**Understanding Trends in E. coli and MSSA Bacteraemia: A Population-Level Analysis in England**

**Background and Rationale**

The increasing incidence of bloodstream infections (BSIs) in England presents a significant public health challenge, particularly concerning Escherichia coli and Methicillin-Susceptible Staphylococcus aureus (MSSA) bacteraemia. According to recent government surveillance data, E. coli bacteraemia cases reached 42,224 in financial year (FY) 2023 to 2024, marking an 8.9% increase from the previous year and the largest annual increase since surveillance began [1]). While hospital-onset cases have remained relatively stable at around 22.7 cases per 100,000 bed-days, community-onset infections have shown a marked increase to 59.5 cases per 100,000 population [1]

#ADD other studies here perhaps taking from other countries as well?

Similarly, MSSA bacteraemia has demonstrated a concerning upward trajectory, with 13,476 cases reported in FY 2023 to 2024, representing a 53.7% increase since FY 2011 to 2012 [1]. The rate of all MSSA cases has risen from 16.4 to 23.5 per 100,000 population during this period, with an 8.3% increase compared to pre-pandemic levels [1].

**Demographic and Socioeconomic Dimensions**

The age and gender distributions of these infections reveal intriguing patterns that warrant further investigation. E. coli bacteraemia shows its highest burden in the 75-84 age group, with a notable female predominance in younger adults (15-44 years). In contrast, MSSA demonstrates a consistent male predominance across all age groups, with the highest burden in the 45-64 age group [Need to triple check this looking through the datasets] [1]. These distinct demographic patterns suggest different risk factors and transmission dynamics that require targeted research approaches

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**Current Evidence**

The data reveals striking demographic and socioeconomic patterns. For E. coli, the greatest burden falls on adults aged 45 years and over, with both sexes in the 75-84 years age group showing the highest proportion of cases (16.1% male, 14.1% female). The age-standardised incidence rate shows the highest rates in Asian and Black ethnic groups (107.9 and 86.6 cases per 100,000 population, respectively)[1].

MSSA demonstrates different patterns, with males experiencing 2.2 times more cases than females across all age groups. The highest rates are observed in those aged 85 years and over, with males showing 207.6 cases per 100,000 population compared to females at 87.2 cases per 100,000 population[1]

The COVID-19 pandemic period provided unique insights, with both infections showing significant declines during 2020-21 (E. coli dropping to 36,804 cases and MSSA to 11,705 cases) followed by rapid rebounds. This natural experiment offers valuable data on how healthcare disruptions affect infection patterns**.**

**#From UKHSA so can either change this or just add different literature**

**Research Objectives**

**Primary Objective**

To determine whether demographic factors (age), socioeconomic indicators (ONS deprivation indices), and geographical distribution can explain the observed trends in both E. coli and MSSA bacteraemia rates. Current data shows significant variations by age (highest in 75-84 years for E. coli) and deprivation level (82.9 versus 67.5 cases per 100,000 population for most versus least deprived areas in E. coli; 30.1 versus 19.3 for MSSA) [1].

**Secondary Objectives**

1. To evaluate whether antibiotic prescribing patterns and GP appointment availability influence both E. coli and MSSA bacteraemia rates in community settings
2. To analyse how COVID-19 pandemic trends strengthen our understanding of infection patterns
3. To determine whether similar population-level factors explain parallel trends in both infections

**Methodological Approach**

**[To be expanded]**

**This section will detail:**

* Data sources and collection methods
* Statistical analysis approaches
* Population stratification methods
* Geographical mapping techniques
* Time series analysis methods
* Integration of multiple datasets
* Handling of missing data
* Adjustment for confounding factors

**Expected Impact**

This research aims to inform targeted interventions for reducing infection rates, particularly in community settings where traditional hospital-based approaches may have limited effectiveness. Understanding the relationship between socioeconomic factors and infection rates could lead to more equitable healthcare delivery and improved prevention strategies.

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**References**

[1] UK Health Security Agency (2024). Annual epidemiological commentary: Gram-negative, MRSA, MSSA bacteraemia and C. difficile infections up to and including financial year 2023 to 2024. GOV.UK.