Implementation Challenges in Antimicrobial Stewardship

Professor Karin Thursky

Director, National Centre for Antimicrobial Stewardship, Department of Infectious Diseases, University of Melbourne

Director, Royal Melbourne Hospital Guidance Group

Director, Centre for Health Services Research in Cancer, Peter MacCallum Cancer Centre

Implementation Stream Lead, National Centre for Infections in Cancer, Peter MacCallum Cancer Centre

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Declarations:
No conflicts of interest
Melbourne Health owns Guidance and NAPS IP

195 Countries *should* have National Action Plans for AMR

Overall global average score of 51.7 out of 100 for AMS implementation and governance

Patel et al. Measuring the global response to antimicrobial resistance, 2020–21: a systematic governance analysis of 114 countries. Lancet ID 2023

A very small workforce of antimicrobial stewardship experts
(ID physicians, specialist pharmacists, specialist nurses, microbiologists)

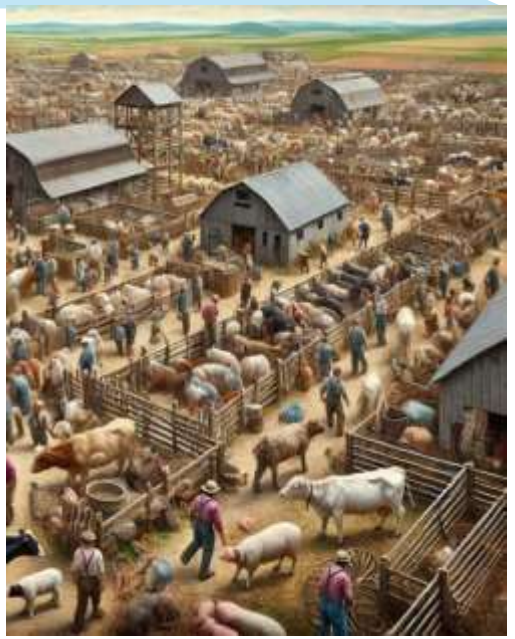
Billions of users and prescribers

Doctors

Patients and carers

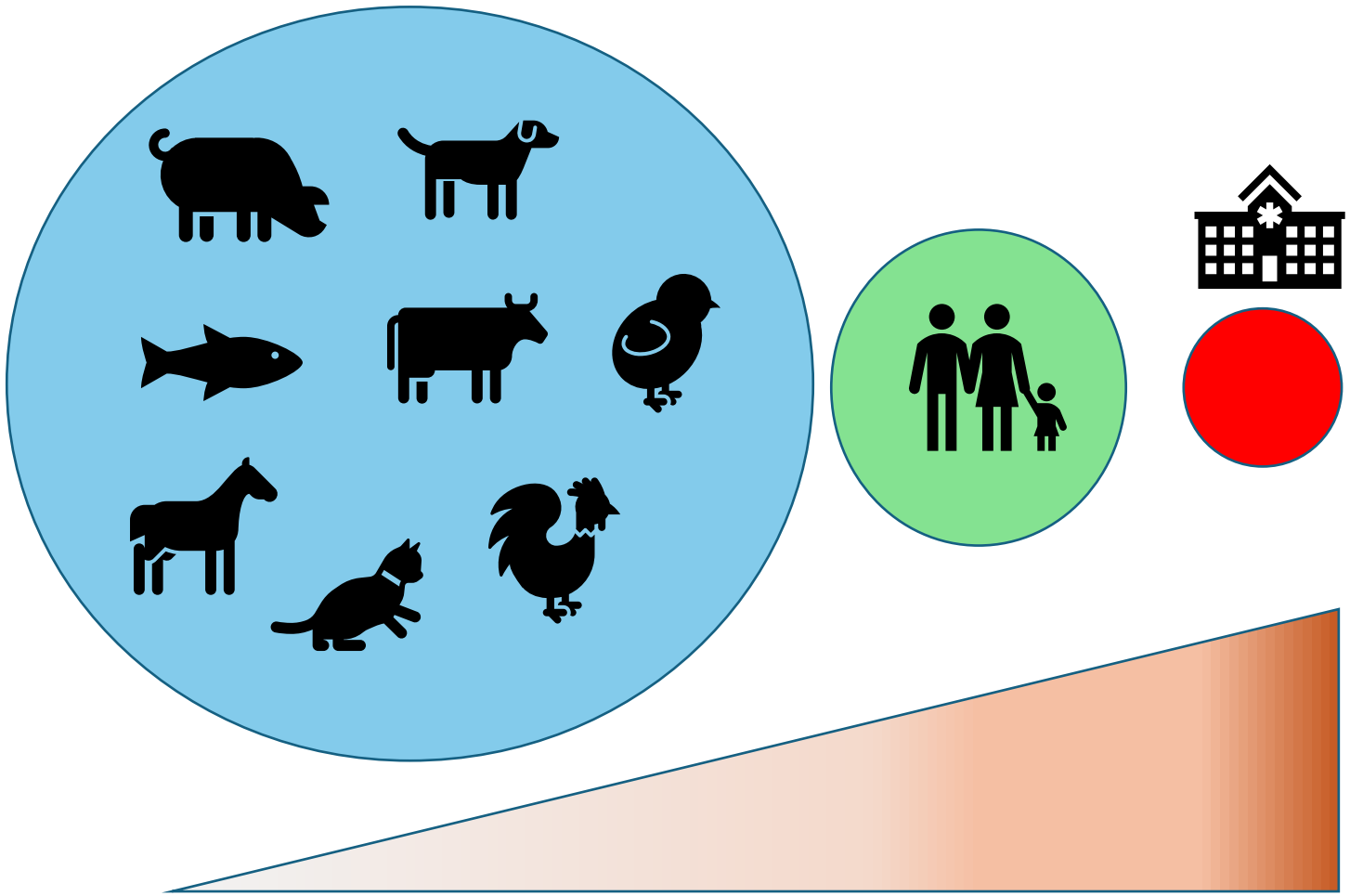
Nurses

Pharmacists



Farmers, vets

Where, who, why and how are our antimicrobials being used?



