Government of **Western Australia**
Department of **Health**

School of
Medical & Health Sciences

AUSTRALIA ECU EDITH COWAN UNIVERSITY

The burden of community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) on healthcare facilities

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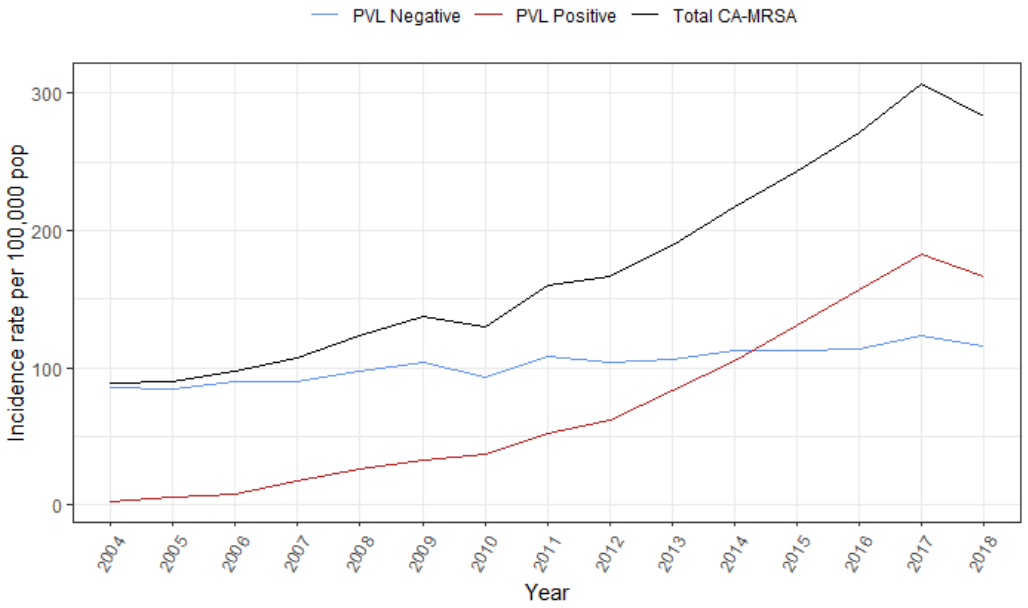
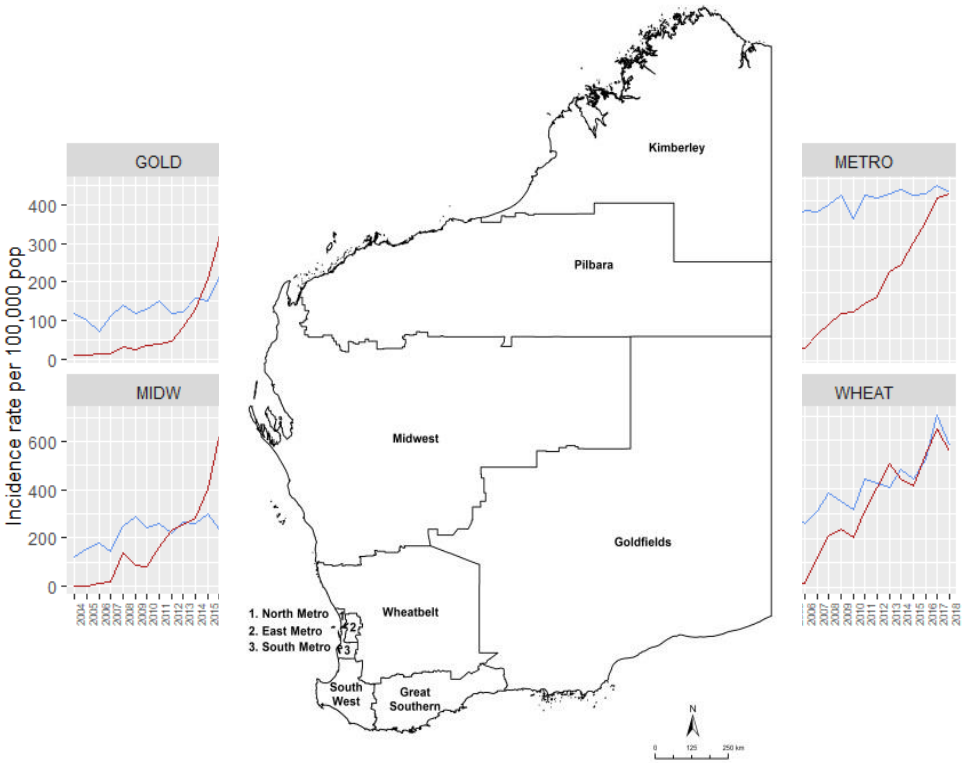
Background

