Community-wide Surveillance for Carbapenemase Producing Organisms (CPO) Statistical Report for 2024 Quarter 4

Division of Epidemiology & Public Health Preparedness (EPHP) 775-328-2447
Christabell Sotelo, MPH, Epidemiologist, Healthcare Associated Infection Coordinator, csotelo@nnph.org

Cumulative Summary & Changes from Previous Quarter *

- CRO counts: 75 (**increased by 21**)
- CPO counts: 5 (**no change**)
- CRO antibiotic resistance:
    - 3+ classes of antibiotics: 72.0% (**increased by 3.5%**)
    - 4+ classes of antibiotics: 64.0% (**increased by 6.6%**)
    - 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	5	7	**28**
CRPA	6	11	14	14	**45**
CRAB	0	1	0	0	**1**
Unk*	0	0	1	0	**1**
Other CROs	0	0	0	0	**0**
Total	**12**	**22**	**20**	**21**	**75**

* Unknown organism was detected via PCR screening swab that indicated the presence of a CRO, but failed to culture.

- For the current reporting quarter, 21 CROs were reported.
    - 7 CRE and 14 CRPA.

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	69 years	NA
	Minimum	21 years	NA
	Maximum	93 years	NA
Gender	Male	34	45.33%
	Female	41	54.67%
Race/Ethnicity	White, non-Hispanic	55	73.33%
	White, Hispanic	8	10.67%
	Asian	3	4.00%
	Black	0	0.00%
	American Indian/Alaskan Native	1	1.33%
	Other	6	8.00%
	Unknown	2	2.67%
Washoe County Resident	Yes	61	81.33%
	No	14	18.67%
	Unknown	0	0.00%
Specimen Type	Urine	51	68.00%
	Respiratory	7	9.33%
	Wound	10	13.33%
	Rectal	1	1.33%
	Invasive (e.g., blood, cerebrospinal fluid)	2	2.67%
	Other	2	2.67%
	Surgical	1	1.33%
	Unknown	1	1.33%
Facility Type	Inpatient	26	34.67%
	Outpatient	37	49.33%
	Long Term Acute Care	2	2.67%
	Intensive Care Unit	9	12.00%
	Skilled Nursing Facility	1	1.33%
Total		75	100.00

In summary, 2024 CRO cases were:

- 69 years (median age).
- Female (54.67%).
- White, non-Hispanic (73.33%).
- Washoe County residents (81.33%).
- Detected from urine specimens (68.00%), and at an outpatient facility (49.33%).

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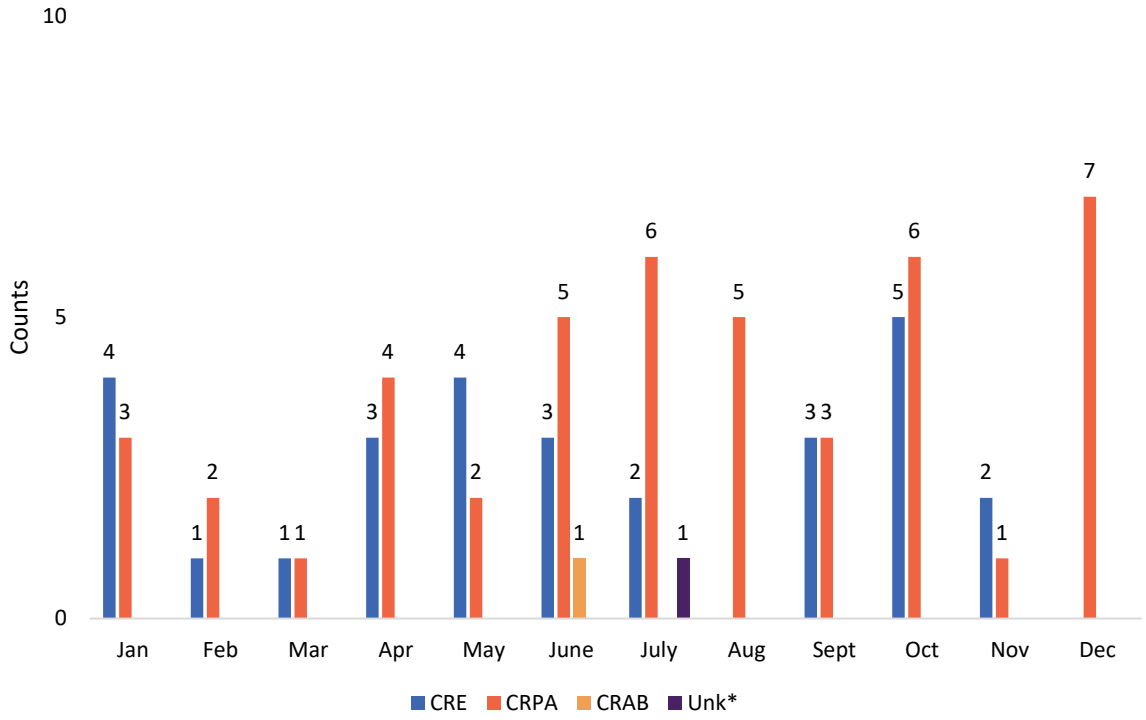
Figure 1: CRO cases reported by month, Washoe County, 2024