80% antimicrobials are being used in the animal sector

80% of human use is in the community

Most data and the highest quality data is from the hospital sector

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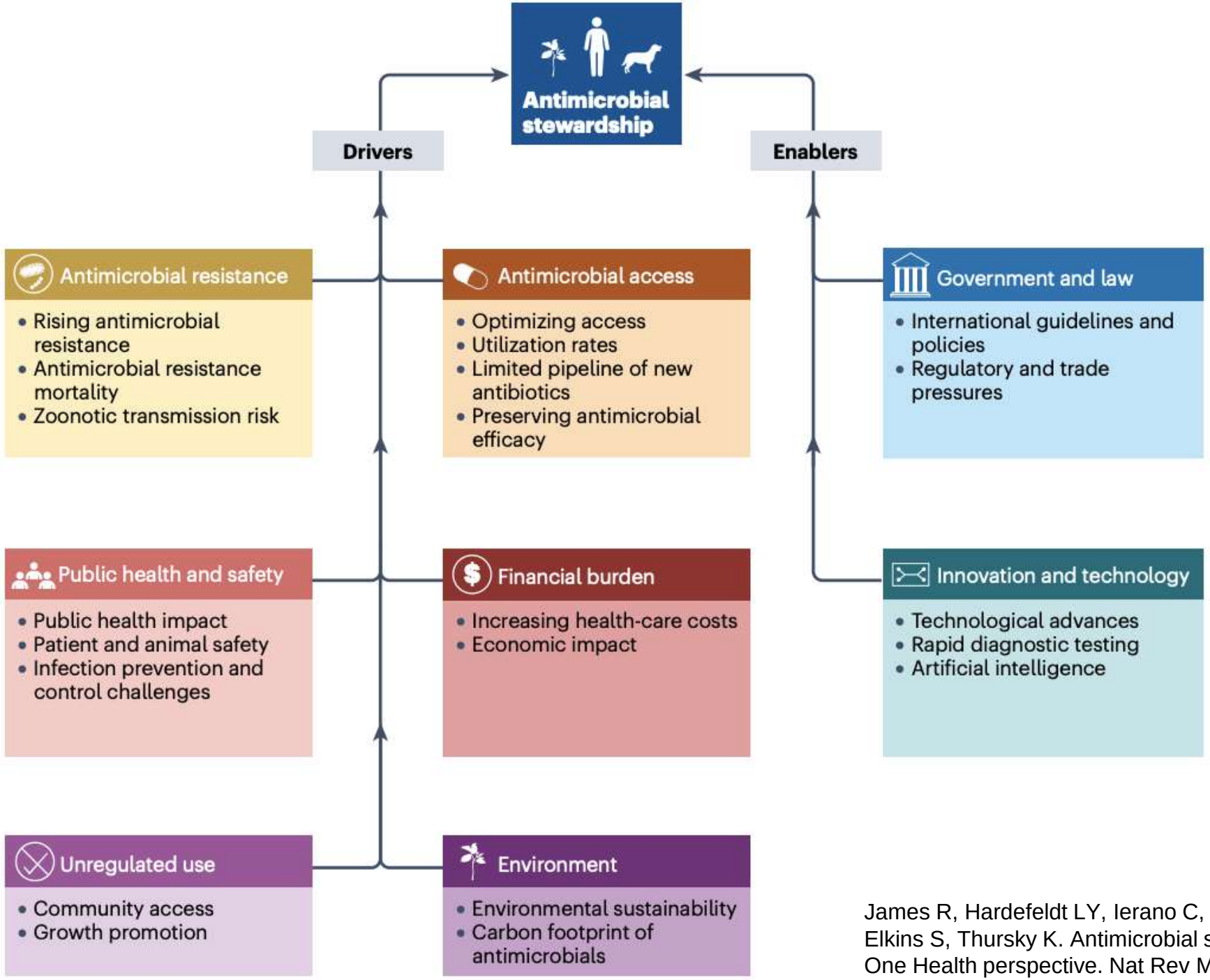
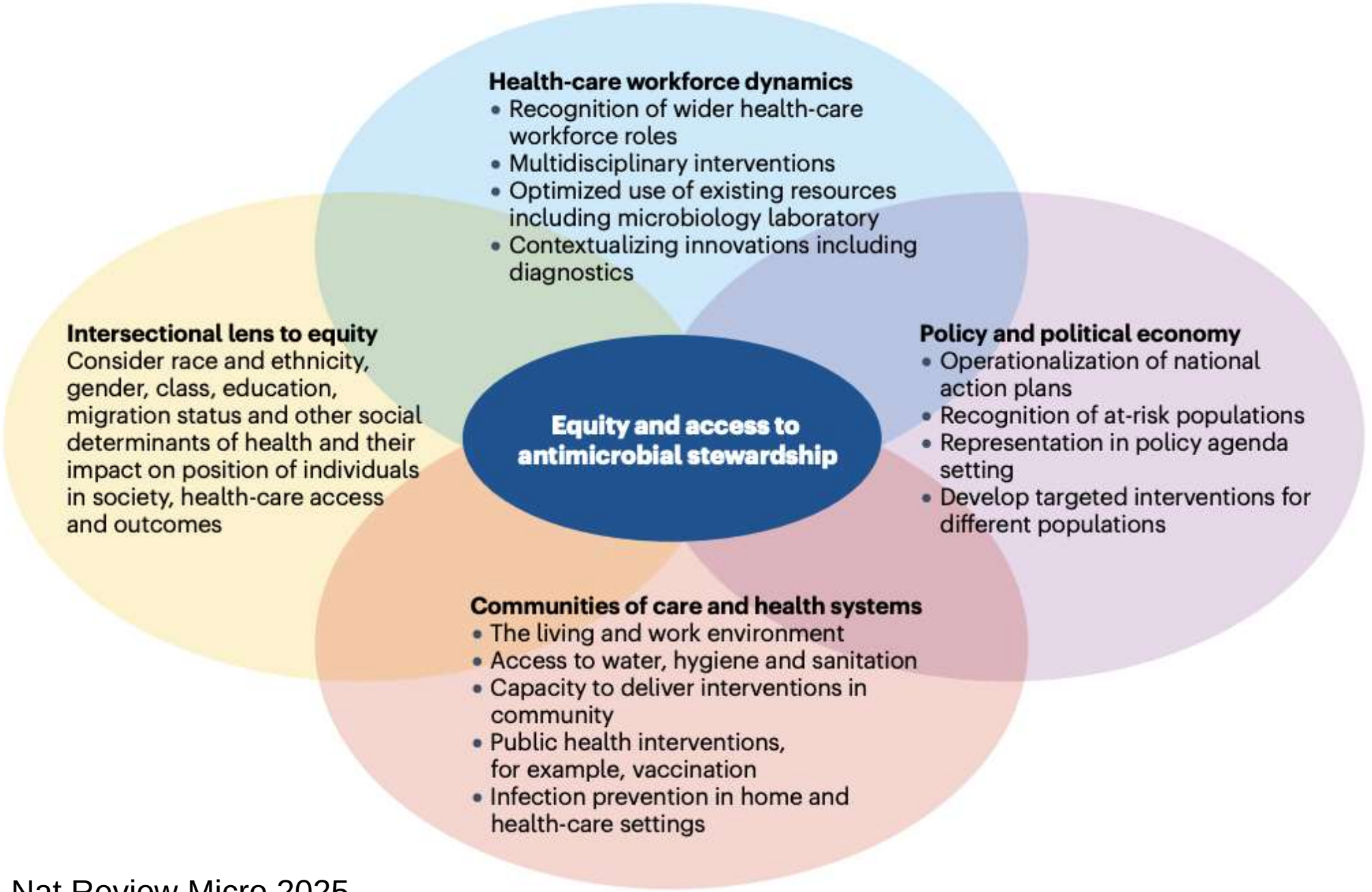
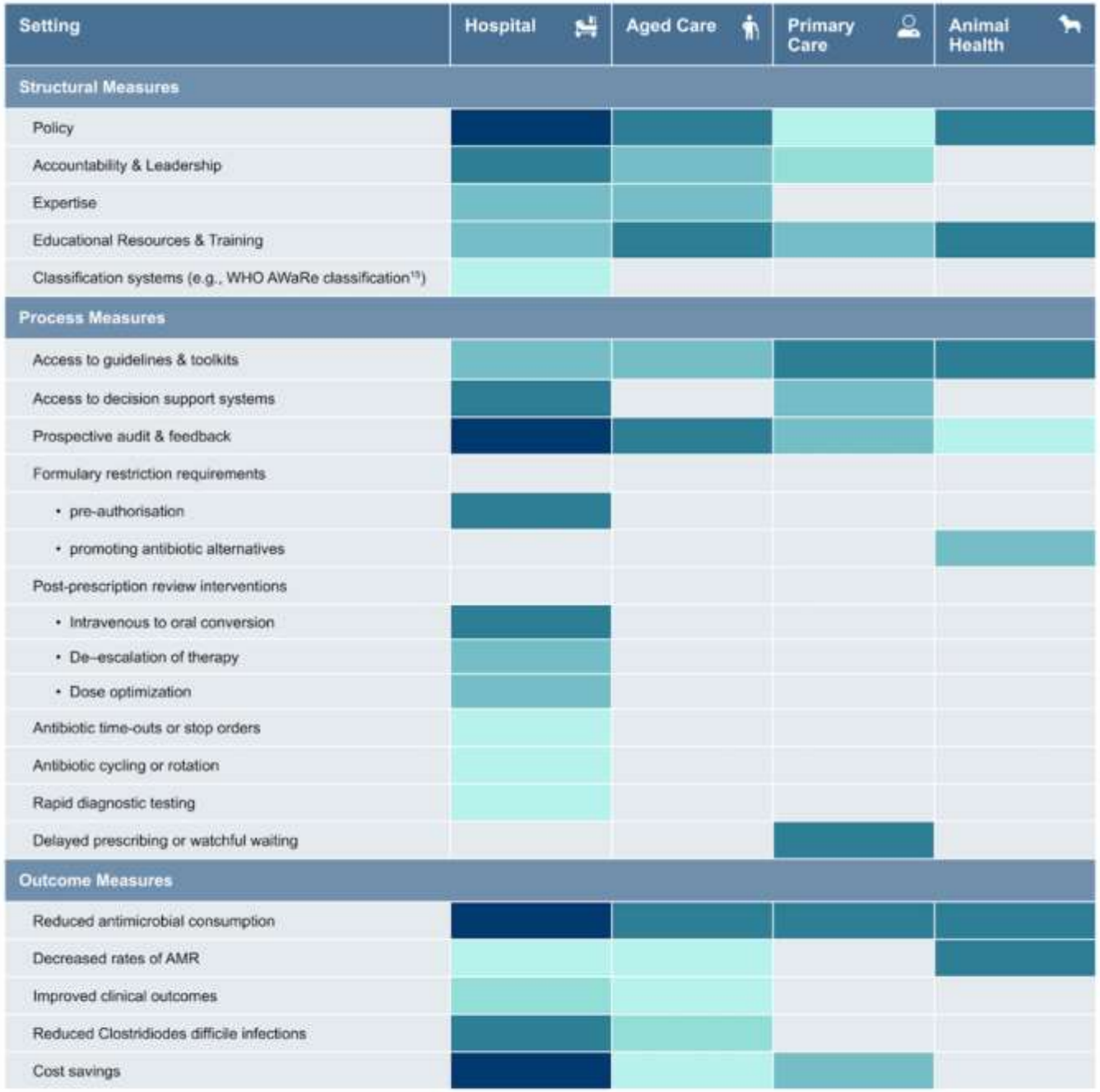


