies can trigger a behavioral change in these settings and move toward evidence-based prescription practices.
- Improved diagnostic capabilities in tertiary hospitals will capture AMR data in national/regional databases — data that can, in turn, be used to facilitate Asia-centric epidemiological modeling.
- Upgraded diagnostic infrastructure can be leveraged to establish and support clinical trial networks in Asia, improving patient access and accelerating product development.
- Enhanced diagnostics and surveillance systems can be leveraged to define clinical and economic benefits that arise from novel-class antibiotics. These insights could increase the adoption of alternatives to broad-spectrum antibiotics and encourage novel reimbursement options.

Impact of reference model: The GAVI vaccine alliance is the gold standard benchmark for AMR bonds. GAVI's vaccine bonds have raised sufficient working capital to immunize 800 million children in developing countries, an unequivocal success that demonstrates the potential for a similar public-private AMR initiative.[25]

Multilateral AMR funding for R&D/ manufacturing of novel-class drugs and diagnostics

Description: A multilateral funding pool facility to support R&D in AMR diagnostics and therapeutics should be established. This could follow the COVID-19 Vaccines Global Access (COVAX) template,[26] a risk-sharing funding model that mitigates the financial stress on industry players and attracts new funding dedicated to the development of novel AMR tools. Such a funding pool would entail a regionwide/global partnership between the government, the private sector and NGOs.

Funding coverage: Funds can be directed to high-priority ESKAPE pathogens and diagnostics:

- Antibiotics R&D targeting ESKAPE pathogens: In addition to novel-class drugs, funding coverage could be expanded to include R&D in new antibiotics (analogues to existing classes), as such as have demonstrated high efficacy in tackling AMR strains[27]
- Point-of-care (POC)/low-cost diagnostics R&D: POC diagnostic tools for pathogen identification (ID) and the measurement of antibiotics susceptibility could be used in low- and middle-income countries (LMICs), particularly in outpatient settings or clinics with limited access to centralized laboratories with established ID/AST systems

Impact of multilateral funding pool:

- Transition toward a volume de-linked model and risk-sharing of R&D costs eases the investment pressures on pharma companies, encouraging investment
- The use of novel-class drugs over broad-spectrum antibiotics, where appropriate, decreases mortality/morbidity rates associated with complex therapeutics for AMR infections and reduces the development of AMR

- The development of low-cost POC tools offers quick turnaround times (<1 hour), e.g., molecular/micro-fluidic-based techniques, presently in research stages[28,29]
- Cost-effective POC tools in care centers can mediate evidence-based treatment decisions over empiric therapy

Impact of reference model: Once again, parallels to the COVAX facility set up in response to the pandemic to accelerate R&D and manufacturing of COVID-19 vaccines are appropriate. In addition to fulfilling vaccine needs in the donor country, vaccines are donated to emerging markets with the funds raised. In February 2021, the COVAX enabled vaccine delivery to over 100 economies within 10 months of its establishment.[30]

Minimum revenue guarantee incentives

Description: Minimum revenue guarantee incentive models can drive the commercialization of novel drugs and diagnostics while mitigating affordability challenges. Such revenue guarantee models can be adopted by individual countries with support from their drug regulatory associations. The minimum revenue guarantee could be for a set period from drug launch with a provision for further extension.

Funding coverage:

Funding should cover drugs that target the ESKAPE pathogens that cause severe clinical, societal and economic harm in APAC. Different resistance levels among patient demographics mean that antibiotics need to be tailored to APAC population resistance patterns.[31] The magnitude of the revenue guarantee can be determined by annual revenues needed to reach acceptable commercial ROIs for drug companies.