* Unknown organism was detected via PCR screening swab that indicated the presence of a CRO, but failed to culture.

- CRE cases (blue) peaked in October (5 cases) and were the lowest in February and March (1 case each). Quarter 2 had over a third of the total CRE cases reported.
- CRPA cases (orange) peaked in December (7 cases) and were the lowest in March (1 case). CRPA cases continued to increase between quarter 2 and 4.
- 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	75	28	37.33

- Of the 75 CRO's reported, 37.33% (28/75) were CREs.

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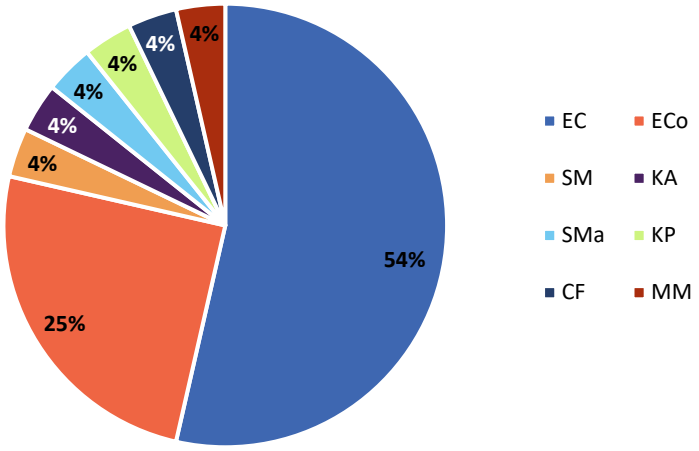
Figure 2: CRE cases reported by organism (N=28), Washoe County, 2024



EC-*Enterobacter cloacae*, ECo-*Escherichia coli*, SM-*Serratia marcescens*, KA-*Klebsiella aerogenes*, SMa-*Stenotrophomona maltophilia*, KP-*Klebsiella pneumoniae*, CF-*Citrobacter freundii*, MM-*Morganella morganii*
Note values in pie chart are rounded.

Of the 28 CREs reported,

- *Enterobacter cloacae* was the most reported (54%).
- *Serratia marcescens*, *Klebsiella aerogenes*, and *Stenotrophomona maltophilia*, *Citrobacter freundii*, and *Morganella morganii* were the least reported (4% 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.
7/2024	NDM	*Klebsiella pneumoniae*	Clinical	Severe wound infection at a hip replacement site performed in El Salvador. Broader screening didn't find spread in the acute care hospital. Case was discharged to a SNF. Screening identified the presence of OXA-48, but failed to culture an organism.
	OXA-48	*Unknown*	Screening	

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8/2024	NDM	*Escherichia coli*	Clinical	Experienced UTI symptoms after having a catheter inserted at an outpatient facility.
10/2024	NDM	*Escherichia coli*	Clinical	Hospitalized and intubated in Mexico after experiencing respiratory failure. Transferred to a health facility in California before being transferred to a Washoe County health facility where he continued to experience respiratory issues.

- Three NDM producing *Escherichia coli* (*E. coli*) have been reported.
- One NDM producing *Klebsiella pneumoniae* has been reported.
- One OXA-48 resistance mechanism from an unknown organism was reported.

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:

- 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*	62	4	6.45
Total	391	19	4.86

* One CPO is not included in Table 4 as they were identified by PCR testing and were not mCIM tested.

- Out of the 62 specimens submitted for mCIM testing, four specimens tested positive (6.45%).