- The rates of CA-MRSA in WA have been steadily increasing since 2004 and are ~3 times higher than they were 15 years ago
- The northern regions of the state have been disproportionately affected
- **What has been the impact of this increasing trend on hospitals?**



CA-MRSA rates, Western Australia, 2004 - 2018

Study design – Data Linkage



Notification data were extracted with the following inclusion criteria:

- Collection date between 1 July 2003 and 30 June 2015
- Persons with a **Kimberley** address
- Sample was not identified as a duplicate
- Sample was positive for a CA-MRSA clone identified by GPTL
- Sample was identified as a clinical specimen (screening specimens excluded)

Notification data linked to:

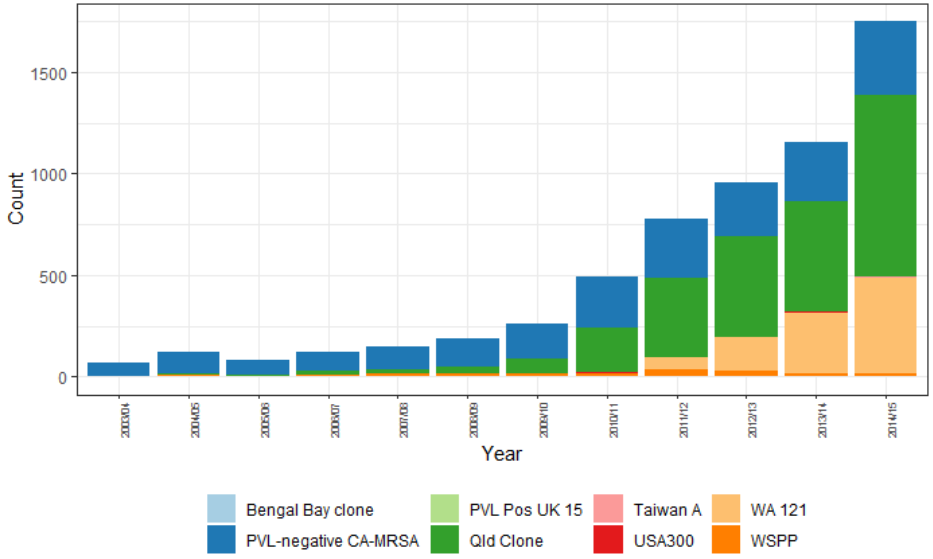
- Hospitalisation data
- Emergency department data

PVL+ and CA-MRSA

- Panton-Valentine leukocidin (PVL) genes are frequently present in CA-MRSA clones
- It has been *suggested* that its presence may cause more severe SSTIs than PVL- isolates, but not more invasive disease
- Are observed increases in disease severity are due to the presence of the PVL toxin, or is it is a marker for other virulence factors?
- Conflicting evidence from animal and human studies has led to inconclusive findings of the exact role of PVL in disease severity; evidence suggests that the effects *may* be strain-specific