James R, Hardefeldt LY, Ierano C, Charani E, Dowson L, Elkins S, Thursky K. Antimicrobial stewardship from a One Health perspective. Nat Rev Microbiol. 2025



James et al. Nat Review Micro 2025

Current Evidence for AMS Interventions



James et al. Nat Review Micro 2025

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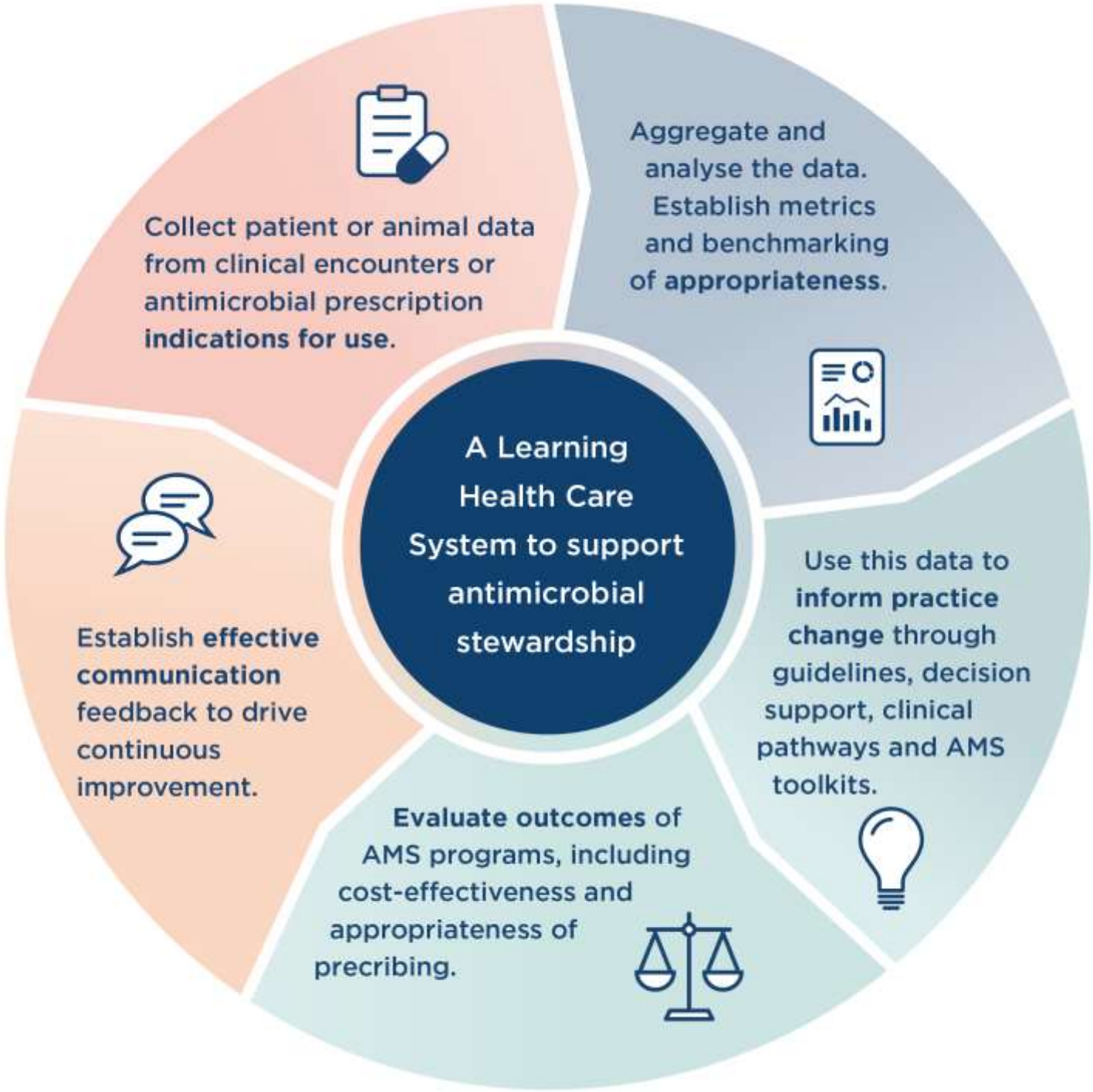

The Learning Health Community

AMS /AMR experts
Data analytics
Data scientists
Human factors experts
Clinical informaticists
Epidemiologists
Implementation scientists
Health economists
Social scientists
Communications experts
Patients and consumers
Management and executive
Policy makers

