Community-wide Surveillance for Carbapenemase Producing Organisms (CPO) Statistical Report for 2024 Quarter 2

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Cumulative Summary & Changes from Previous Quarter *

- CRO counts: 22 (**increased by 10**)
- CPO counts: 1 (**increased by 1**)
- CRO antibiotic resistance:
    - 3+ classes of antibiotics: 70.6% (**decreased by 4.4%**)
    - 4+ classes of antibiotics: 55.9% (**decreased by 2.4%**)
    - Pan resistance: 0 (**no change**)

Please note caution should be taken when comparing 2023 and onward data to previous years as case definition changes have affected case counts.

*For definition and specifics on metrics summarized, please refer to corresponding sections and the surveillance definitions at the end.

CRO Overview

Table 1: CRO cases reported by quarter, Washoe County, 2024

CRO Type	Q1	Q2	Q3	Q4	Total
CRE	6	10	-	-	**16**
CRPA	6	11	-	-	**17**
CRAB	0	1	-	-	**1**
Unknown	0	0	-	-	**0**
Other CROs	0	0	-	-	**0**
Total	**12**	**22**	**-**	**-**	**34**

- For the current reporting quarter, 22 CROs were reported.
    - 10 CRE, 11 CRPA, and 1 CRAB.

Data presented in this report is preliminary and may be updated in future reports as additional information is received throughout the year.

Table 1-1: Descriptive statistics for reported CRO cases, Washoe County, 2024

Characteristics		2024	
		No.	Percent (%)
Age	Median	68 years	NA
	Minimum	21 years	NA
	Maximum	91 years	NA
Gender	Male	15	44.12%
	Female	19	55.88%
Race/Ethnicity	White, non-Hispanic	28	82.35%
	White, Hispanic	3	8.82%
	Asian	1	2.94%
	Black	0	0.00%
	American Indian/Alaskan Native	0	0.00%
	Other	2	5.88%
	Unknown	0	0.00%
Washoe County Resident	Yes	29	85.29%
	No	5	14.71%
	Unknown	0	0.00%
Specimen Type	Urine	23	67.65%
	Respiratory	3	8.82%
	Wound	3	8.82%
	Rectal	0	0.00%
	Invasive (e.g., blood, cerebrospinal fluid)	2	5.88%
	Other	2	5.88%
	Surgical	1	2.94%
	Unknown	0	0.00%
Facility Type	Inpatient	9	26.47%
	Outpatient	18	52.94%
	Long Term Acute Care	1	2.94%
	Intensive Care Unit	5	14.71%
	Skilled Nursing Facility	1	2.94%
Total		34	100.00

In summary, 2024 CRO cases were:

- 68 years (median age).
- Female (55.88%).
- White, non-Hispanic (82.35%).
- Washoe County residents (85.29%).
- Detected from urine specimens (67.65%), and at an outpatient facility (52.94%).

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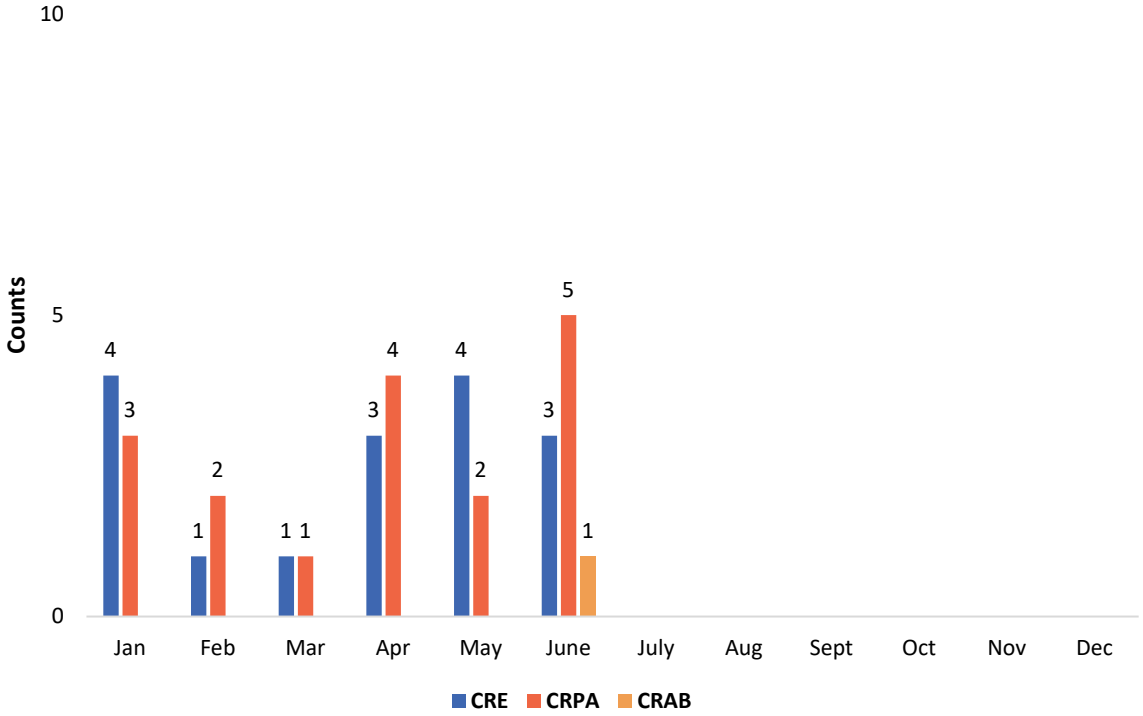
Figure 1: CRO cases reported by month, Washoe County, 2024