Descriptive epidemiology – all Kimberley CA-MRSA

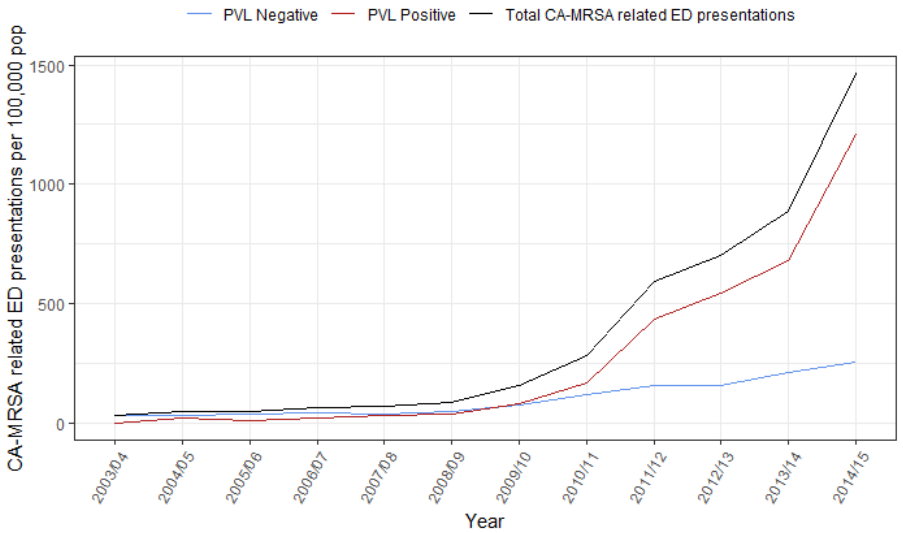
- The number of unique isolates increased from 66 notifications to 1,751 notifications (IRR 22.6, CI_{95} 17.8 – 29.2)
- Noted emergence of two PVL+ clones
- PVL^{+} accounted for 63.7% (n=3,897) of all clinical isolates reported over this period
- The proportion of PVL^{+} specimens increased from 0% (n=0) in 2003/04 to 79% (n=1,384) in 2014/15*



Count of CA-MRSA, by clone, 2003/04 – 2014/15, Kimberley Region

*Chi-squared=1082.5, p<0.001

Results – Emergency Presentations

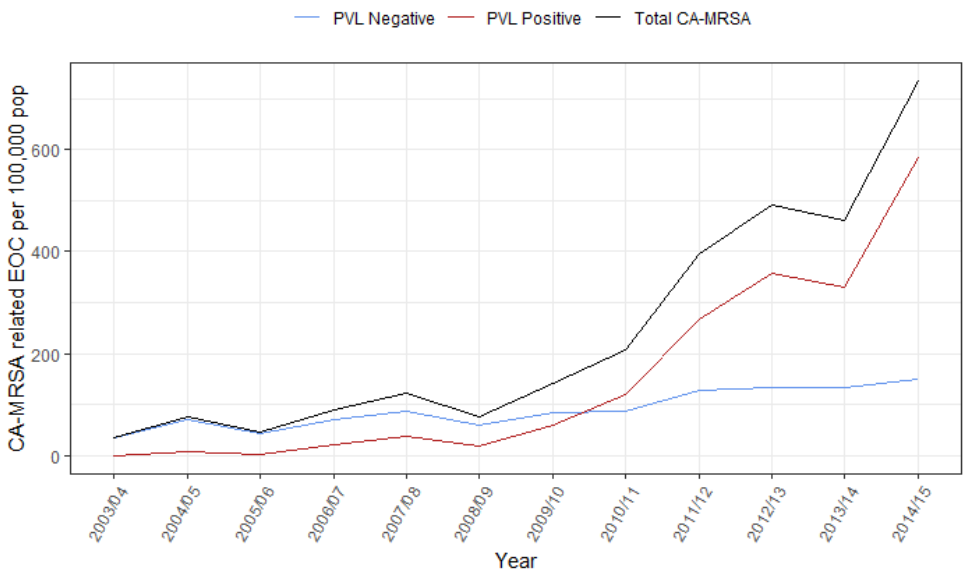


Annual ED presentations per 100,000 pop, by PVL status

- 'CA-MRSA related' presentations – Category 9 OR Category 18 who had a positive CA-MRSA specimen taken on the day of presentation
- The **proportion** of CA-MRSA notifications presenting to EDs has demonstrated an increasing trend
- Using 2003/04 levels as baseline, there have been an additional **1,563** presentations in the Kimberley over the study period due to the increasing burden