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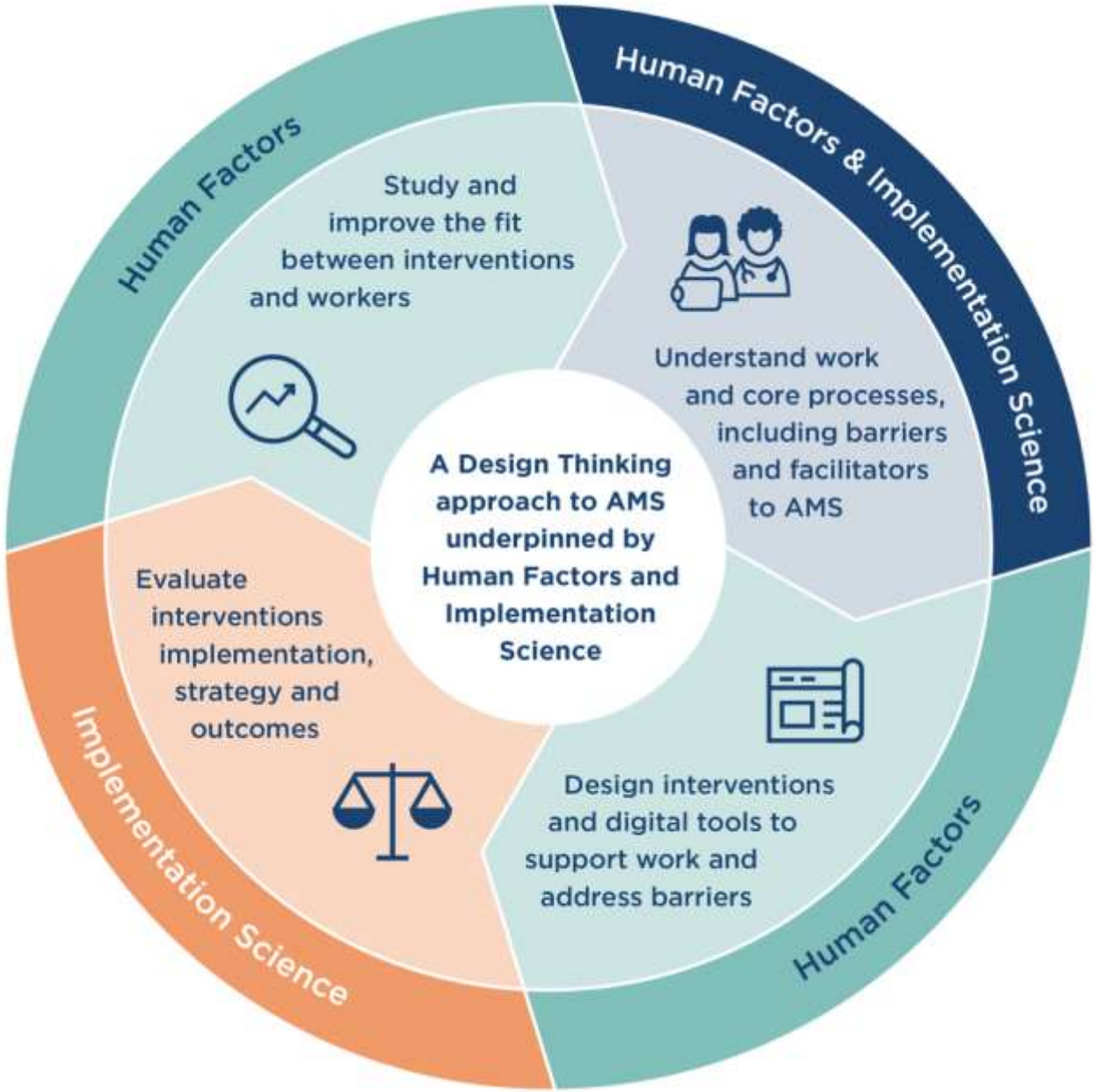

How do we ensure that our AMS processes are fit for purpose?

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The National Antimicrobial Prescribing Survey

NAPS National Antimicrobial Prescribing Survey

Welcome to the National Antimicrobial Prescribing Survey (NAPS)

Thank you for showing interest in the NAPS program

The NAPS program is coordinated by a multi-disciplinary team at the National Centre for Antimicrobial Stewardship and is delivered by the Royal Melbourne Hospit
2013 and has helped thousands of health care facilities globally assess the quality of their antimicrobial prescribing practices.

Multi-factor authentication is required to sign-up for an account, log-in and to make changes to your account details. Please refer to our cheatsheet to guide you thr

The recommended internet browsers are Google Chrome and Microsoft Edge. If you experience issues with loading our website, we suggest clearing your browser

Current audit tools

Click on the following for more information on specific surveys

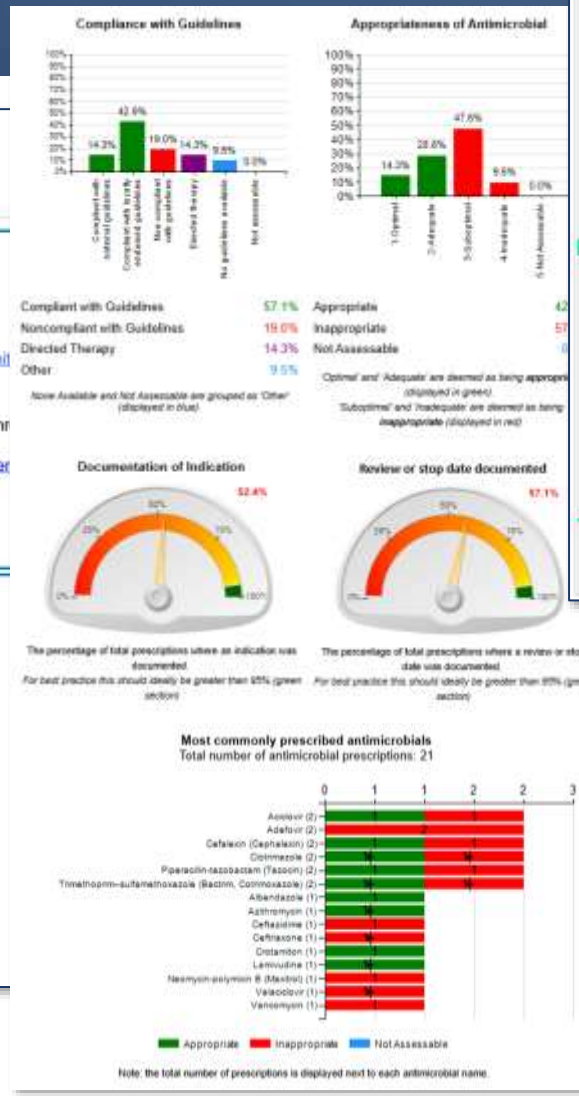
HOSPITAL NAPS | AGED CARE NAPS | SURGICAL NAPS | QI Quality Improvement NAPS | ANTIFUNGAL NAPS