Impact of minimum revenue guarantee model:

- New and novel drugs commercialized for Asian markets could improve clinical and societal outcomes due to better efficacy against AMR strains and potentially could reduce selection pressure
- In addition to new and novel-class drugs developed at the R&D stages, recent antibiotics (existing chemical class drugs targeting priority pathogens with high efficacy) can also be considered for commercial incentives given the significant clinical/societal benefits that could be derived from their availability and use in select patients
- Given the importance of commercialization and adoption, additional policies could be implemented to overcome the issue of drug affordability; policies could include pharmaco-economic exemptions to prevent price benchmarking to generic antibiotics
- Extensions of patents for new drugs (especially those tackling priority pathogens) could be considered to further incentivize drug company investments

Impact of reference model: Sweden has piloted a minimum revenue guarantee model dedicated to offering funding compensation to drug companies, in order to increase the national availability of antibiotics tackling drug-resistant pathogens. Draft agreements have been made with four pharmaceutical companies (MSD, Shionogi, Pharmaprim and Unimedic Pharma) for five antibiotics effective against resistant strains[32]. The assessment of this promising program is due in 2022.

The health and socioeconomic value

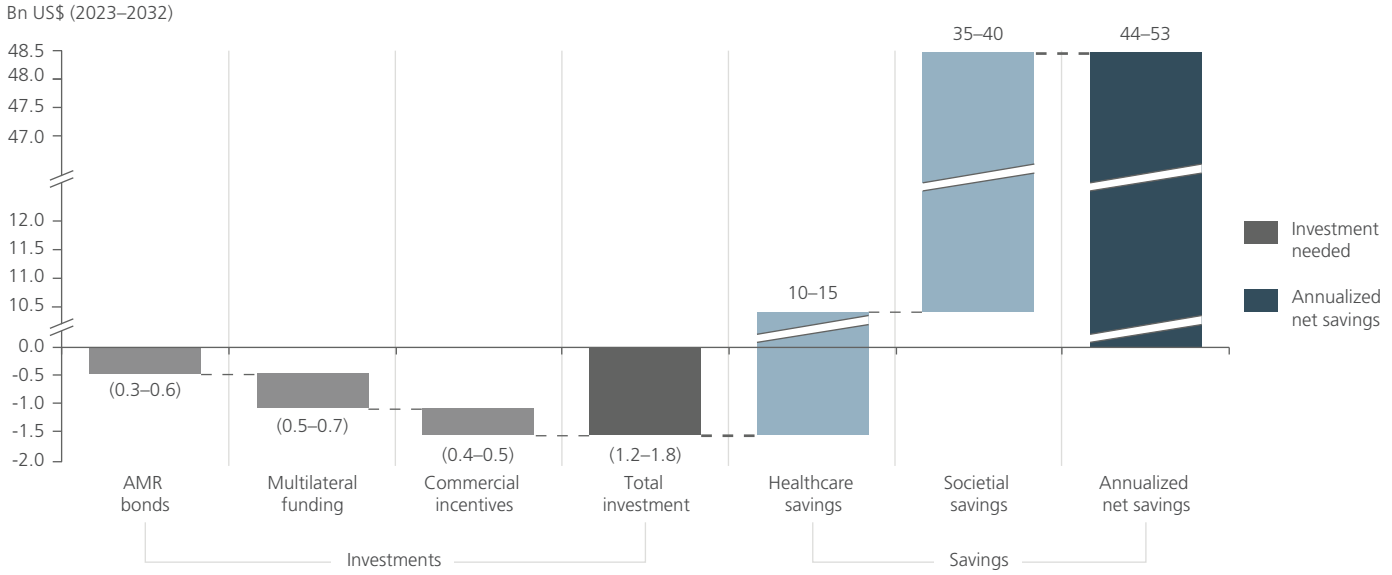
Key messages:

- The average annual investment needed to provide multilateral funding for R&D, develop AMR bonds and provide proper commercial incentives is estimated to be up to about US$1.8 billion between 2023 and 2032
- The returns from such timely investments in addressing AMR are striking; they are estimated to elicit annualized health and societal savings at a value of US$44 billion-$53 billion
- Peak healthcare savings could amount to 1%-1.5% of annual healthcare expenditure