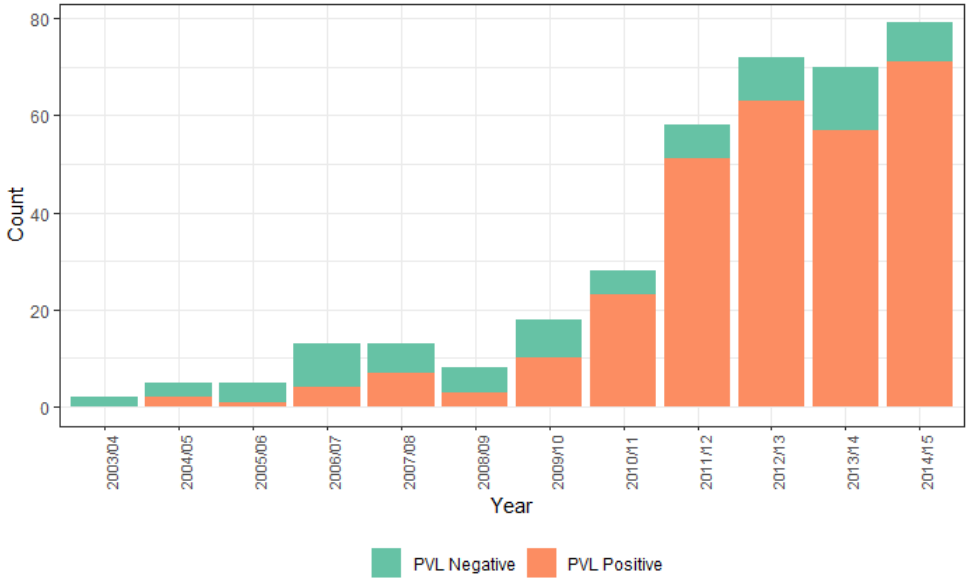
Results - Admissions

- ‘CA-MRSA related’ admissions – diagnosed within 24h **and met specific list of ICD-10 codes**
- 1,084 admissions met these criteria
- 395 (36%) of these were PVL- and 689 (64%) were PVL+
- No indication of increased burden of admissions associated with PVL+ strains (no significant trend in **proportion** of total cases admitted)
- Median LOS 3 days
- Using 2003/04 as baseline an additional **952** admissions were reported over the study period



Annual admissions per 100,000 pop, by PVL status

Procedures – Skin and soft tissue infections



Count of procedures for CA-MRSA related SSTI admissions, by PVL status

- 371 procedures matched to 867 admissions for **SSTI** were deemed to be CA-MRSA related including aspiration and/or excision, incision or drainage
- A significantly higher proportion of episodes of SSTI required surgical intervention if associated with **PVL+** clones compared to PVL- clones (50% vs. 28%, $p<0.001$)

Costs

- Total **average** costs for each diagnostic related group are calculated by combining of direct and overhead costs using National Hospital Data Collection Data
- 1,018 admissions had a DRG for which a national average cost was able to be retrieved
- Based on these data, approximately **AUD 7 million** in total costs were attributed to CA-MRSA related inpatient admissions over the study period, with costs of **AUD 1.8 million** in 2014/15 alone
- These are conservative estimates

Summary

- On average, 1/3 of notified CA-MRSA cases in the Kimberley presented to an ED, and 1/5 were admitted to hospital
- While there has been an increasing trend in the proportion of cases presenting to ED, the proportion of total cases being admitted to hospital has remained stable
- PVL+ cases were more likely to be younger, male and Aboriginal, and were more likely to be managed surgically
- Since 2003/04, there has been a 2491% increase in CA-MRSA related emergency presentations, and 5580% increase in CA-MRSA related admissions (conservatively)
- **Using 2003/04 as a baseline, the increased burden observed over the course of the study in the Kimberley has lead to 1,563 additional ED presentations, 952 additional admissions, and additional 2,856 bed days (assuming median LOS)**
- Although the most heavily effected by population size, this is only one region of the state; 7,234 cases reported across the state in 2018 alone

Acknowledgements

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L Bloomfield[1,2], **A Burroughs[3], A Beswick[2], A Bowen[4], R McCann[2], P Armstrong[2]**

[1]Edith Cowan University, School of Medical and Health Sciences

[2]WA Department of Health, Communicable Disease Control Directorate

[3]Australian National University, Master of Applied Epidemiology Scholar

[4]Telethon Kids Institute