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# Epidemiology of *Escherichia coli*, *Klebsiella* spp. and *Pseudomonas aeruginosa* bloodstream infections in Northern Ireland, 2012-2016

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There were 8051 cases of *Escherichia coli*, *Klebsiella* spp. and *Pseudomonas aeruginosa* between 2012 and 2016 in NI



In 2016, the highest rates occurred in males over the age of 75



29.3% of specimens were taken in Emergency departments, 57.1% were taken from hospital inpatients and 13.4% were taken in Outpatient departments



Between 2012 and 2016, there were 6,500 *E. coli*, 1,153 *Klebsiella* spp and 398 *P. aeruginosa* bacteraemias.



51.7% of all reports were from females, 48.3% of all reports were from males



0.2% of specimens were taken by a General Practitioner

## Background

Bloodstream infections caused by Gram-negative organisms are of serious concern to patients and clinicians because they may be acquired due to healthcare, and they pose a particular risk of being resistant to antibiotics. The Department of Health (NI), has committed to reducing healthcare-associated Gram-negative bloodstream infections (GNBs) by 50% by 2020.

In response to this objective, during 2017/18 the Public Health Agency introduced a new surveillance programme for the most common GNB infections (*Escherichia coli*, *Klebsiella* species and *Pseudomonas aeruginosa*).

## Aim

To establish baseline data prior to implementing GNB infection surveillance in Northern Ireland to facilitate monitoring progress against this ambition in 2018/19.

## Method

Clinical microbiology laboratories reported bloodstream infections and patient location to PHA through a voluntary regional laboratory reporting system (CoSurv). We extracted data for the period 01/01/2012 to 31/12/2016 and calculated rates using mid-year population estimates. Analysis was completed using R v3.4.3.

## Results

Between 2012 and 2016, 8,051 *E. coli*, *Klebsiella* spp and *P. aeruginosa* bacteraemias were reported. Rates in Northern Ireland have been steadily increasing over time: from 1,124 in 2012 to 1,850 in 2016 (64.6% increase). Rates were higher in 2015 for *E. coli* (80.3 reports per 100,000 population) and *P. aeruginosa* (5.1 reports per 100,000 population). Rates of *Klebsiella* spp were higher in 2016 (14.4 per 100,000 population) (Figure 1).

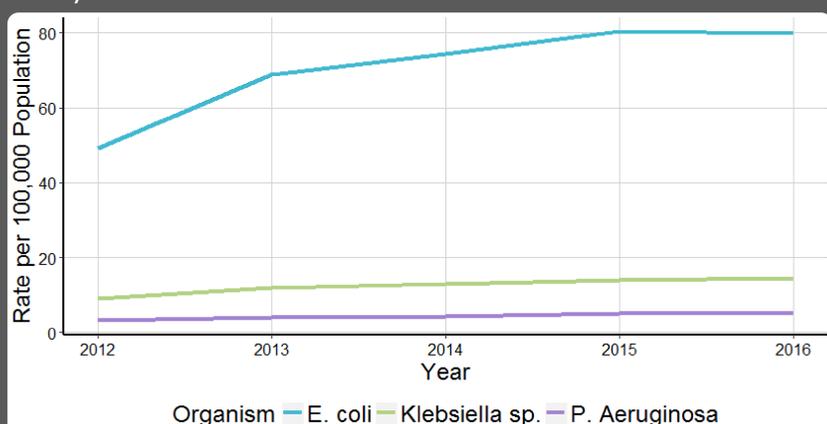


Figure 1. Rate of *Escherichia coli*, *Klebsiella* species and *Pseudomonas aeruginosa* per 100,000 population in Northern Ireland 2012 – 2016.

The majority of reports are for *E. coli* bacteraemia (6,500 episodes, 80.7%). 51.7% of all reports were from females, and 48.3% of all reports were from males.

For all three organisms, the highest rates occurred in males over the age of 75 (with 613 reports per 100,000 population for *E. coli*, 119 reports per 100,000 population for *Klebsiella* spp and 54 reports per 100,000 population for *P. aeruginosa*) (Figure 2).

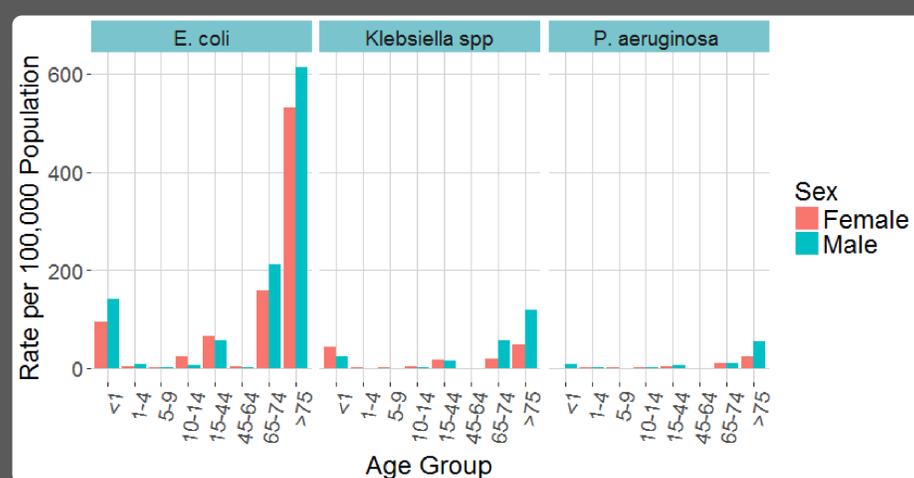


Figure 2. Rate of *E. coli*, *Klebsiella* spp and *P. aeruginosa* per 100,000 population by age group and sex.

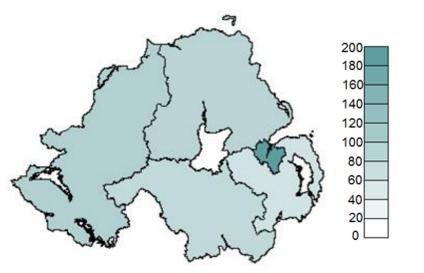


Figure 3. Geographic distribution of *Escherichia coli*, *Klebsiella* species and *Pseudomonas aeruginosa* by Trust Laboratory region (Rate per 100,000 population).

There is some regional variation in rates by Trust geographical area. The highest rates of *E. coli*, *Klebsiella* spp and *P. aeruginosa* bacteraemias per 100,000 population were reported by the Belfast Trust laboratory area (195 reports) (Figure 3).

Of the specimens who had a known location recorded on CoSurv (6909 specimens), 927 (13.4%) had their specimen taken during an outpatients appointment and 12 (0.2%) had their specimen taken by a general practitioner. The majority of reports had specimens taken during an inpatient admission episode (3947 reports; 57.1%).

## Discussion

The incidence of GNB infection is rising in Northern Ireland, with the largest proportion being *E. coli*, like the rest of the UK. We observed regional variation in the rate of GNB although this may, in part, be explained by differences in case mix. We also saw an increased incidence in older age groups. While the majority of specimens are reporting during an inpatient admission it is not possible using existing data to explore health care association, as defined by DH (England) ambitions.

The Public Health Agency will facilitate enhanced data collection (to include risk factor information such as admission dates devices, recent surgery and antibiotic use) to assist HSC Trusts with measuring change and improvement in the incidence of healthcare-associated Gram-negative bacteraemias.