Timely investments and implementation of the breakthrough AMR solutions would result in both health and socioeconomic value within the next 10-year period. The annualized investment costs in AMR bonds, multilateral funding and commercial incentives are estimated to be US$1.2 billion-$1.8 billion. With timely investment in these solutions, annual savings in healthcare and other socioeconomic costs amounting to US$10 billion-$15 billion and US$35 billion-$40 billion, respectively, can be realized in APAC (Figure 4). Healthcare savings are the result of reduced expenditure from judicious antibiotics use and decreased length of stay of hospitalized patients. Healthcare savings amount to about 1%-1.5% of APAC healthcare expenditure. Furthermore, savings from improved labor supply and productivity with improved outcomes from the implementation of AMR initiatives result in socioeconomic savings.

For drug companies, accounting for incidence rates in APAC (potential addressable market) and relative affordability, positive ROI is expected within four to six years from when the drug is launched. The 10-year internal rate of return (IRR) for the period 2023-2032 — assuming drug launch in 2029 — is estimated to be approximately 10%-15%. Funding models that support R&D expenditure would further increase the IRR.

Figure 4
Annual investment and potential returns



Source: Organisation for Economic Co-operation and Development (OECD); World Bank AMR report 2017; Oxford Economics; World Bank data; PubMed; L.E.K. research and analysis

An aspirational yet realistic roadmap for APAC

The flowchart below (Figure 5) outlines the steps to securing step-change improvements in APAC's AMR management across three initiatives.

Solution 1: AMR bonds for diagnostics

Stage 1: Establish a new finance facility

Key stakeholder: New AMR-dedicated organization equivalent to the International Finance Facility for Immunization (IFFIm)

The first step would be to establish a finance facility to direct and maintain AMR aid flows (investments and donations), coordinate collaboration between the various stakeholders in the public and private sectors, and create awareness for the cause. It is envisaged that this would be a similar scheme to that of IFFIm, which is dedicated to increasing vaccine availability in emerging markets.

Stage 2: Seek investments and donor pledges

Key stakeholder: The financial organization established in stage 1

Once established, the new facility would seek investment from capital markets in return for AMR bonds, as well as annual pledges from donor countries to facilitate the repayment of the long-term investments. A financial coordinating authority would play a role in valuing and issuing AMR bonds in return for funding from capital markets investors. The organization would be responsible for the timely repayment of investments (at predetermined interest rates) from donor country pledges.