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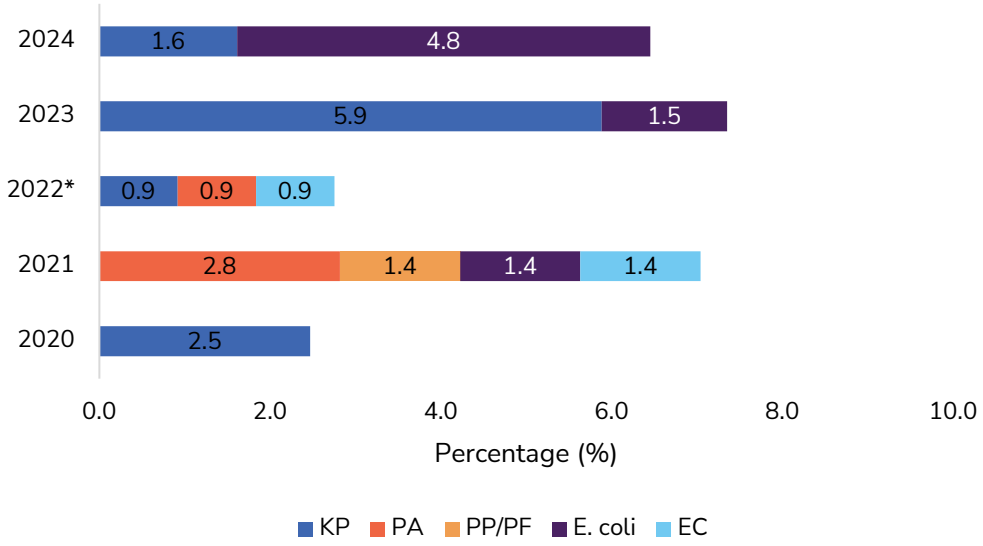
Figure 3: Percent mCIM positive by organism, Washoe County, 2020-2024



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

- Of the organisms that were mCIM positive in 2024, 4.8% were *E. coli* and 1.6% were *Klebsiella pneumoniae*.
- From 2020-2023, the organisms that were mCIM positive varied.

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	45	5	11.1
Total	102	22	21.6

- Out of the 45 specimens submitted for PCR testing in 2024, five tested positive (11.1%).

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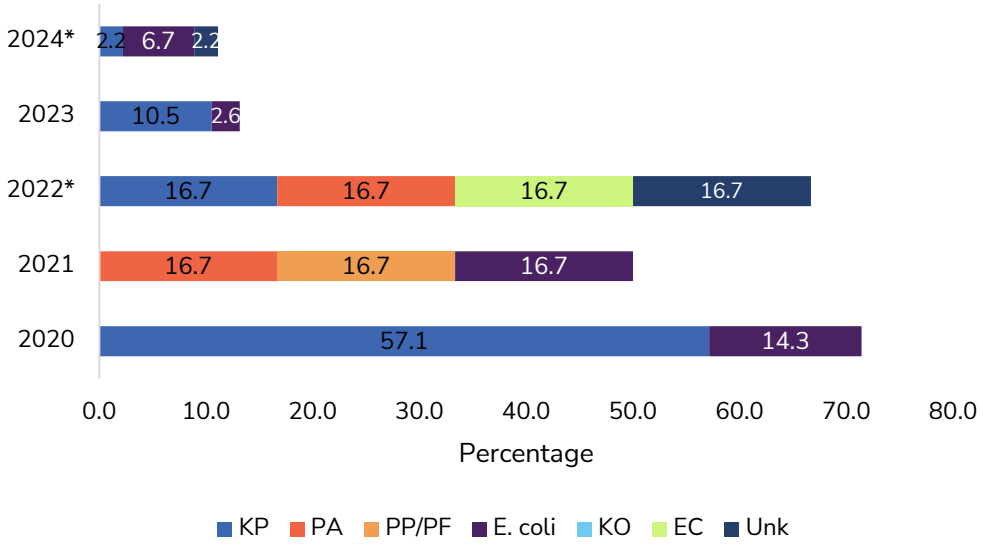
Figure 4: Percent PCR positive by organism, Washoe County, 2020-2024