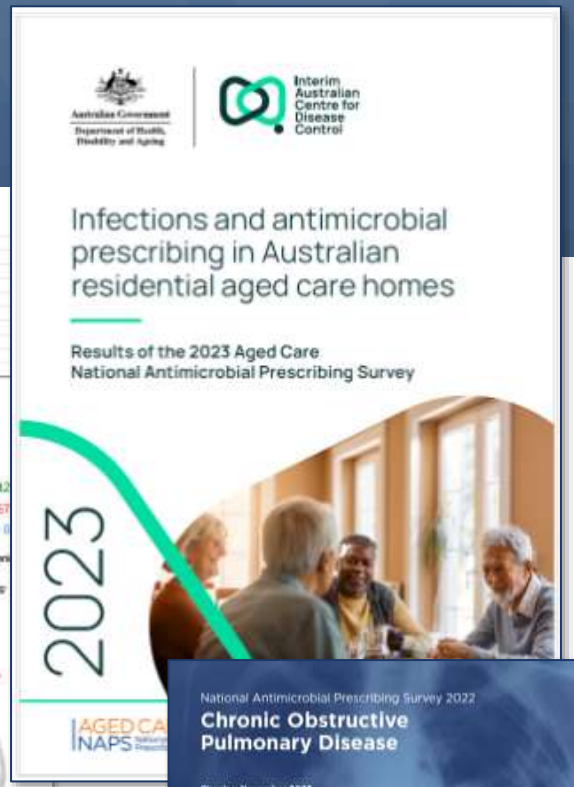
Reports

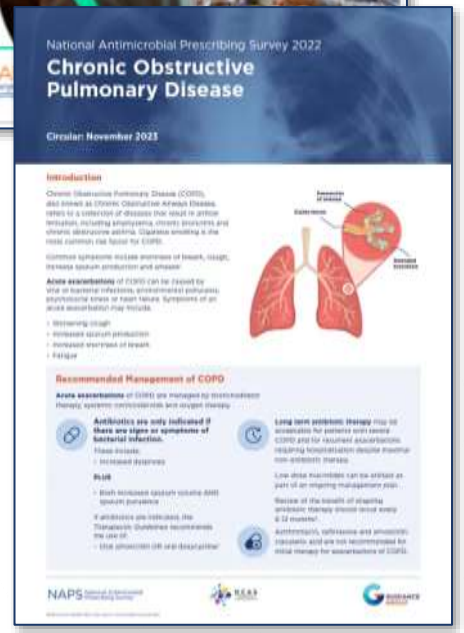
All reports for the **Hospital NAPS**, **Surgical NAPS** and **Aged Care NAPS** are publicly available. Click here to view.

Contact us

If you are experiencing any problems registering, or have any questions about the NAPS, please Contact us for assistance.







NAPS Program – Reasons for Success

User centred design led by AMS clinician experts

Standardised and validated audits, structured appropriateness assessment eLearning packages
Online data entry portals and automated reports

Proven transferability with programs operating in over 750 hospitals and 1,000 aged care homes and 13 countries

Accreditation compliance

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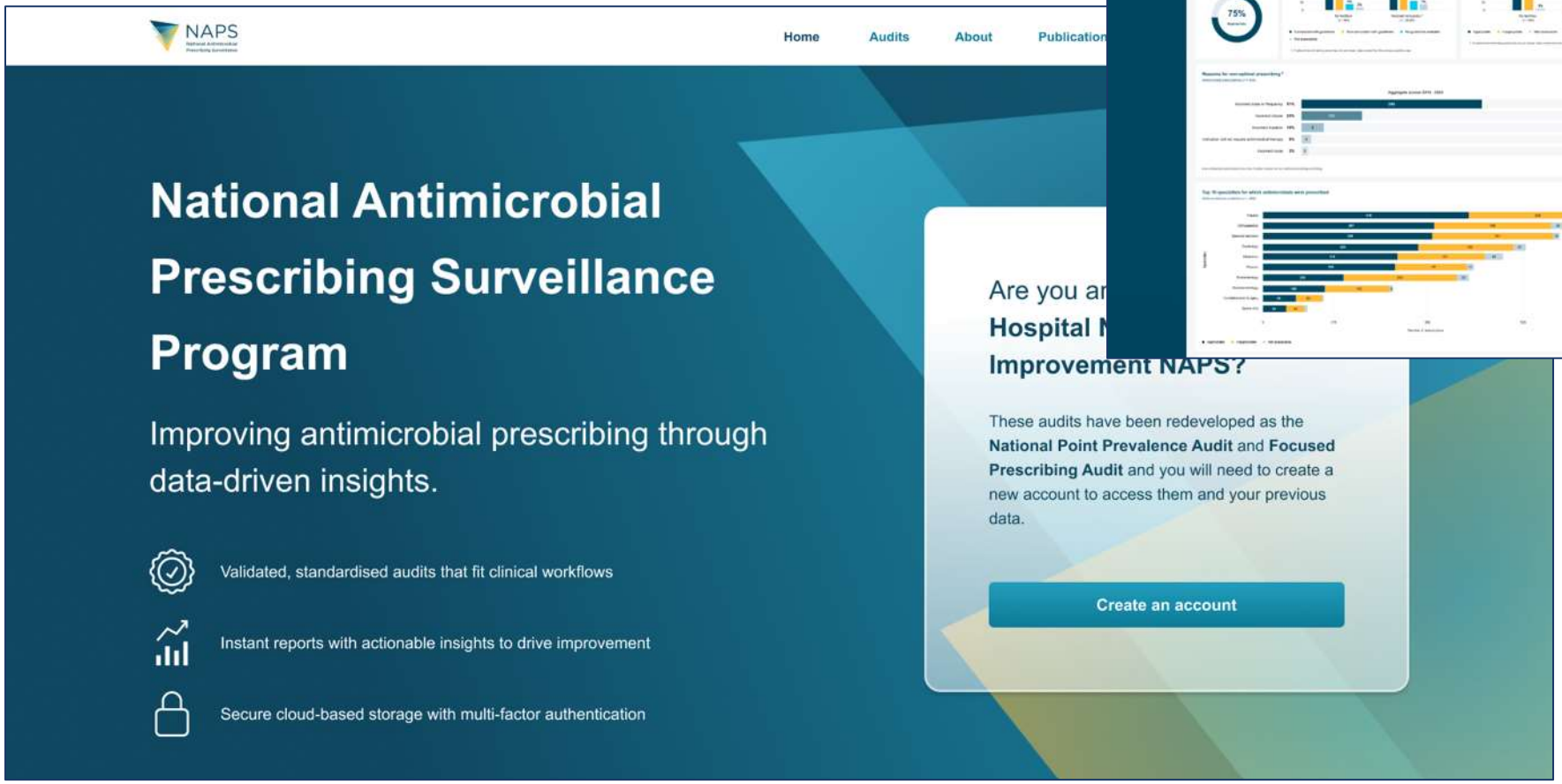
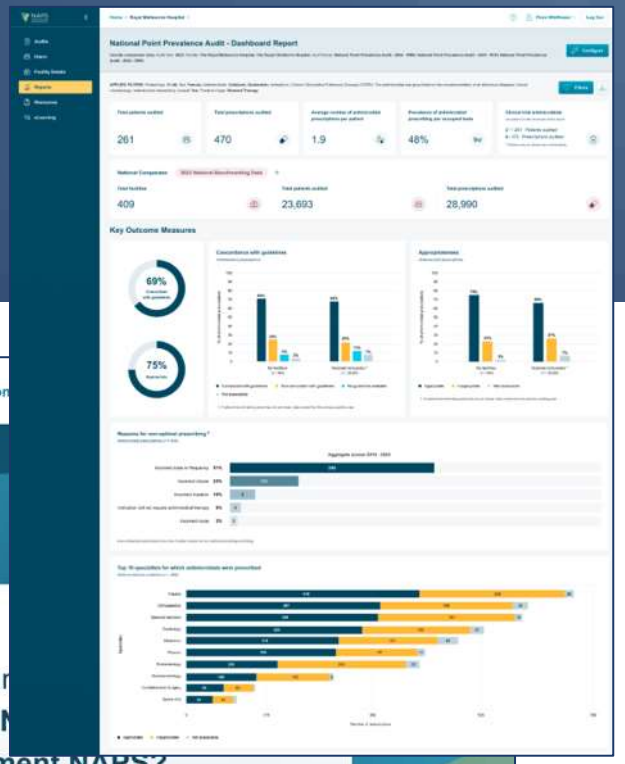
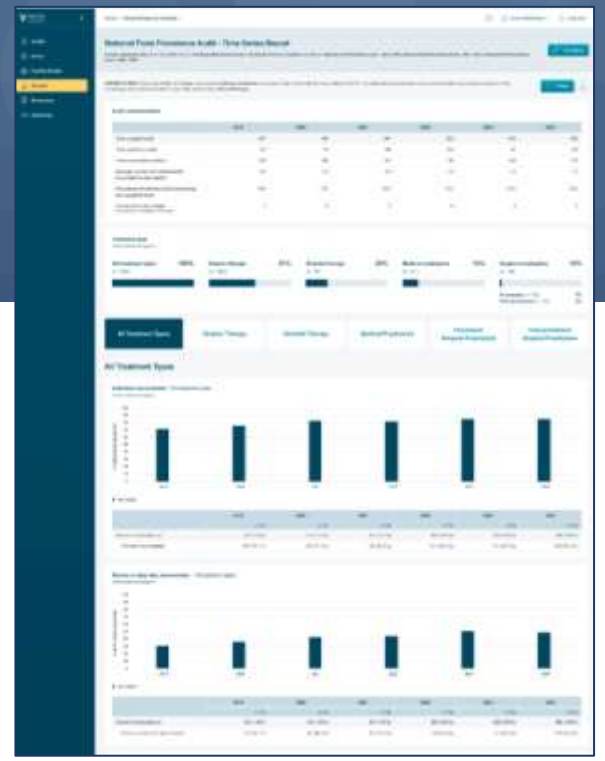
2026 and Beyond…







