

Hospital Prevalence of Carbapenem-Resistant Enterobacteriaceae in Arkansas



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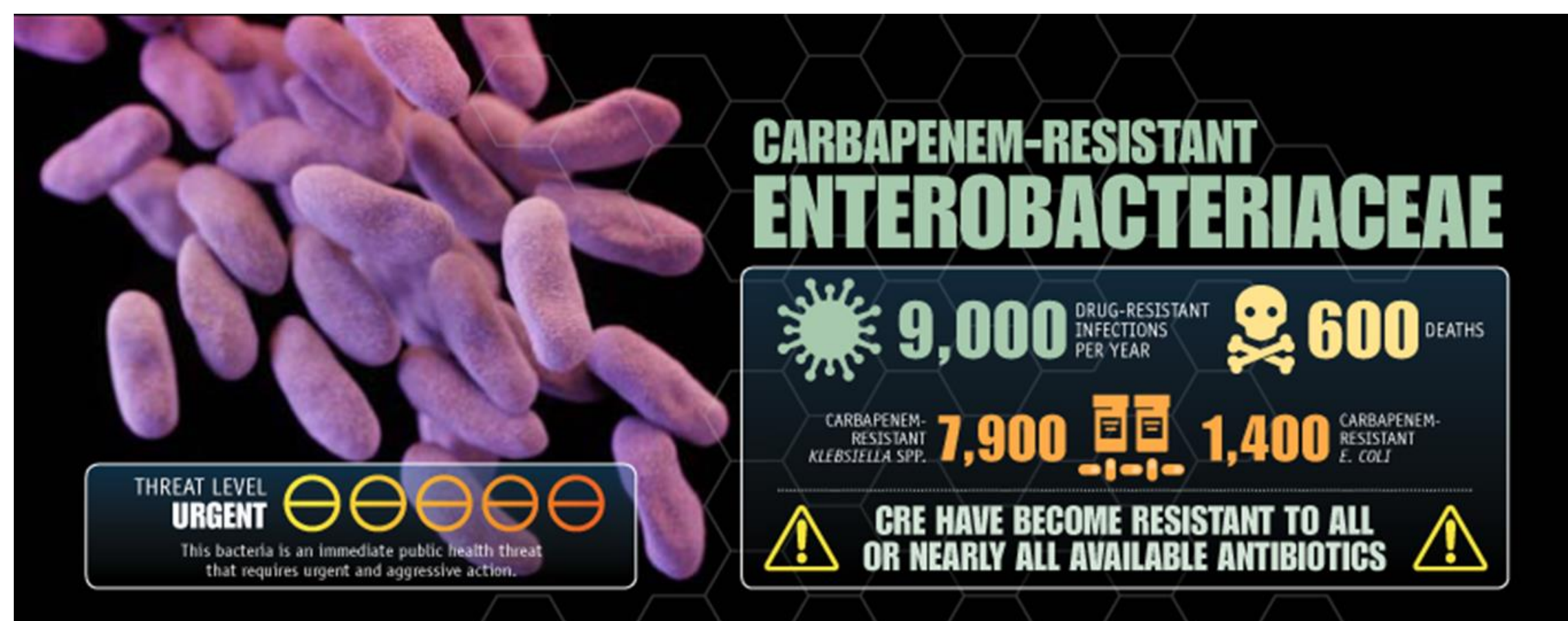
Background

Carbapenem-resistant Enterobacteriaceae (CRE)

- Family of gram-negative bacteria that have high levels of resistance to antibiotics¹
- One of the three drug-resistant pathogens on the Centers for Disease Control and Prevention's (CDC) most urgent threat list²
- Cause infections when entering the body, often through medical devices like ventilators, intravenous catheters, urinary catheters, or wounds caused by injury or surgery
- Transmitted through contact with infected or colonized people, particularly contact with wounds or stool
- Associated with high mortality rates, up to 50% in some studies¹
- Can possess carbapenemases, which are enzymes that confer resistance to all B-lactam antibiotics and hydrolyze all penicillins, cephalosporins, and carbapenems
- Carbapenemases can be transmitted from one Enterobacteriaceae to another, potentially facilitating transmission of resistance
- Carbapenemase production is the most concerning resistance mechanism (CP-CRE)

Surveillance of CRE

- Due to the movement of patients throughout the healthcare system, regional approaches to controlling CRE are important¹
- Not a reportable condition in Arkansas or nationally, so regional data is limited
- Understanding the burden of CRE in the state would allow targeted approaches to prevention and control