Stage 3: Build expertise

Key stakeholders: Foundation for Innovative New Diagnostics (FIND)/hospitals

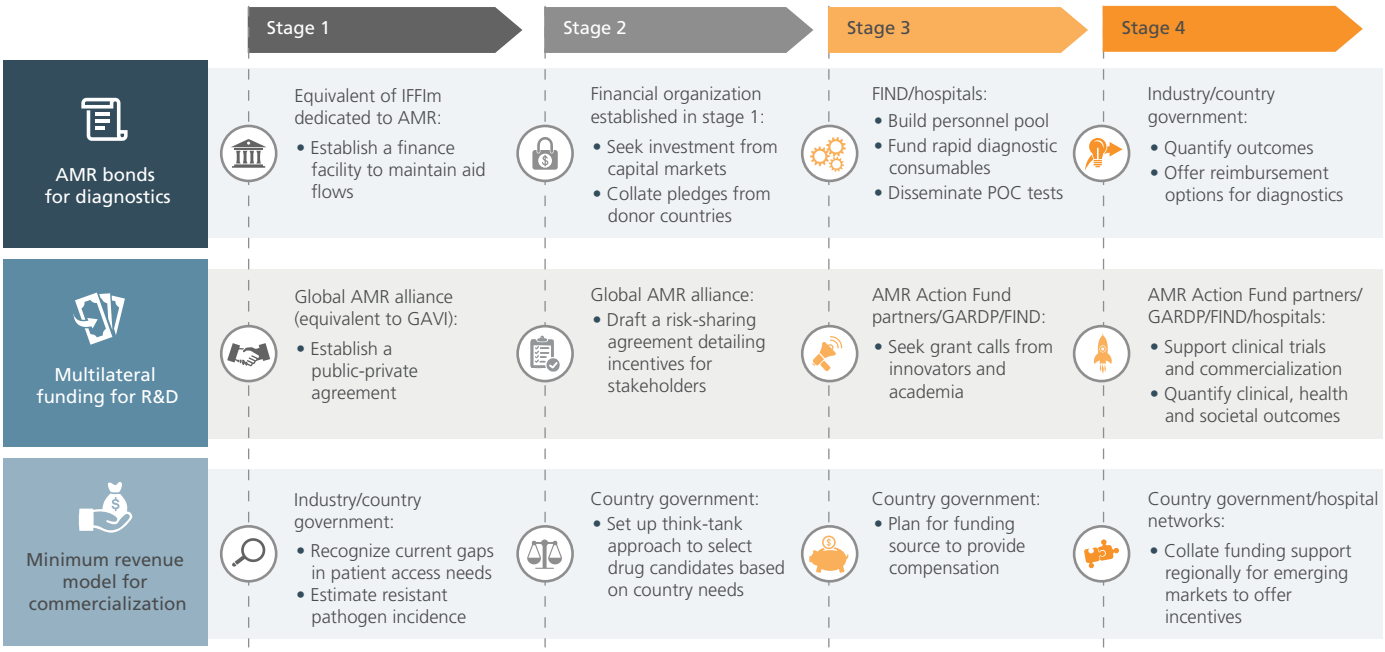
The working capital raised from investors can be used to build a personnel pool to expand diagnostic stewardship programs. Furthermore, the capital can be used for the integration of POC diagnostics and rapid diagnostic tests in outpatient clinics and hospital workflows, respectively.

Stage 4: Quantify outcomes and reimbursement policies for diagnostics

Key stakeholders: Industry/country government

The improved societal, clinical and health benefits should be documented to aid in evidence-based, public healthcare policymaking on reimbursement provisions for AMR diagnostics.

Figure 5
Stage–wise roadmap to implementation of 3 proposed solutions



Source: L.E.K. interviews, research and analysis

Solution 2: Multilateral funding for R&D

Stage 1: Establish Global AMR Alliance

Key stakeholders: Newly established Global AMR Alliance (akin to GAVI)

As with AMR bonds, access to a multilateral funding pool will require public-private collaboration, including industry players, NGOs and national/regional governments calling for funds to support existing, as well as new, initiatives in R&D for novel-class antibiotics and POC diagnostics.

Stage 2: Draft risk-sharing agreement

Key stakeholders: Global AMR Alliance

During stage 2, Global AMR Alliance roles and responsibilities are assigned. The risk-sharing agreement should explicitly detail the incentives available from donor governments and industry in return for risk mitigation on investment in R&D. As part of the new risk-sharing model, governments would guarantee the supply of novel therapeutics/POC diagnostics, potentially at a reduced price point.

Stage 3: Solicit grant calls

Key stakeholders: AMR Action Fund partners/Global Antibiotics Research and Development Partnership (GARDP)/FIND

Solicit grant calls from innovators/academia developing therapeutics, targeting the priority pathogens with high incidence/resistance rates in APAC, or cost-effective POC diagnostics tools with rapid turnaround times (<30minutes).

Stage 4: Support clinical trials and commercialization of tools

Key stakeholders: AMR Action Fund partners/GARDP/FIND/hospitals

Finally, experienced funding pool partners could further play a role in organizing an incubator model, providing mentorship as needed to advance the technology from preclinical stages to commercialization. This final stage could involve the quantification of the positive clinical, societal and health outcomes realized through the commercialization of novel tools — providing the empirical evidence for policymakers to develop reimbursement and identify continued investment.

