

# Using Antimicrobial Susceptibility Testing Data To Identify Possible Carbapenem-resistant *Klebsiella pneumoniae* and *Escherichia coli* in Hawaii, 2005–2010

Zeshan Chisty MPH, CPH, Myra Ching-Lee MPH, Sarah Y. Park MD  
Disease Outbreak Control Division, State of Hawaii Department of Health

Corresponding Author: Zeshan Chisty  
1250 Punchbowl Ste 458  
Honolulu, HI, 96813  
Office: 808-586-4595  
Zeshan.chisty@doh.hawaii.gov

## Introduction

- Carbapenem-resistant *Enterobacteriaceae* (CRE) is an increasingly concerning etiology of some healthcare-associated (HAI) infections, with high mortality rates up to 40 to 50%
- The production of enzyme *Klebsiella pneumoniae* carbapenemase (KPC), the most common method of resistance, confers resistance to carbapenems, penicillins, cephalosporins, and aztreonam
- According to the Centers for Disease Control and Prevention (CDC), 40 states (including Puerto Rico) have reported KPC producing organisms
- According to CDC, *K. pneumoniae* and *Escherichia coli* are a priority for detection
- In Hawaii CRE infection is not a reportable disease
- The population of Hawaii is over 1.3 million, Oahu has 70% of the population and all the trauma centers
- This study aims to identify any possible CRE infections occurring in Hawaii from 2005–2010