Methods

- Developed survey in SurveyMonkey[®] and distributed to Infection Preventionists (IP) at all acute care, long-term acute care (LTAC), and critical access hospitals in Arkansas
- Distributed survey in several iterations – piloted with IPs from all seven LTAC hospitals, slightly revised and sent to IPs from acute care hospitals, then slightly revised and sent to IPs from critical access hospitals
- Asked facilities how many isolates of *E. coli*, *Klebsiella* and *Enterobacter* species were identified and how many were classified as CRE in 2014, as defined by the current CSTE case definition³
- Asked if any reported CRE isolates were tested for carbapenemase production
- Asked about laboratory capabilities and processes of alerting staff of a CRE infection

	<i>E. coli</i>	<i>Klebsiella</i> spp.	<i>Enterobacter</i> spp.	Total
# Isolates	Question 8	Question 10	Question 12	Sum of Row
# CRE	Question 9	Question 11	Question 13	Sum of Row

- In 2014, how many total isolates of *E. coli* were identified at your facility?
- Of the previous total, how many were classified as CRE, using the 2015 CRE case definition?
- In 2014, how many total isolates of *Klebsiella* spp. were identified at your facility?
- Of the previous total, how many were classified as CRE, using the 2015 CRE case definition?
- In 2014, how many total isolates of *Enterobacter* spp. were identified at your facility?
- Of the previous total, how many were classified as CRE, using the 2015 CRE case definition?

Figure 1. Table distributed to determine total number of isolates of specific Enterobacteriaceae species and number of isolates classified as CRE in 2014.