- CRE cases (blue) peaked in January and May (4 cases each) and were the lowest in February and March (1 case each). CRE cases remained relatively high in the 2nd quarter compared to the 1st.
- CRPA cases (orange) peaked in June (5 cases) and were the lowest in March (1 case). CRPA cases remained relatively high in the 2nd quarter compared to the 1st.
- One CRAB (gold) case was reported.

Table 2: Proportion of CROs that were CREs, Washoe County, 2020-2024

Year	CRO Total	CRE Total	Proportion (%)
2020	90	48	53.33
2021	77	36	46.75
2022	145	62	42.76
2023	81	42	51.85
2024	34	16	47.06

- Of the 34 CRO's reported, 47.06% (16/34) were CREs.

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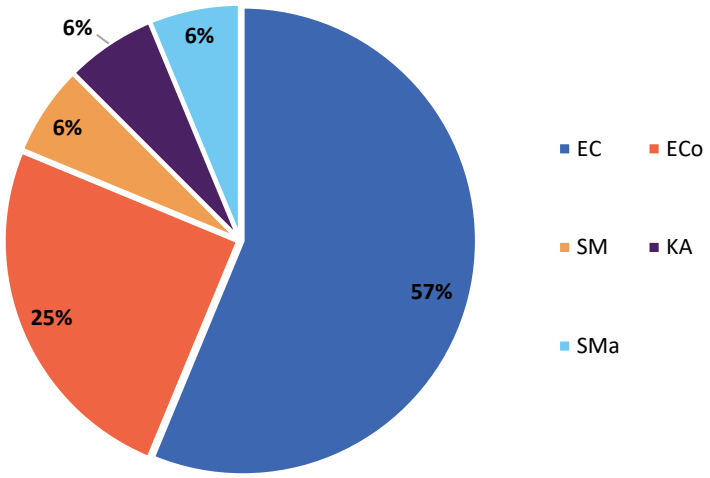
Figure 2: CRE cases reported by organism (N=16), Washoe County, 2024



EC-*Enterobacter cloacae*, ECo-*Escherichia coli*, SM-*Serratia marcescens*, KA-*Klebsiella aerogenes*, SMa-*Stenotrophomona maltophilia*

Of the 16 CREs reported,

- *Enterobacter cloacae* was the most reported (57%).
- *Serratia marcescens, Klebsiella aerogenes,* and *Stenotrophomona maltophilia* were the least reported (6% each).

Carbapenemase Producing Organisms (CPO)

Table 3: CPO cases reported, Washoe County, 2024

Month/Year Reported	Resistance Mechanism	Organism	Clinical, Screening	Case notes
4/2024	NDM	*Escherichia coli*	Clinical	UTI symptoms. Received treatment in a South American clinic for traveler's diarrhea prior to symptom onset but was not hospitalized. No contacts identified.

- One NDM producing *Escherichia coli* (*E. coli*) was reported in quarter 2.

Tables 4 and 5 and Figures 3 and 4 present laboratory test data used to identify CPOs. The modified carbapenem inactivation method (mCIM) is a phenotypic (observable trait) test, while polymerase chain reaction (PCR) is a molecular test for carbapenemase genes. Please note the following when interpreting the data:

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- Not all specimens are forwarded to the Nevada State Public Health Laboratory for mCIM testing.
- Some area hospitals perform PCR testing in-house.
- Though mCIM and PCR positive counts often match, in some instances, a specimen may only test positive for one of either tests.

