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MRSA and carbapenem-resistant *Acinetobacter baumannii* on the fall: successful infection prevention and control in Chilean ICUs

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Two critical hospital-associated pathogens, MRSA and carbapenem-resistant *Acinetobacter baumannii* (CRAB), have historically driven ICU outbreaks and high mortality worldwide. According to the WHO's Global Antimicrobial Resistance and Use Surveillance System (WHO-GLASS) report, both pathogens are classified among the top limited-treatment bacterial threats globally, with median MRSA prevalence of 27.1% among *Staphylococcus aureus* isolates and 54.3% for CRAB in *Acinetobacter baumannii* isolates among patients with bloodstream infections (BSIs).[1] Yet, long-term multicentre data from Latin America are limited, and Chile in particular still does not contribute to WHO-GLASS.

Here, we report 2015–2024 surveillance data from 59 Chilean ICUs participating in the Collaborative Group on Bacterial Resistance to understand whether national infection prevention and control (IPC) and antimicrobial stewardship investments have translated into measurable declines in MRSA and CRAB incidence among the most critical patients. Incidence density rate (IDR) was defined as the number of new MRSA- or CRAB-specific cases per 1000 patient-days. All ICU clinical isolates were included, irrespective of infection or colonization status (distinction not feasible). Resistance was classified using the CLSI interpretive standards applicable to the year of report. Annual medians and IQRs of ICU-level IDRs were estimated for each organism. Temporal changes were visualized with yearly boxplots, and percentage variation relative to 2015 (baseline) was calculated as $(\text{median}_t - \text{median}_{2015})/(\text{median}_{2015} \times 100)$, with t denoting any year after 2015 and up until 2024. The years 2019 and 2020 were excluded due to the COVID-19 pandemic. More details are found elsewhere.[2]

We observed that MRSA and CRAB incidence declined sharply over 10 years (Figure 1). In 2015, the median MRSA IDR was 3.2 per 1000 patient-days (IQR 1.5–5.5), decreasing progressively to 1.1 per 1000 patient-days in 2024. Variability narrowed across hospitals, with fewer high-outlier ICUs. Relative to 2015, the national median MRSA IDR fell by nearly 70% by 2024. For CRAB, declines were even more pronounced, with the baseline median IDR 1.1 per 1000 patient-days (IQR 0.5–2.0), but by 2023–2024 most hospitals reported near-zero incidence, and many recorded no CRAB infections for consecutive years. However, variation in diagnostic practices and surveillance intensity across hospitals may partly influence these findings. The steepest drop occurred between 2017 and 2021, contemporaneous with intensified stewardship and formulary controls on carbapenem usage in Chilean hospitals. By 2024, the median CRAB incidence declined by roughly 85% versus 2015.

These findings indicate a sustained, nationwide reduction in CRAB and MRSA in Chilean ICUs. Chile's experience aligns with international evidence. While GLASS reported a 2.5% global decline in MRSA in BSIs between 2018 and 2023,[1] this had been noted in Chile earlier.

In a 17-year single-centre study, Martínez *et al.*[3] reported a decline in MRSA BSIs from 11.5 to 2.0 cases per year between 2000 and 2016, alongside increasing clonal diversity. Healthcare-acquired MRSA isolates also declined from 67.7% to 46.2%, according to the Public Health Institute.[4] Contrarily, CRAB poses a particularly stubborn challenge globally given limited treatment options and environmental persistence (e.g. endemic ICU transmissions), with GLASS indicating a 5.3% annual increase between 2018 and 2023.[1] In Latin America, the SENTRY study[5] reported *A. baumannii* as a more frequent cause of BSIs than in other regions, with carbapenem susceptibility falling from >80% (1997–2000) to around 15% (2013–2016).[6] For example, Argentina and Brazil have reported CRAB prevalence rates of 83% and 85% among *A. baumannii* isolates, respectively.[7] In contrast, Chile has displayed a different pattern, with meropenem resistance decreasing from 81% in 2012% to 44% in 2016 among healthcare-associated infections,[4] consistent with our study findings.

Such progress did not occur in isolation; rather, it reflects the convergence of multiple reinforcing interventions that together drove the reduction of both CRAB and MRSA (Figure 1e). Considering the strong role of horizontal transmission within the healthcare setting for both pathogens, we hypothesize that this trend in incidence responds primarily to IPC measures. First, Chile's long-standing IPC programme (established in 1983) has received consistent government support and implemented key