Results

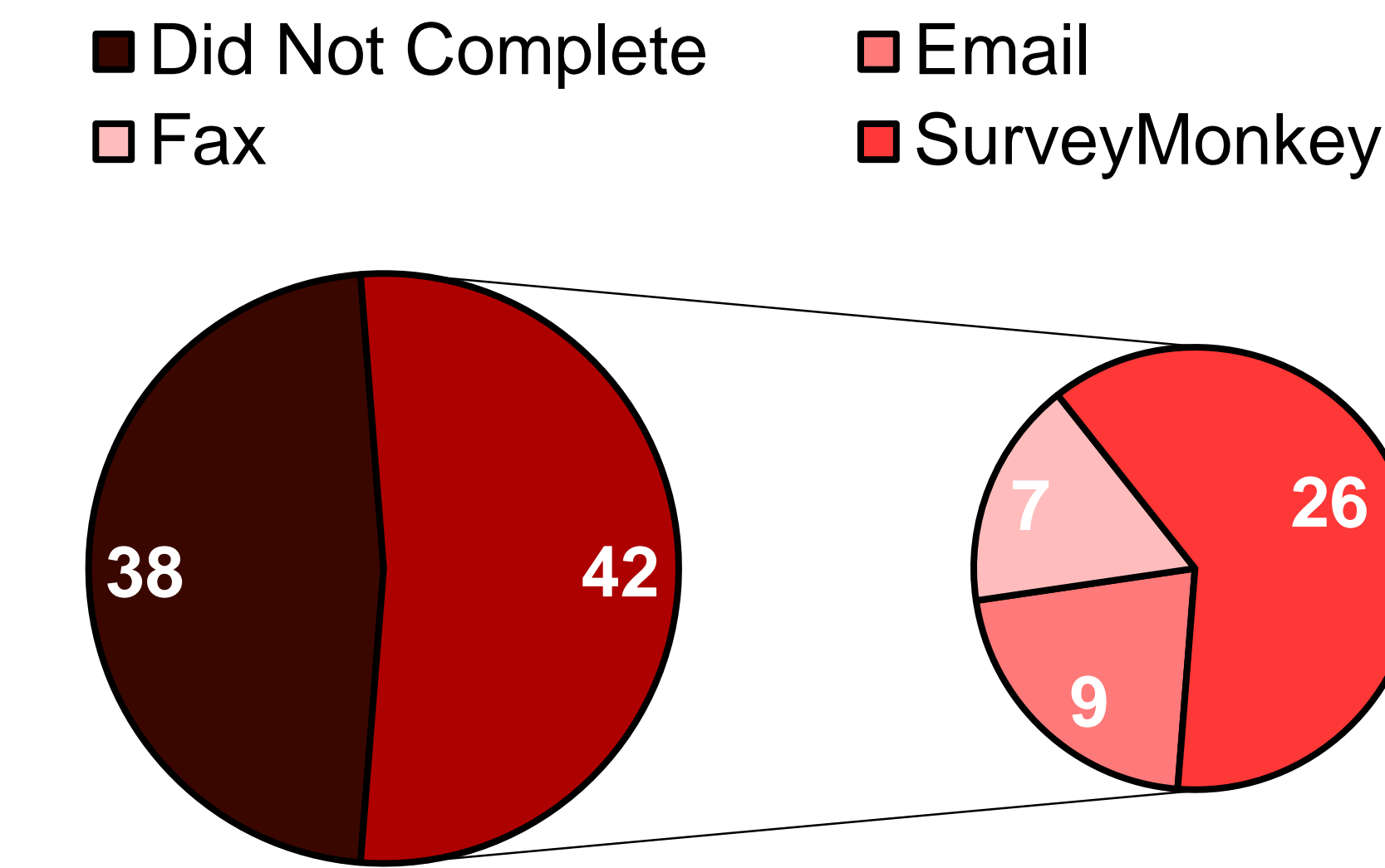


Figure 2. Number of facilities that completed the survey by response type.

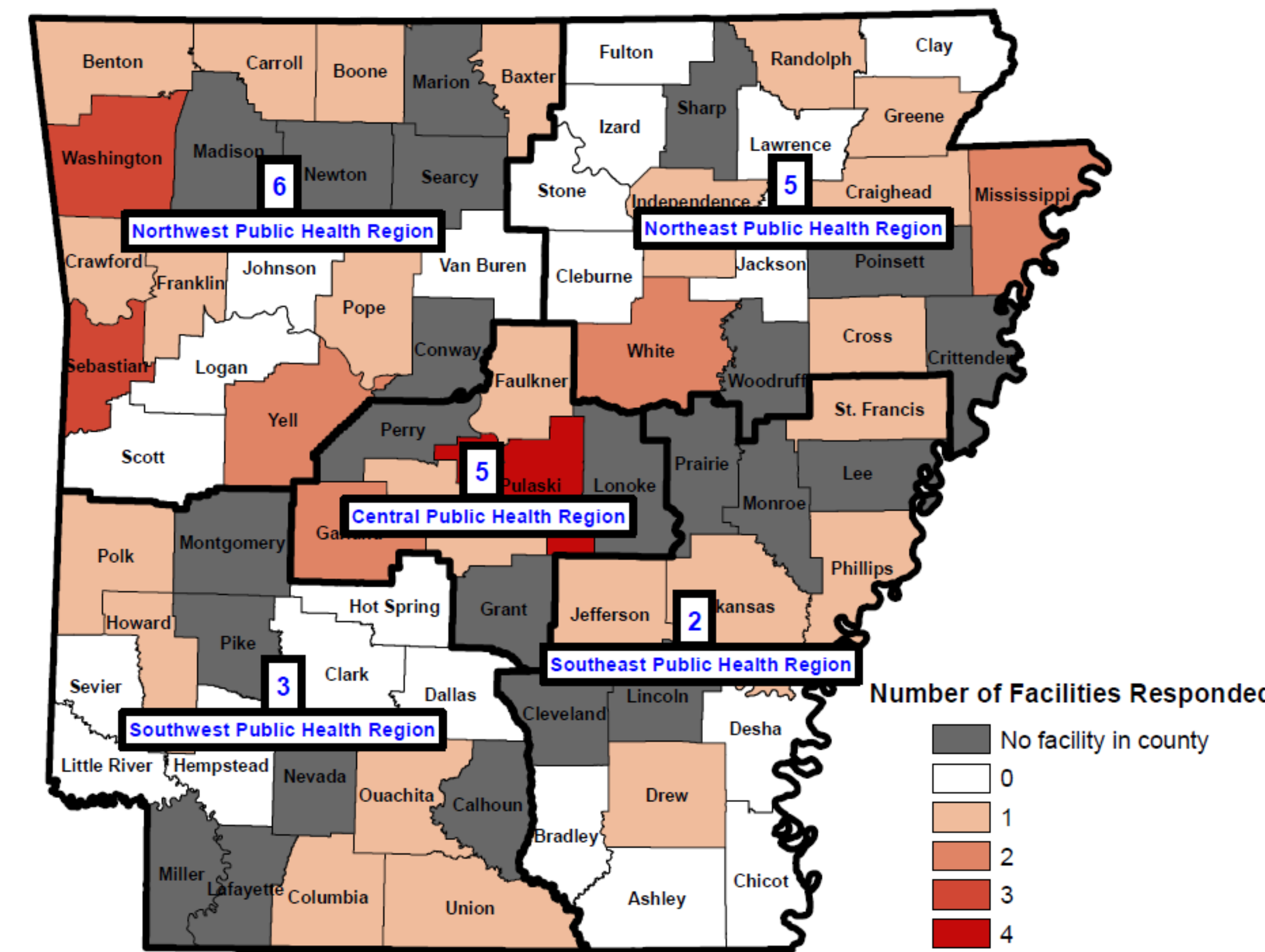


Figure 3. Number of facilities in each county that completed the survey and the number of facilities in each region that reported having at least one CRE infection in 2014.