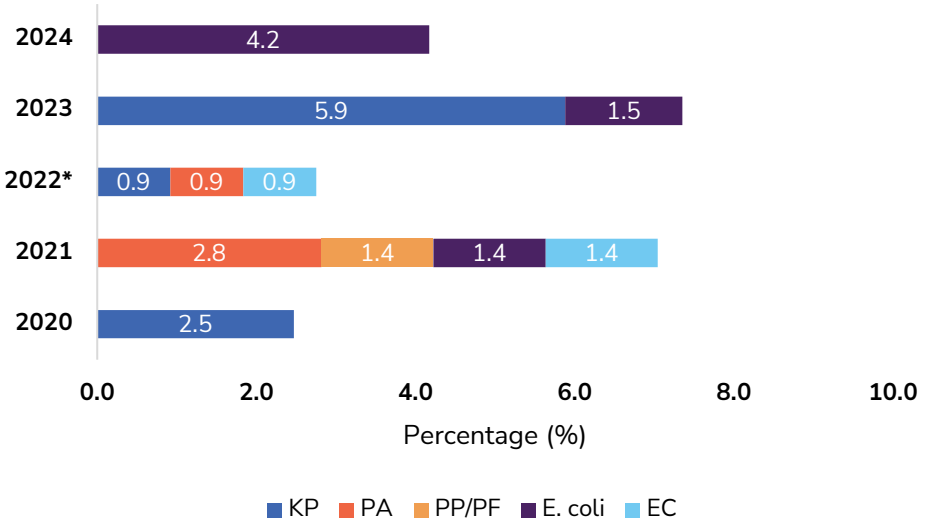
Table 4: Modified carbapenem inactivation method (mCIM) testing, Washoe County, 2020-2024

Year	N Tested	N Positive	Positivity (%)
2020	81	5	6.17
2021	71	5	7.04
2022*	109	3	2.75
2023	68	2	2.94
2024	24	1	4.17
Total	353	16	4.53

* One CPO is not included in Table 6 as they were identified by PCR testing and not mCIM.

- Out of the 24 specimens submitted for mCIM testing, one specimen was positive (4.17%).

Figure 3: Percent mCIM positive by organism, Washoe County, 2020-2024



KP-*Klebsiella pneumoniae*, PA-*Pseudomonas aeruginosa*, PP/PF-*Pseudomonas putida/fluorescens*, EC-*Enterobacter cloacae*, ECo-*Escherichia coli*

- In 2024, one organism, *E. coli*, was mCIM positive.
- From 2020-2023, the organisms that were mCIM positive varied.

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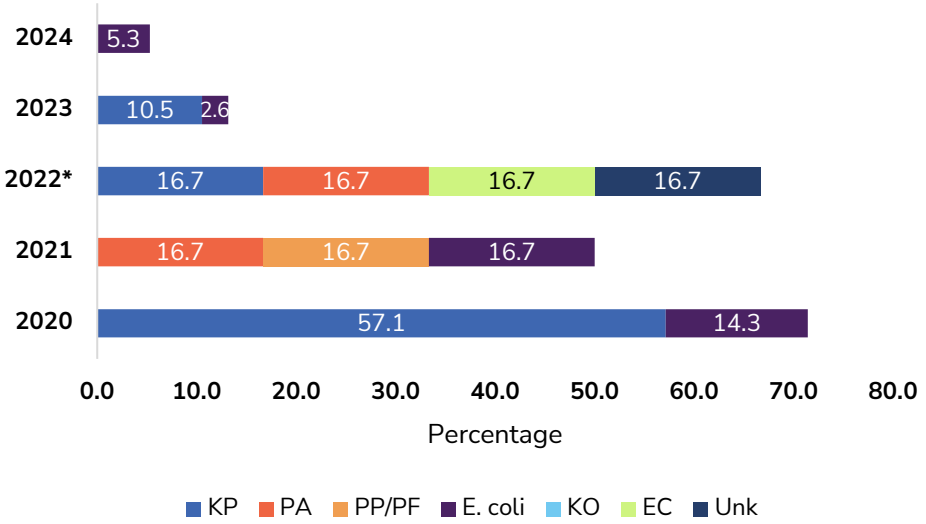
Table 5: Polymerase chain reaction (PCR) testing, Washoe County, 2020-2024

Year	N Tested	N Positive	Positivity (%)
2020	7	5	71.4
2021	6	3	50.0
2022	6	4	66.7
2023	38	5	13.2
2024	19	1	5.3
Total	76	18	23.7

- Out of the 19 specimens submitted for PCR testing in 2024, one was positive (5.3%).