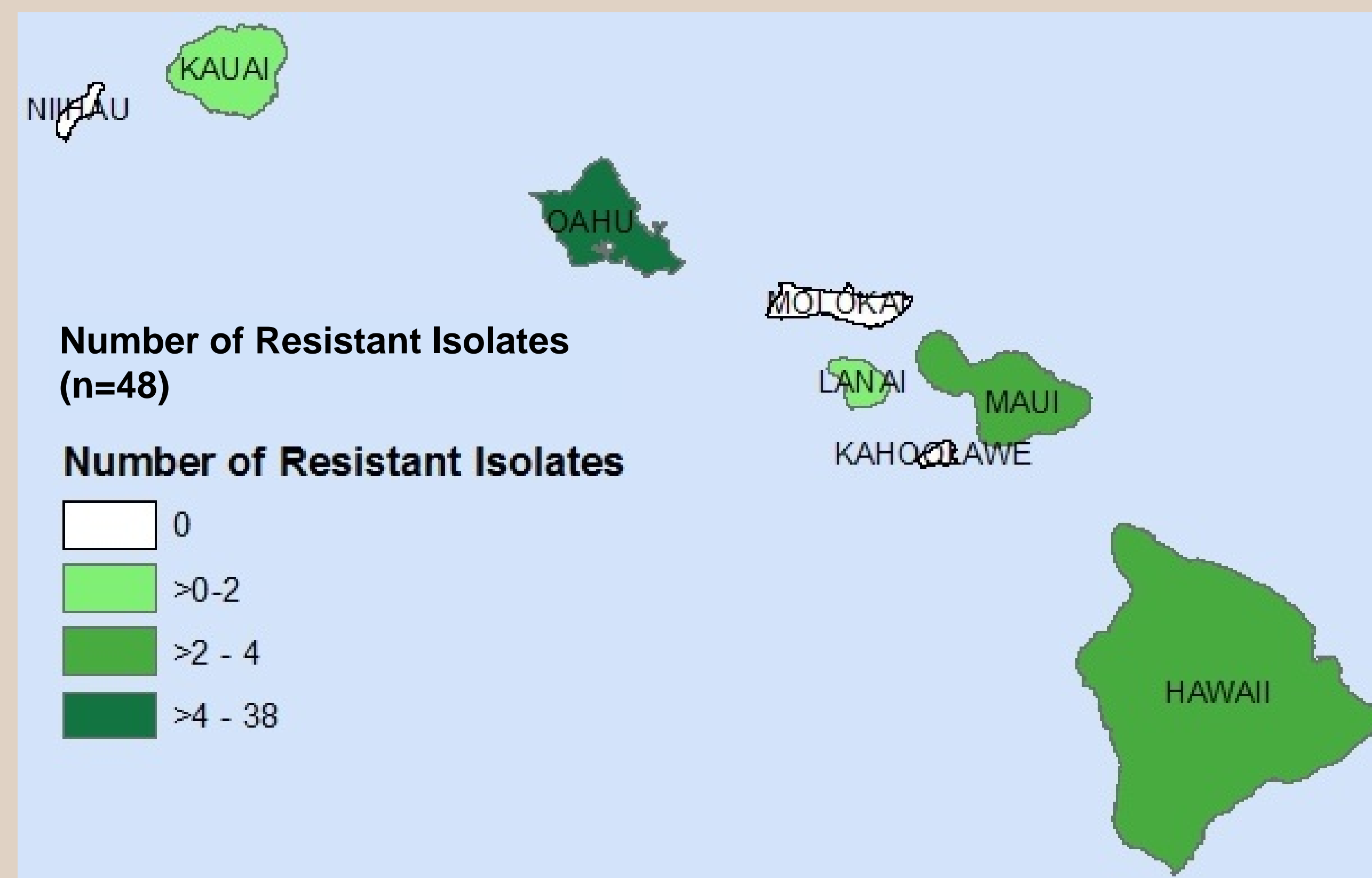
## Methods

- Antimicrobial susceptibility testing (AST) data are retrospectively collected by the State of Hawaii Antimicrobial Resistance Project (SHARP)
- Data are collected from the state's 4 major clinical laboratories (95% of AST data statewide)
- *K. pneumoniae* and *E. coli* AST results were compared with the 2012 minimum inhibition concentration (MIC) carbapenems resistance breakpoints determined by the Clinical and Laboratory Standards Institute (CLSI)
- We defined CRE as an isolate resistant to at least one carbapenem and 3<sup>rd</sup> generation cephalosporins (Table 1)