Table 2. Total number of isolates reported, number of carbapenem-resistant isolates, and number of carbapenemase-producing isolates by species for 2014.

Region	Total <i>E. coli</i> Isolates	# <i>E. coli</i> CRE (%)	Total <i>Klebsiella</i> Isolates	# <i>Klebsiella</i> CRE (%)	Total <i>Enterobacter</i> Isolates	# <i>Enterobacter</i> CRE (%)	Total CRE Isolates (%)	Confirmed CP-CRE (%)
Central	2,218	3 (<1%)	472	5 (1%)	98	7 (7%)	15 (<1%)	2 (1%)
Northeast	6,524	9 (<1%)	1,476	5 (<1%)	444	9 (2%)	23 (<1%)	10 (43%)
Northwest	8,254	20 (<1%)	3,058	25 (<1%)	442	20 (5%)	65 (<1%)	10 (15%)
Southeast	651	15 (2%)	464	1 (<1%)	434	3 (<1%)	19 (1%)	19 (100%)
Southwest	936	25 (3%)	256	10 (4%)	171	51 (30%)	86 (6%)	0 (0%)
Total	18,583	72 (<1%)	5,726	46 (<1%)	1,589	90 (5.7%)	208 (<1%)	41 (20%)

Table 3. Number of facilities with an on-site microbiology laboratory.

Region	Yes (%)	No (%)	Total
Central	7 (88%)	1 (12%)	8
Northeast	7 (78%)	2 (22%)	9
Northwest	9 (60%)	6 (40%)	15
Southeast	5 (100%)	0 (0%)	5
Southwest	5 (100%)	0 (0%)	5
Total	33 (79%)	9 (21%)	42

Table 4. Number of facilities with access to a lab that has the ability to identify production of a carbapenemase.

Region	Yes (%)	No (%)	Total
Central	8 (100%)	0 (0%)	8
Northeast	6 (67%)	3 (33%)	9
Northwest	15 (100%)	0 (0%)	15
Southeast	4 (80%)	1 (20%)	5
Southwest	4 (80%)	1 (20%)	5
Total	37 (88%)	5 (12%)	42

Table 1. Number of facilities that reported at least one CRE in 2014 by region and facility type.

Region	Yes (%)	No (%)	Total
Central	5 (63%)	3 (37%)	8
Northeast	5 (56%)	4 (44%)	9
Northwest	6 (40%)	9 (60%)	15
Southeast	2 (40%)	3 (60%)	5
Southwest	3 (60%)	2 (40%)	5
Facility Type	Yes (%)	No (%)	Total
Acute Care	17 (59%)	12 (41%)	29
Critical Access	2 (29%)	5 (71%)	7
LTAC	2 (33%)	4 (67%)	6
Total	21 (50%)	21 (50%)	42

Table 5. Number of facilities with an established system for alerting infection prevention staff in a timely manner whenever a CRE isolate is identified.

Region	Yes (%)	No (%)	Total
Central	7 (88%)	1 (12%)	8
Northeast	9 (100%)	0 (0%)	9
Northwest	11 (73%)	4 (27%)	15
Southeast	4 (80%)	1 (20%)	5
Southwest	5 (100%)	0 (0%)	5
Total	36 (86%)	6 (14%)	42

Table 6. Number of facilities that perform CRE screening.

Region	Yes (%)	No (%)	Total
Central	2 (25%)	6 (75%)	8
Northeast	0 (0%)	9 (100%)	9
Northwest	1 (7%)	14 (93%)	15
Southeast	0 (0%)	5 (100%)	5
Southwest	0 (0%)	5 (100%)	5
Total	3 (7%)	39 (93%)	42

Limitations

- Minimum inhibitory concentrations (MIC) were not defined in the survey, so different hospitals may be following different guidelines for determining susceptibilities.
- Utilized hospital laboratory data, but unable to determine healthcare-onset.
- Our largest hospitals in the Central Region did not complete the survey.
- While prevalence of CRE was similar in most regions, the Southeast Region appeared to be an outlier with 100% of their CRE isolates being carbapenemase-producing.

Conclusions and Next Steps

- CRE were particularly rare in 2014 in those Arkansas facilities that completed the survey (<1%).
- Half (50%) of the respondents reported having at least one CRE in their facility, affecting all regions of the state.
- The Arkansas Department of Health (ADH) will develop regional interventions and education to tackle CRE.
- To address limited availability of CRE mechanism testing, ADH is implementing polymerase chain reaction (PCR) capabilities.

References

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