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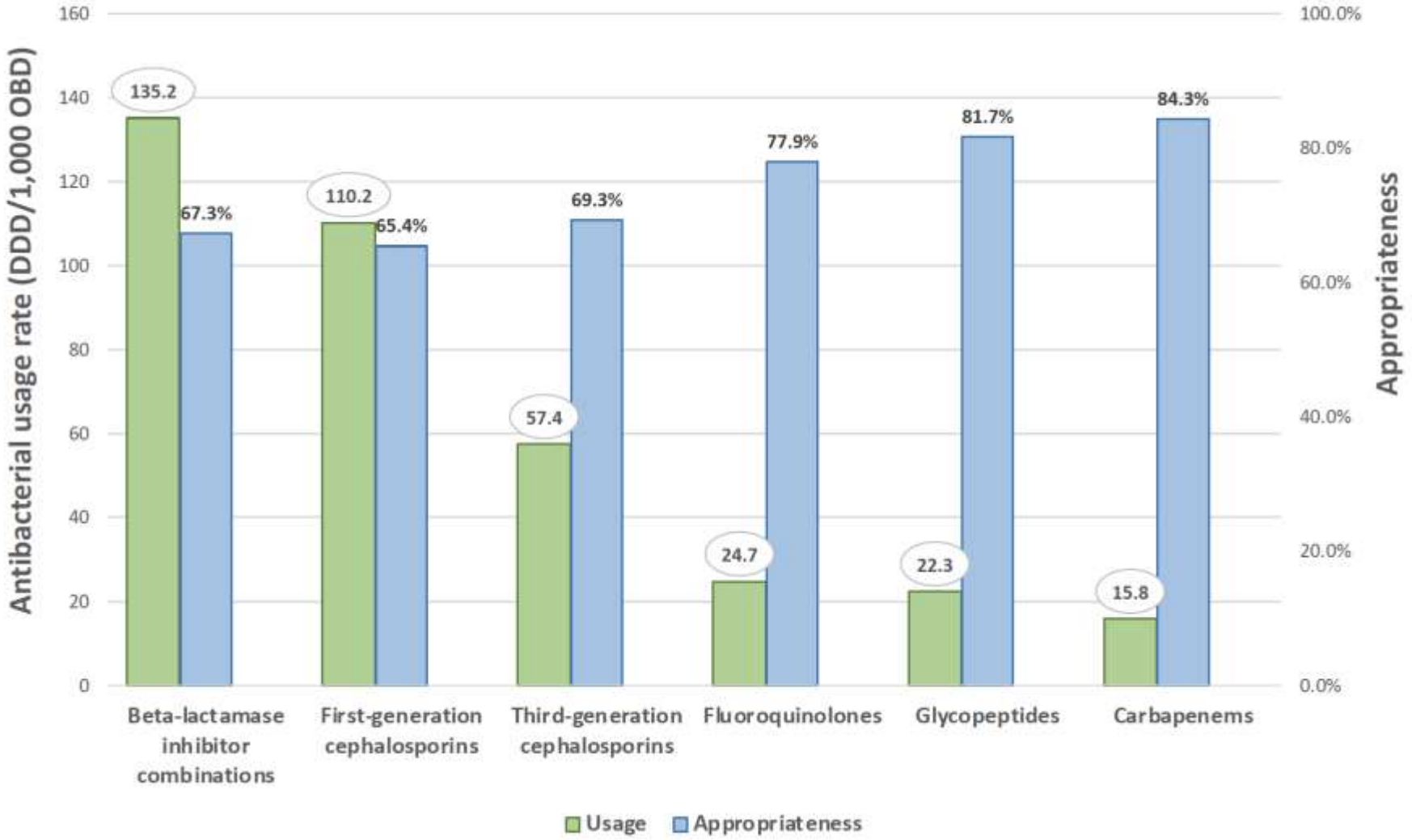
Combining antimicrobial consumption and appropriateness data