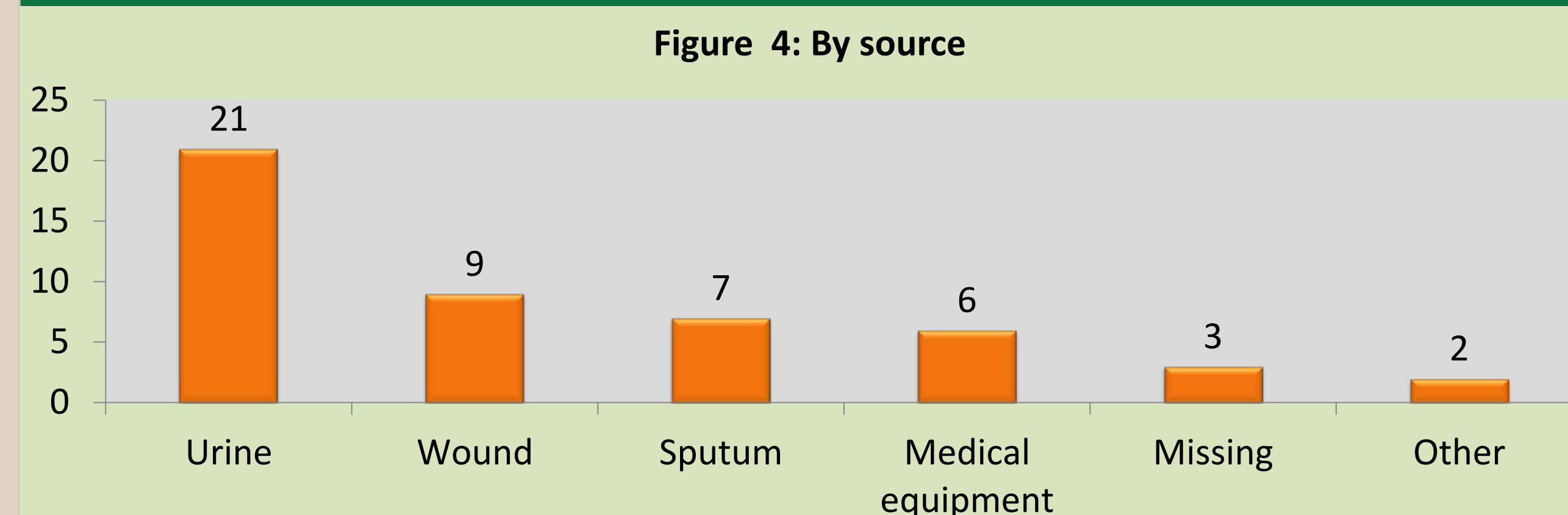
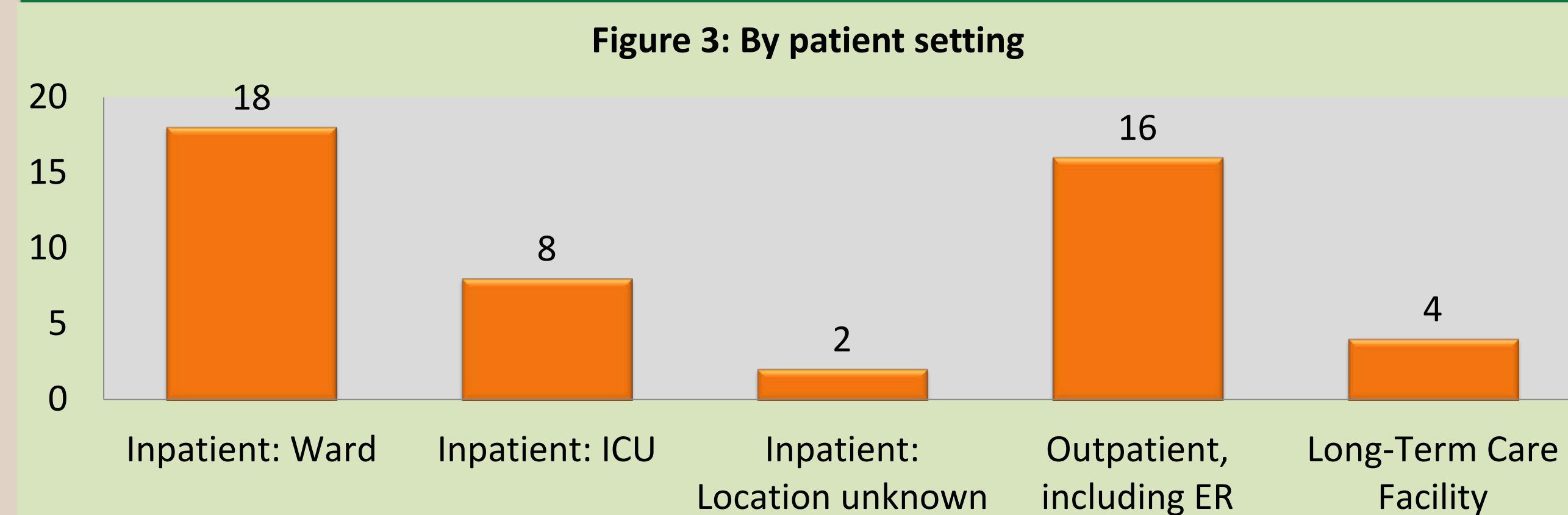
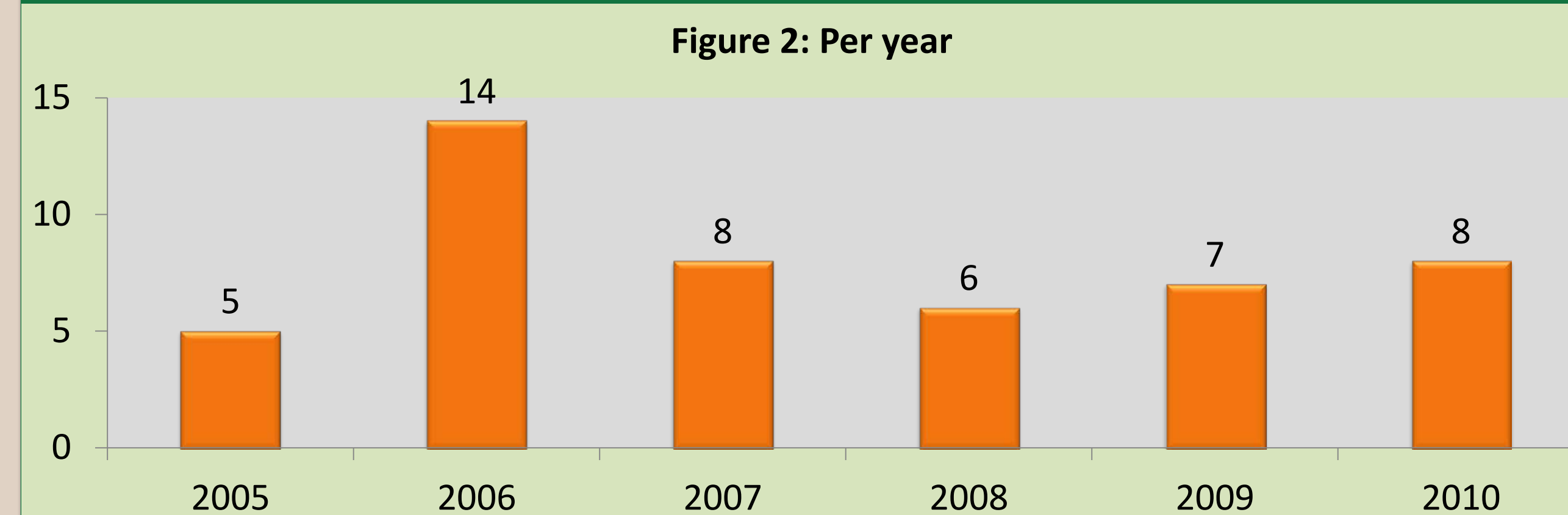
**Table 1: The Carbapenems and Cephalosporins of Interest and Their Respective MIC breakpoints**