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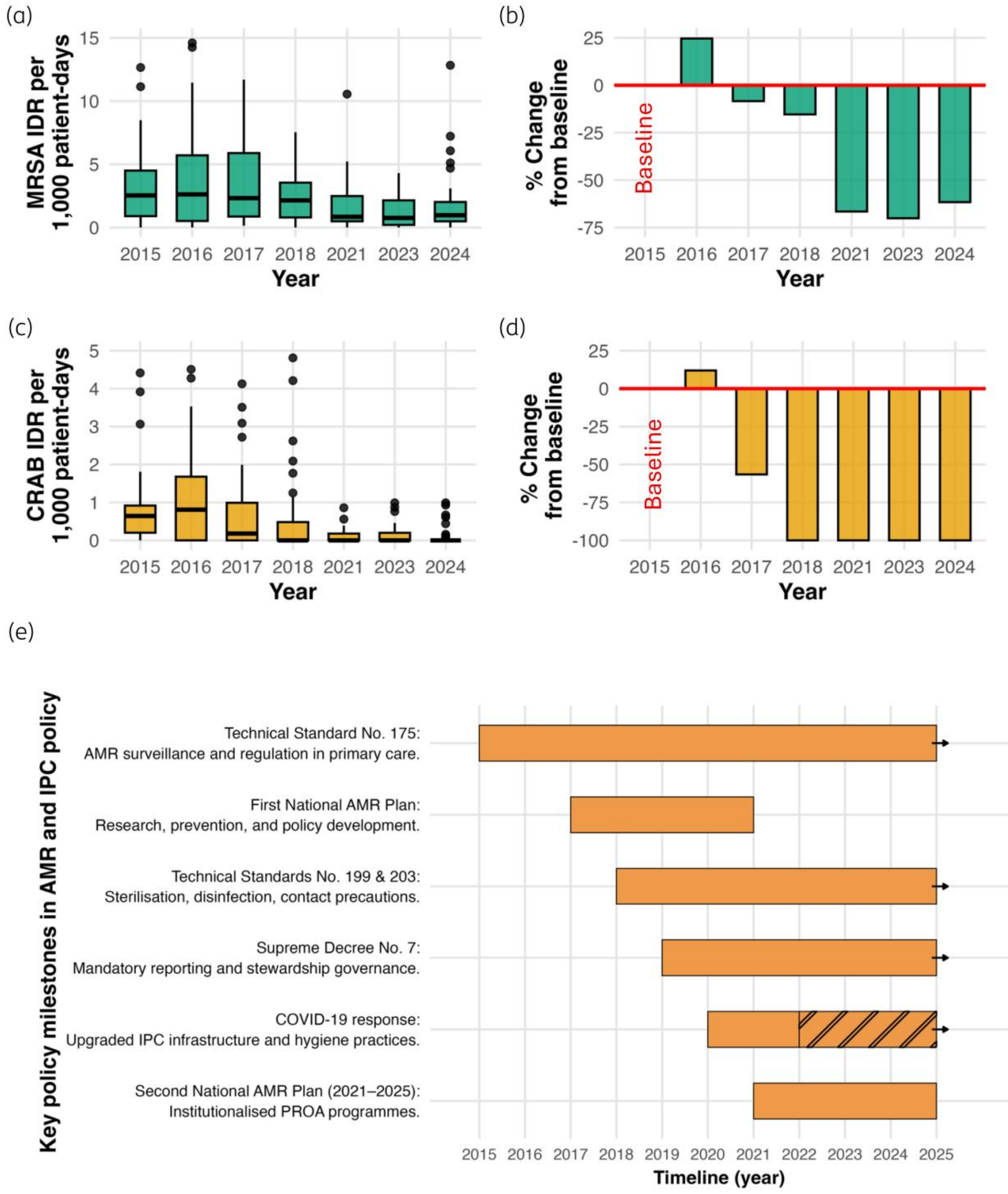

Figure 1. Trends and relative changes in the incidence of MRSA and CRAB in 59 ICUs, Chile, 2015–2024. (a) MRSA IDR per 1000 patient-days over time. (b) Percentage change in MRSA IDR per 1000 patient-days over time and in respect to the baseline year 2015. (c) CRAB IDR per 1000 patient-days over time. (d) Percentage change in CRAB IDR per 1000 patient-days over time and in respect to the baseline year 2015. (e) Key policy milestones in AMR and IPC in Chile, over time. Shaded area regarding COVID-19 response indicates potential impacts of upgraded IPC after the COVID-19 pandemic. Black arrows indicate continuation of such policies after 2025. AMR, antimicrobial resistance; CRAB, carbapenem-resistant *Acinetobacter baumanniii*; IDR, incidence density rate per 1000 patient-days; IPC, infection prevention and control. For panels (a) and (c); boxes show the interquartile range (Quarter 1–Quarter 3), the line inside is the median, black dots present outliers.

regulations to curb multidrug resistant organism (MDRO) transmissions, including the national surveillance system (Technical standard No. 175, 2015), sterilization/disinfection standards (Technical standard No. 199, 2018), and isolation and contact precaution guidelines (Technical standard No. 203, 2018). Second, Chile's second national action plan on antimicrobial resistance (AMR)

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(2020–2025, continuing in practice) mandated reporting of resistant isolates (Supreme Decree No. 7, approved in 2019),[8] expanded training, fostered collaboration for detection, and established governance for stewardship, providing new strategies for MDRO containment.[9] The 2020 decree also mandated hospital-based antimicrobial stewardship programmes (Programas de Optimización de Antimicrobianos, or 'PROAs', in Spanish) nationwide, with all hospitals required to comply within 6 months.[10] Third, during COVID-19 (2020–2021), many facilities upgraded IPC infrastructure and diagnostic workflows. However, sustained gains require continuous surveillance, stewardship capacity and quality-assured microbiology. Rebound risks include pathogen replacement, such as carbapenem-resistant *Klebsiella pneumoniae* or *Pseudomonas aeruginosa*, observed as rising threats in Latin America[11] despite MRSA declines.

These data present limitations. We used aggregated ICU-level surveillance and did not account for patient-level risk factors or outcomes. Differences in diagnostic capacity and case ascertainment may affect year-to-year variation; however, uniform CLSI standards and national quality assurance reduced systematic bias. We did not include genomic or clonal data, which are important for MRSA given the differing transmission behaviours of its clones.

The MRSA and CRAB reductions likely reflect the cumulative impact of strengthened IPC, targeted stewardship and robust national coordination. Chile's experience demonstrates that meaningful AMR control is achievable through sustained, system-level interventions and can inform regional strategies across Latin America. These findings are aligned with UN Sustainable Development Goals (target 3.d.2) aiming to monitor progress towards AMR burdens, and the strategic objective 3 of the Global Action Plan on AMR that aims to intensify IPC.

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Transparency declarations

All authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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All authors contributed equally to the conceptualization, writing, reviewing and editing of the manuscript.

Data availability

Data are available upon request.

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