Figure 4: Percent PCR positive by organism, Washoe County, 2020-2024



KP-*Klebsiella pneumoniae*, PA-*Pseudomonas aeruginosa*, PP/PR-*Pseudomonas fluorescens/putida*, EC-*Enterobacter cloacae*, KO-*Klebsiella oxytoca*

*1 screening specimen was PCR positive, but failed to culture an organism.

- In 2024, one organism, *E. coli*, was PCR positive.
- From 2020-2023, the organisms that were PCR testing varied, however, *Klebsiella pneumonia* was the highest across all years combined.

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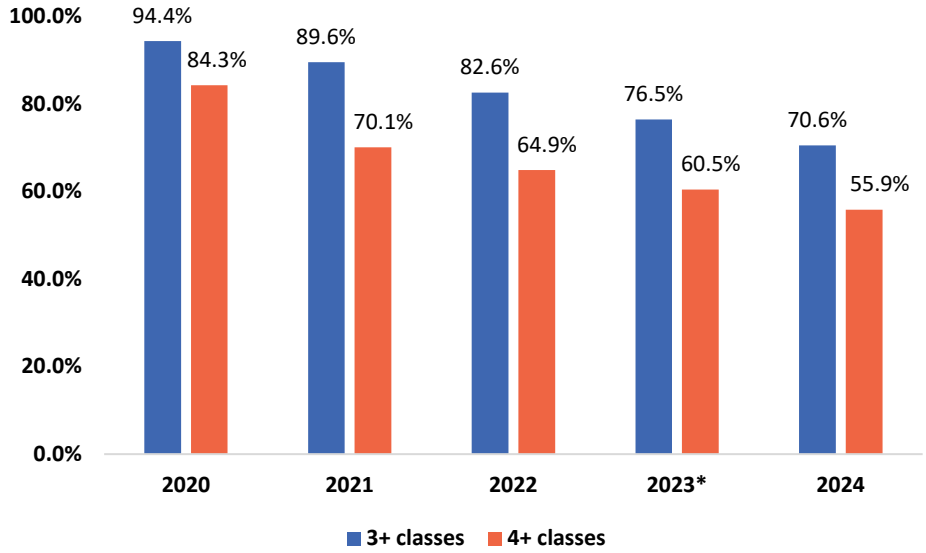
Severity of Antibiotic Resistance

Figure 5: Percent of CRO cases resistant to classes of antibiotics, Washoe County, 2024



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In 2024, the proportion of reported CROs resistant to at least

- three or more classes of antibiotics was 70.6% (24/34).
- four or more classes of antibiotics was 55.9% (19/34).
- Between 2020-2023, antibiotic resistance had a downward trend.

Table 6: Pan-resistance rate, Washoe County, 2020-2024

Year	Total N Cases	No. Pan-resistance	Proportion (%)	Organisms (No. pan-resistant)
2020	89	2	2.25	*Citrobacter sp.* (1), *K. pneumoniae* (1)
2021	76	0	0.00	-
2022	145	1	0.69	*Pseudomonas aeruginosa*
2023	81	1	1.23	*Acinetobacter baumannii*
2024	34	0	0.00	-

- Proportion pan-resistant*: 0% (0/34).
  *Pan-resistance is defined as non-susceptible to all tested drugs at the clinical lab.

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Table 7. Antibiotic Susceptibility for CRE, CRPA and CRAB 2024

Antimicrobial Class or Subclass	CRE (n=16)			CRPA[1] (n=17)			CRAB[1] (n=1)		
	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible
Penicillins									
Ampicillin	17	0	0.00	15	0	0.00			
Piperacillin			0.00	3	1	33.33			
Cephems									
Cefazolin	22	1	4.55			0.00			
Cefepime	22	11	50.00	28	19	67.86	2	1	50.00
Cefotaxime	1	0	0.00			0.00			
Ceftazidime	13	2	15.38	18	10	55.56	1	0	0.00
Ceftriaxone	20	1	5.00			0.00	1	0	0.00
Cefuroxime	13	1	7.69			0.00			
β-Lactam/β-lactamase inhibitor combinations									
Amoxicillin-clavulanic acid	14	0	0.00						
Ampicillin-sulbactam	17	0	0.00	15	0	0.00	2	1	50.00
Piperacillin-tazobactam	20	3	15.00	26	15	57.69			
Ticarcillin-clavulanic acid			0.00	2	1	0.50			
Fluoroquinolones									
Ciprofloxacin	22	17	77.27	30	12	22.00	2	1	50.00