Carbapenems (µg/ml)	Cephalosporins (µg/ml)
Ertapenem ≥2	Ceftriaxone ≥4
Imipenem ≥4	Cefotaxime ≥4
Meropenem ≥4	Ceftazidime ≥16
Doripenem ≥4	

**Figure 1: Distribution of Identified Potential CRE Isolates, Hawaii 2005-2010**



**Number of Identified Potential CRE\* Isolates, Hawaii 2005–2010 (n=48):**



\* CRE= Carbapenem-resistant *Enterobacteriaceae*

## Results

- 818,541 AST results for *K. pneumoniae* and *E. coli* were tested against carbapenems and cephalosporins from January 2005–December 2010 (excluding isolates from stool samples)
- We identified 48 isolates that were resistant to carbapenems; however, no isolate was observed to be resistant to doripenem
- Oahu had the largest number of cases at 38 (79%) (Figure 1)
- The annual median number of isolates for the study period was 8, range 5–14 (Figure 2)
- 28 (58%) isolates originated from an inpatient setting, and of these, 8 originated from the ICU (Figure 3)
- Urine was the primary clinical source for the majority of isolates 21 (44%) (Figure 4)

## Conclusion

- Our findings suggest that some CRE infections may have occurred in Hawaii during the study period
- As may be expected, Oahu had the highest percentage of isolates
- These findings are limited in that full clinical resistance is not always observed or consistent with in vitro results, and past CLSI breakpoints varied during the study period
- Using AST data and applying CLSI breakpoints may provide an efficient overall surveillance method to detect potential CRE infections
- Further investigation using clinical records is needed to confirm these CRE and determine the clinical circumstances, evolution, and potential associated trends

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