Data from the Australian NAPS and NAUSP program

181 facilities contributed data to both programs in 2022

Indication level appropriateness

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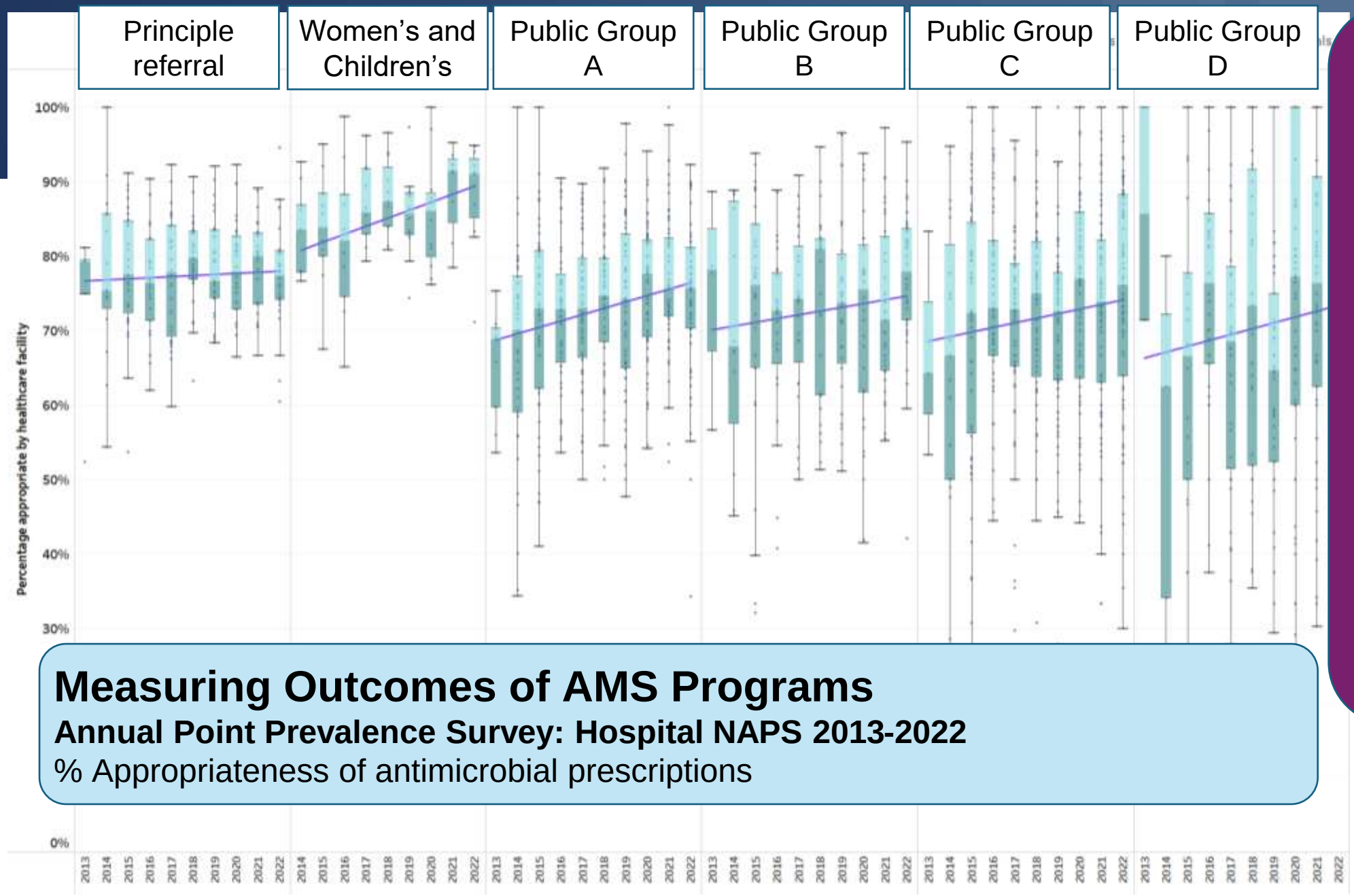
Data courtesy Erin O'Connor, NAUSP, SA Health. Presented at ASA, Sydney. Feb 2024



Measuring Outcomes of AMS Programs

Annual Point Prevalence Survey: Hospital NAPS 2013-2022

% Appropriateness of antimicrobial prescriptions

"NAPS has validated clinician concerns about antimicrobial prescribing, … assisted in gaining awareness of antimicrobial resistance [and] created an open dialogue between the health care team, including doctors, microbiologists, pathologists, pharmacists and nursing."

Remote hospital pharmacist

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Real World Data

Aggregation and triangulation of data from multiple sources
Local, regional and population level
Understand trends, patterns and drivers for AMR and AMU

Examples:

- Clinical and laboratory
- Quantitative and Qualitative
- Human and animal (and environmental)

- Data quality and accuracy
- Data privacy and security
- Integration and interoperability
- Bias and fairness
- Ethical and regulatory issues

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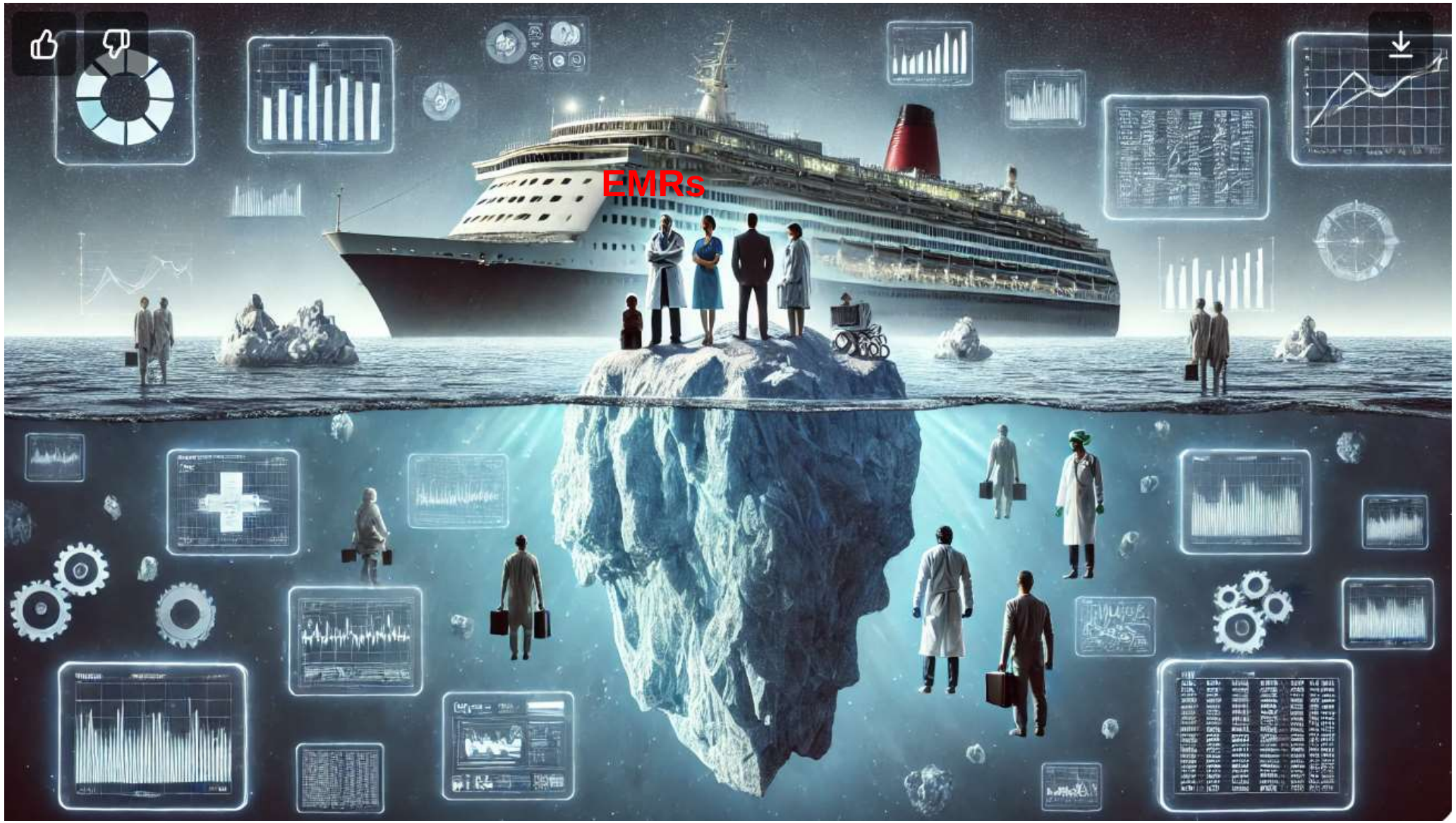

Data for action: The Reality

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Here is the futuristic depiction of antimicrobial stewardship in 2025, showcasing a high-tech hospital environment with healthcare professionals collaborating through holographic displays and advanced digital tools. Let me know if you'd like any adjustments or additional details!

What is the role of artificial intelligence for AMS?

