BACKGROUND/OBJECTIVES

**Background**
Extended-spectrum beta-lactamase (ESBL) enzymes are produced by multidrug-resistant (MDR) pathogens and confer resistance to beta lactam antibiotics. Infections due to ESBL producing pathogens are of major concern worldwide and are associated with prolonged hospital stay and increased case fatality rate. Carbapenems are the treatment of choice for severe infections however overuse of this class of antibiotics is leading to decreasing efficacy. Variations have been observed in the prevalence of ESBL strains from different U.S. regions however it is unclear if morbidity and mortality follow a similar pattern.

**Objective:**
This study was conducted to explore the incidence of ESBL infections in the inpatient setting and factors that affect morbidity/mortality.

**METHODS**

- **NIS-HCUP (2012-2014)**
  - Combined data collection from states, hospital associations, private data organizations
  - The largest collection of multi-year hospital care data
  - Estimates and projects nationwide data using 20% of discharges from hospitals
- Hospitalizations identified with ICD 9 code “V09.1”
- Comparisons were made chi-square test and linear regression for categorical and continuous variables, respectively
- Multivariable binary logistic regression model was used to examine survival for those with ESBL infection
- \( p < 0.05 \) was considered significant

**RESULTS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Patients</th>
<th>ESBL (v 09.1)</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>320,888,511</td>
<td>11,732</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Age (Years) - Mean (SD)</td>
<td>66.4 (13.3)</td>
<td>67.46 (9.38)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>128,385,446</td>
<td>6,681 (37.07)</td>
<td>0.023</td>
</tr>
<tr>
<td>Race and ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>224,238,502</td>
<td>11,530 (71.91)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>45,750,024</td>
<td>3,879 (11.69)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>31,210,251</td>
<td>2,629 (8.30)</td>
<td>&lt; 0.005</td>
</tr>
<tr>
<td>Age (Years) - Mean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest vs. Northeast</td>
<td>68.1% vs. 70.2%</td>
<td>40.20% vs. 19.35%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Midwest vs. South</td>
<td>70.2% vs. 70.2%</td>
<td>40.20% vs. 19.35%</td>
<td>&lt; 0.001</td>
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<td>Midwest vs. West</td>
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</tr>
<tr>
<td><strong>Figure 1:</strong></td>
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</tr>
</tbody>
</table>

**CONCLUSIONS**

- The analysis identified 320,888,511 hospitalizations
- 17,732 identified with ESBL infection via V09.1 ICD 9 code
- Significant differences (\( p < 0.001 \)) for those with and without an ESBL infection were found based on US region with the pertinent results as follows (Figure 1):
  - Midwest vs. Northeast: 68.1% decreased odds of mortality (\( p = 0.048 \))
  - Midwest vs. West: 81.4% decreased odds of mortality (\( p = 0.003 \))

**DISCUSSION**

**Significance of findings:**
- Comparatively lower risk of mortality as related to ESBL infection in Midwest as compared to the West region.
- The eventual goal is to identify high risk patients in an effort to counteract extended hospital stays associated with ESBL infections.
- A greater understanding of the regional epidemiology of \( \beta \)-lactamases is needed to clarify why this disparity exists.
- Can be related to antibiotic use, antibiotic stewardship and/or regional variations in virulence of ESBL strains to name a few
- This knowledge would help to guide outpatient/inpatient policies to minimize the further dissemination of these resistance genes.

**Limitations of the study:**
- Inpatient database does not account for outpatient deaths
- There may be variations within the regions given size of each region
- Study is based on ICD 9 coding which can underestimate prevalence of infections with drug resistant organisms

Notable findings from this study include a statistically significant variation in mortality risk between US regions. Comparatively lower risk of mortality as related to ESBL infection was noted in the Midwest region as compared to the West region. A greater understanding of the regional epidemiology of \( \beta \)-lactamases is needed to clarify why this disparity exists.