Solution 3: Minimum revenue guarantee model for commercialization

Stage 1: Estimate resistant pathogen incidence rate

Key stakeholders: Industry/country government

Estimate current and emerging pathogen resistance rates in the country population and assess present therapeutic capabilities to determine the specific needs of the country.

Stage 2: Set up think-tank methodology

Key stakeholders: Country government

During stage 2, a think-tank methodology would facilitate a structured process to choose drug candidates based on current and future country needs. This would involve:

- Convening an advisory board (including industry representation) to catalog and list key criteria
- Identifying a funding model that best meets the specific needs of the country
- Setting commercially relevant funding amounts and terms of funding compensation
- Developing AMS guidelines to enable appropriate clinical adoption
- Inviting company proposal submissions
- Implementing and organizing annual reviews

Stage 3: Identify funding sources

Key stakeholders: Country government

In stage 3, governments would need to ensure that sufficient funding has been allocated to provide the agreed-upon compensation.

Stage 4: Collaborate regionally

Key stakeholders: Country government/hospital networks

In the final stages of implementation, regional governments could consider collaborating with each other to support sufficient funding for antibiotics availability in multiple markets, and ensure greater efficacy.

Conclusions

Antimicrobial resistance poses a grave threat to the continued prosperity of the Asia-Pacific region, characterized by high and rising mortality rates and an unwelcome economic burden equivalent to approximately 10% of current healthcare expenditure. Given persistent headwinds from the COVID-19 pandemic and alarming AMR incidence rates in many countries, immediate action to achieve a step-change in AMR management is essential. Current underfunded initiatives are hobbled by poor infrastructure, high investment needs and weak commercial incentives, all of which have resulted in low levels of diagnostic stewardship and R&D investment.

Multilateral funding pools, together with AMR bonds, are new funding models to drive R&D and diagnostic infrastructure development for improved AMR therapeutics and diagnostics. The provision of worthwhile incentives via a minimum revenue guarantee model will energize the commercialization of novel-class drugs, improving patient access and outcomes and thus encouraging further R&D.

Whatever the precise roadmap adopted by individual countries, implementation would benefit from a collaborative regional effort using public-private partnership organizations dedicated to combating AMR. Such an approach must involve a sense of shared urgency among the stakeholders, requiring them to unite in their commitment to turn the tide of AMR in APAC.

Endnotes

[1] https://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf
[2] https://www.oecd.org/health/stemming-the-superbug-tide-9789264307599-en.htm
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About the Authors

Jonathan Kfoury is a Managing Director and Partner in L.E.K. Consulting's San Francisco office, and a senior leader of L.E.K.'s West Coast Life Sciences team. Jonathan joined L.E.K. in 2006 and focuses on growth strategy and pipeline/ commercial planning for biopharmaceutical and medical technology clients. Prior to joining L.E.K., Jonathan held R&D and strategic planning roles of increasing responsibility at biotech and specialty biopharmaceutical companies.

Fabio La Mola is a Partner in L.E.K. Consulting's Singapore office, Global Healthcare Co-Head AsiaPacific and Executive Director of the firm's AsiaPacific (APAC) Life Sciences Centre of Excellence. He has more than 18 years of experience across the healthcare services and life sciences industries in strategy, organization and performance. Fabio has worked with clients across Southeast Asia, Europe, the Middle East and the U.S. He advises clients on go-to-market planning, product launches, portfolio optimization, commercial and operating model development, processes, operations, and organizational efficiency improvement projects.

Mei Young is a Manager in L.E.K. Consulting's Singapore office and is a member of L.E.K.'s Life Sciences and Healthcare practices. Mei has worked with healthcare clients in Asia and North America on the development of growth and operations strategies, as well as on driving large-scale transformation and implementation.

Samyukta Ravishankar is a Life Sciences Specialist In L.E.K. Consulting's Singapore office. At L.E.K., she supports healthcare clients across Southeast Asia in conducting market assessment along with developing growth and go-to-market strategies.

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For more information, please contact **lifesciences@lek.com**.