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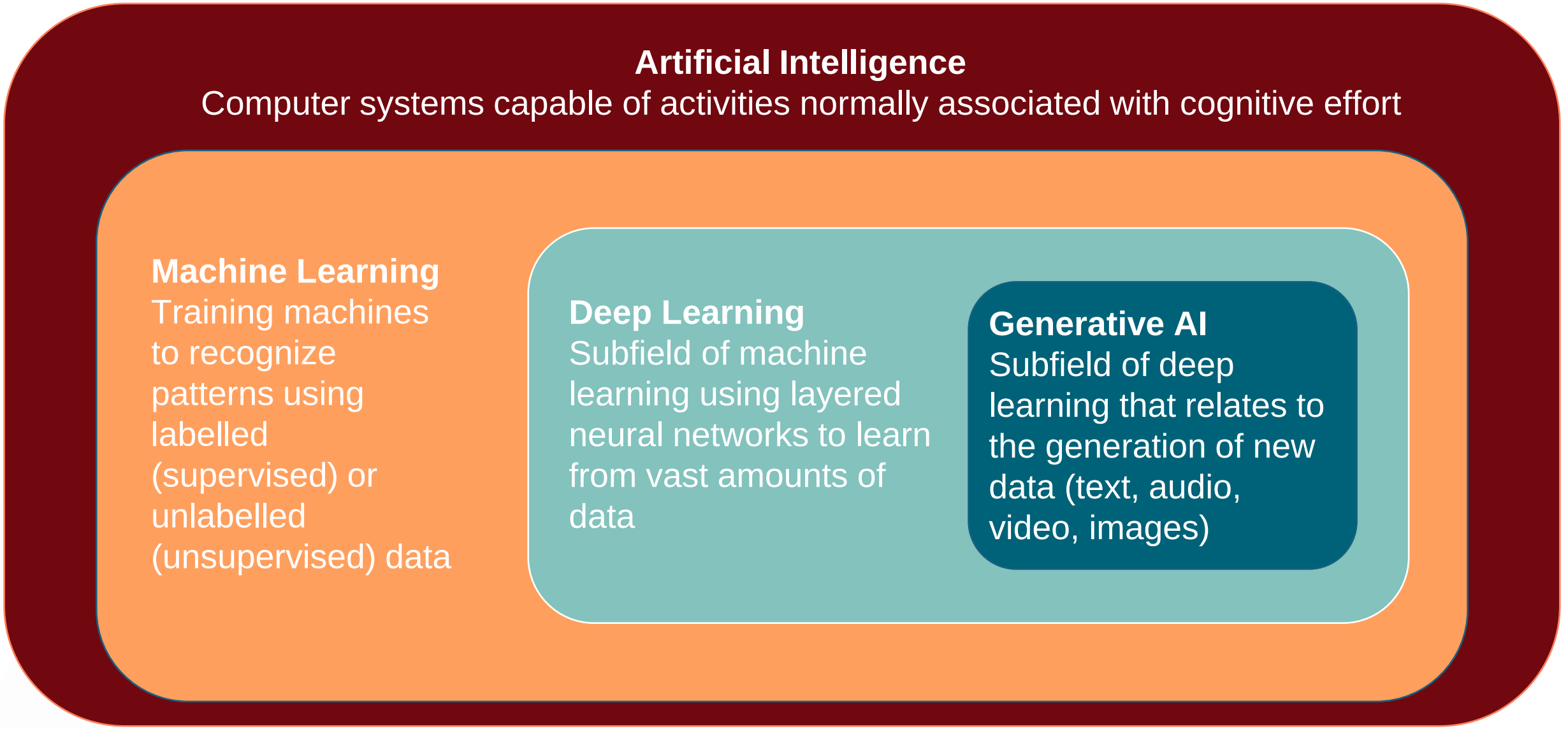

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Machine Learning can support AMS

Antibiotic Selection & Optimization
Appropriate antibiotics based on patient history, infection type, and local resistance patterns.

Prediction of Antimicrobial Resistance (AMR):
Guide targeted therapy and reduce empirical overuse of broad-spectrum antibiotics.

Early Diagnosis & Risk Stratification:
Early identification of infections requiring intervention (e.g sepsis and HAI)

Clinical Decision Support Systems (CDSS):
Assist AMS teams in real-time decision-making, ensuring better adherence to guidelines.

Accuracy across 2 meta-analyses: 74-97%

Comparative Performance with Clinician Judgment
Perform **equal to or better than human experts** in identifying optimal antimicrobial therapies.

Ethical and Implementation Challenges:
Concerns about transparency, interpretability, and clinician trust in AI recommendations.

Bias and Data Limitations:
Potential overfitting in ML models due to biased datasets, often collected from high-income settings.
Limited external validation

Antimicrobial Stewardship

Pennisi F, et. Al Artificial intelligence in antimicrobial stewardship: a systematic review and meta-analysis of predictive performance and diagnostic accuracy. Eur J Clin Microbiol ID 2025
Pinto-de-Sá R, Sousa-Pinto B, Costa-de-Oliveira S. Brave New World of Artificial Intelligence: Its Use in Antimicrobial Stewardship-A Systematic Review. Antibiotics (Basel). 2024 Mar

What is the role of generative AI in AMS?

One query to ChatGPT uses approximately as much electricity as could light one light bulb for about 20 minutes.

The ideal situation

1. Enhance clinical decision making
2. Democratisation of expertise
3. Diagnostic support tools
4. Reduce cognitive load and burden of documentation
5. Support personalized medicine
6. Medical education (including multilingual)

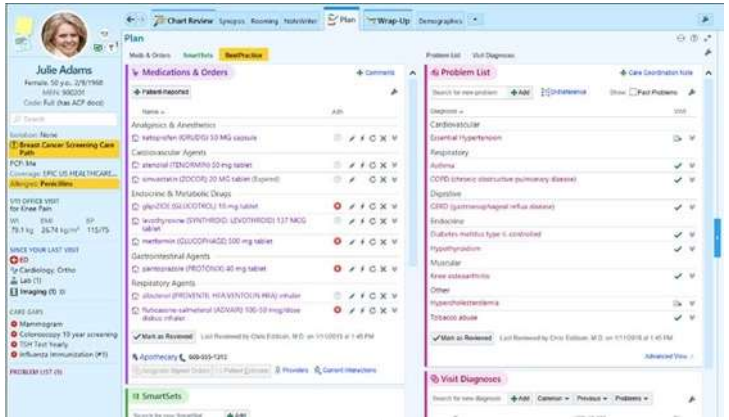
No clear pathway to implement and integrate generative AI in AMS

r/ProgrammerHumor

Reddy et al. Imp Sci 2024
Sabbiah. Nature Medicine 2023

The NCAS Data Science Initiative

An MRFF Research Data Infrastructure Grant



Natural language processing and machine learning
Automation of assessments
Human and animal
Community and hospitals

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Is it time to reframe antimicrobial stewardship?

AMR-related health terms -esp “AMR” and “Antimicrobial resistance” are unsuitable for public health communication, as they score consistently **low on both memorability and risk association**

Practitioners place saving life in the immediate sense as the highest priority. Any risk of an untreated infection is intolerable and motivates the use of antimicrobials.
We need to consider **moral injury as an unintended consequence**

Krockow, Nature Communications Medicine 2023

Davis et al, 2024. Risk individualisation and moral injury in the treatment of infection as impediments to the tackling of antimicrobial resistance. *Health, Risk & Society*

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