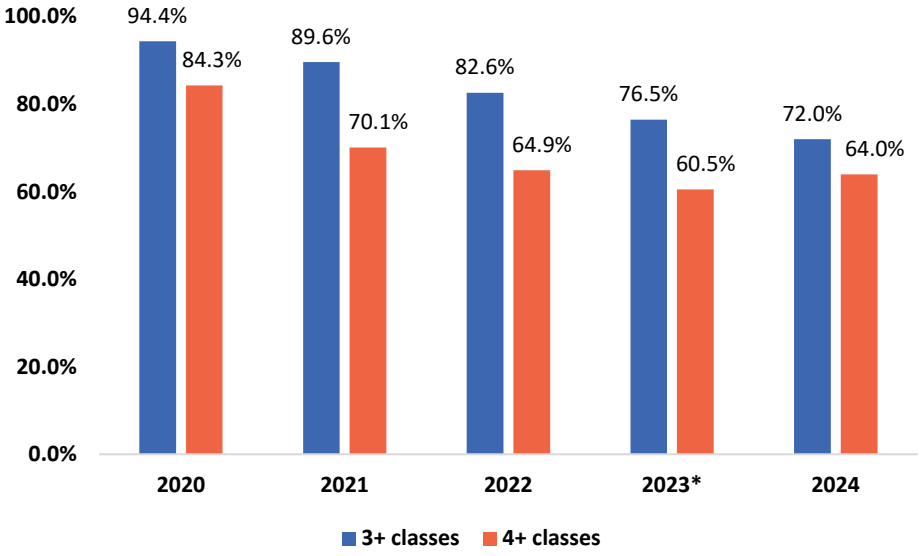
KP-*Klebsiella pneumoniae*, PA-*Pseudomonas aeruginosa*, PP/PR-*Pseudomonas fluorescens/putida*, EC-*Enterobacter cloacae*, KO-*Klebsiella oxytoca*

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

- Of the organisms that were PCR positive in 2024, 6.7% *were E. coli,* 2.2% *were Klebsiella pneumoniae, and* 2.2% were an *unknown organism.*
- From 2020-2023, the organisms that were PCR testing varied, however, *Klebsiella pneumonia* was the highest across all years combined.

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 72% (54/75).
- four or more classes of antibiotics was 64% (48/75).
- 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	75	0	0.00	-

- Proportion pan-resistant*: 0% (0/75).
  *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=28)			CRPA[1] (n=45)			CRAB[1] (n=1)		
	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible
Penicillins									
Ampicillin	33	0	0.00	38	0	0.00			
Piperacillin				5	3	60.00			
Cephems									
Cefazolin	44	1	2.27	13	0	0.00			
Cefepime	44	13	29.55	82	62	75.61	2	1	50.00
Cefotaxime	2	0	0.00						
Cefoxitin	1	0	0.00						
Ceftazidime	28	2	7.14	51	33	64.71	1	0	0.00
Ceftriaxone	43	1	2.33	13	0	0.00	1	0	0.00
Cefuroxime	21	1	4.76						
β-Lactam/β-lactamase inhibitor combinations									
Amoxicillin-clavulanic acid	23	0	0.00						
Ampicillin-sulbactam	38	0	0.00	38	0	0.00	2	1	50.00
Piperacillin-tazobactam	43	5	11.63	79	53	67.09			
Ticarcillin-clavulanic acid				2	1	0.50			

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Antimicrobial Class or Subclass	CRE (n=28)			CRPA[1] (n=45)			CRAB[1] (n=1)		
	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible	# Tested	# Susceptible	% Susceptible
Fluoroquinolones									
Ciprofloxacin	46	29	63.04	84	39	46.43	2	1	50.00
Levofloxacin	48	32	66.67	51	20	39.22	2	1	50.00
Moxifloxacin	4	3	75.00						
Aminoglycosides									
Amikacin	28	27	96.43	72	70	97.22	1	1	100.00
Gentamicin	47	43	91.49	52	37	71.15	2	2	100.00
Tobramycin	47	40	85.11	63	57	90.48	1	1	100.00
Sulfonamides									
Trimethoprim-sulfamethoxazole	47	34	72.34	13	0	0.00	2	1	50.00
Monobactams									
Aztreonam	22	1	4.55	49	32	65.31			
Tetracyclines									
Tetracycline	30	20	66.67	13	0	0.00			
Tigecycline	15	14	93.33						
Nitrofurans									
Nitrofurantoin	26	11	42.31	13	1	7.69			
Carbapenems									
Imipenem	11	4	36.36	35	0	0.00			
Meropenem	44	27	61.36	85	31	36.47	2	1	50.00
Ertapenem	42	2	4.76	14	0	0.00			

* 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.