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Antimicrobial Class or Subclass (cont'd)	CRE (n=16)			CRPA[1] (n=17)			CRAB[1] (n=1)		
	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible
Levofloxacin	24	18	75.00	17	5	29.41	2	1	50.00
Moxifloxacin	3	3	100.00			0.00			
Aminoglycosides									
Amikacin	11	11	100.00	26	26	100.00	1	1	100.00
Gentamicin	23	21	91.30	28	18	64.29	2	2	100.00
Tobramycin	23	22	95.65	19	19	100.00	1	1	100.00
Sulfonamides									
Trimethoprim-sulfamethoxazole	24	20	83.33			0.00	2	1	50.00
Monobactams									
Aztreonam	8	1	12.50	17	10	58.82			
Tetracyclines									
Tetracycline	14	11	78.57						
Tigecycline	8	8	100.00						
Nitrofurans									
Nitrofurantoin	11	7	63.64						
Carbapenems									
Imipenem	7	3	0.00	15	0	0.00			
Meropenem	16	10	62.50	30	11	36.67	2	1	50.00
Ertapenem	21	2	9.52						

* 1 Pseudomonas aeruginosa and Acinetobacter have intrinsic resistance to Ertapenem.

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Surveillance Definitions (Years Updated)

Report Date (2024)

For this report, the date of specimen collection is used for case counts by months.

Carbapenemase-Producing Organisms (CPO) (2023)

Any specimen that meets confirmatory laboratory evidence:

- Positive phenotypic test for carbapenemase production **OR**
- Molecular test detecting a carbapenemase gene **OR**
- Next generation sequencing detecting a carbapenemase gene.

CPO cases will be classified as either clinical case (collected for diagnosing/treating disease), or as screening case (collected for detecting colonization), however since reason for collecting specimens is not reported, the specimen site denotes CPO case classification. Typically a CPO identified through a rectal, peri-rectal, axilla, groin, or stool specimen would be considered screening.

Duplicates (2023)

Duplicates are defined as the same organism/carbapenemase combination regardless of collection source and date. A screening case can be counted as a new clinical case if, for example, they developed a blood stream infection, found to be due to the same organism/carbapenemase combination, but a clinical case cannot be counted as a new screening case with same organism/carbapenemase combination.

Carbapenem Resistant *Enterobacteriaceae* (CRE) (2022)

Enterobacteriaceae that meets the following criteria:

- Resistant to ANY carbapenem antimicrobial (i.e., MIC of ≥ 4 mcg/ml for doripenem, meropenem, or imipenem OR ≥2 mcg/ml for ertapenem) **OR**
- Documented to produce carbapenemase

In addition:

- For bacteria that have intrinsic imipenem nonsusceptibility (i.e., *Morganella morganii, Proteus spp., Providencia spp.*), resistant to carbapenems other than imipenem is required.

Carbapenem Resistant *Pseudomonas aeruginosa* (CRPA) (2022)

Pseudomonas aeruginosa isolated from any body site* that meets the following criteria:

- Resistant to imipenem, meropenem, or doripenem based on current Clinical and Laboratory Standards Institutes Standards (CLSI) M100 standards (≥ 8 mcg/mL); **AND/OR**

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- Demonstrates production of a carbapenemase by a recognized method (e.g., CarbaNP or Polymerase chain reaction (PCR) or other methods).
  **Excluding isolates from patients with cystic fibrosis (CF).*

Carbapenem Resistant *Acinetobacter* (CRA) (2022)

Acinetobacter isolated from any body site that meets the following criteria:

- Resistant to imipenem, meropenem, or doripenem based on current Clinical and Laboratory Standards Institutes Standards (CLSI) M100 standards (≥ 8 mcg/mL); **AND/OR**
- Demonstrates production of a carbapenemase by a recognized method (e.g., CarbaNP or PCR or other methods).

Carbapenem Resistant Organisms (CRO) (2017)

Any organisms meeting the above definitions for CRE, CRPA, and CRA are considered CRO.

Carbapenemase Producing Organisms (CPO) (2017)

Any organisms producing carbapenemase which is laboratory-confirmed are defined as CPO.

Multi-Drug Resistant Bacilli – Carbapenem Resistant (MDRB-CR) (2010-2016)

A case is defined as an infection with an MDRB-CR organism of one patient per hospitalization per year regardless of resident status. Infection with a second species of MDRB-CR organism in the same patient is counted as a separate case. Infections with those Gram-negative bacilli that are constitutively resistant to carbapenems, specifically Stenotrophomonas, Aeromonas & Chryseobacterium, are not counted as cases.

MDRB-CR organisms refer to Gram negative bacilli that are resistant to three or more classes of antibiotics, one of which must be Carbapenem.

Patient's Residency (SINCE 2010)

Patients from out of jurisdiction (OOJ) are included in the surveillance report as long as isolates meet the above surveillance definitions.