



Public Health
England

UK approach to use of metrics and targets for Gram-negative infections (England focussed)

Susan Hopkins

Chair of ESPAUR oversight group

Healthcare Epidemiologist

Consultant Infectious Diseases and Microbiology



March 2016: DH Expert Advisory Group APRHAI recommend to DH that healthcare-associated GN-BSI should be halved

Speech

G7 2016 in Japan: PM press statement

From: [Prime Minister's Office, 10 Downing Street](#) and [The Rt Hon David Cameron MP](#)
Part of: [Counter-terrorism](#), [Health in developing countries](#), [Daesh: UK government response](#), and [Anti-Corruption Summit: London 2016](#)
First published: 27 May 2016
Delivered on: 27 May 2016

May 2016: Ambition
By 2020, we will half
HCA-GN-BSI

Sept 2016: Included in CCG Quality Premium 2017/19

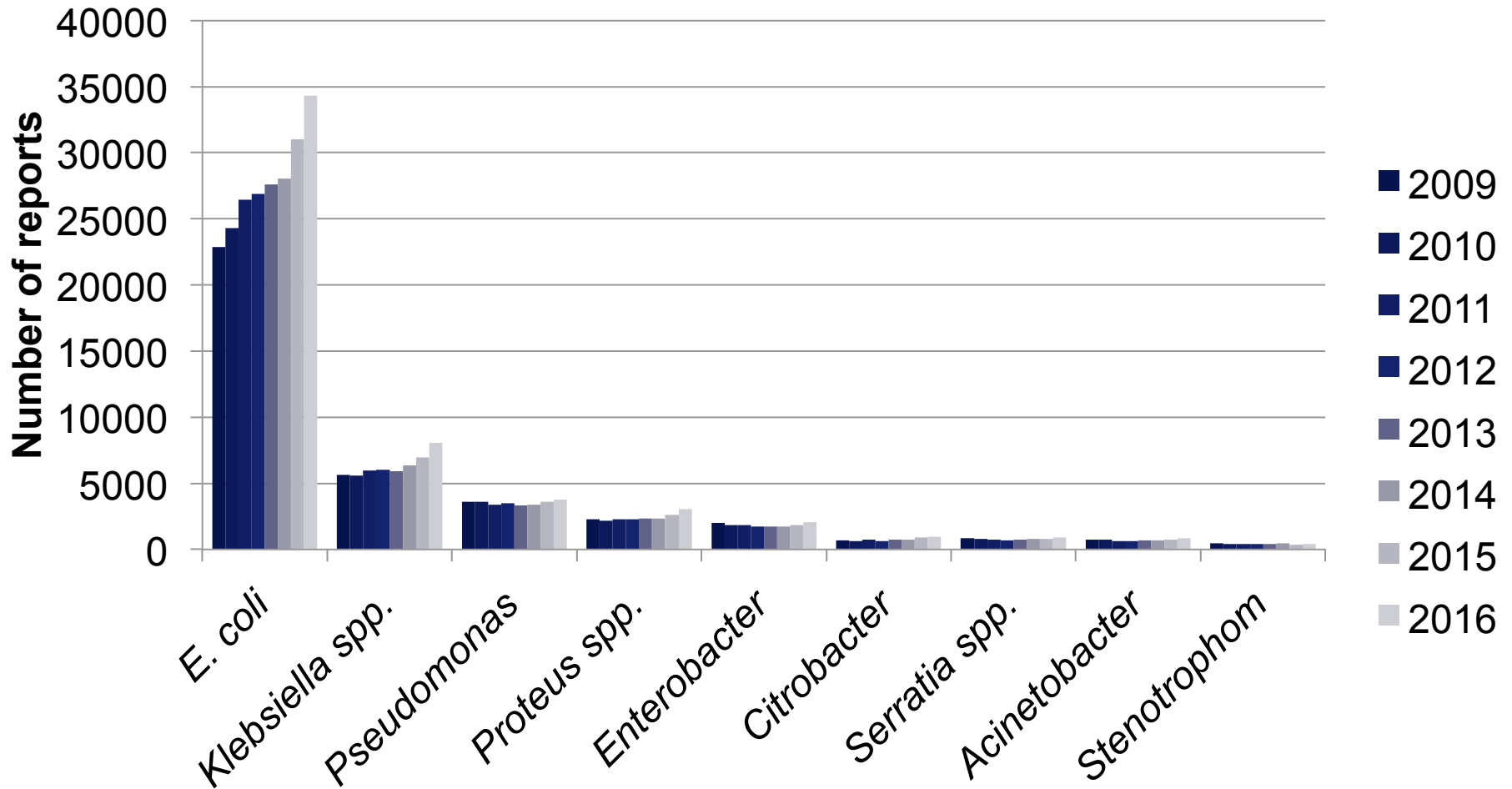
Dec 2016: Ruth May, Director of Nursing, NHSI, SRO for IPC

Feb 2016: UK AMR HLSG – consensus across the UK

March 2017: PHE update mandatory database to NHSI requirements



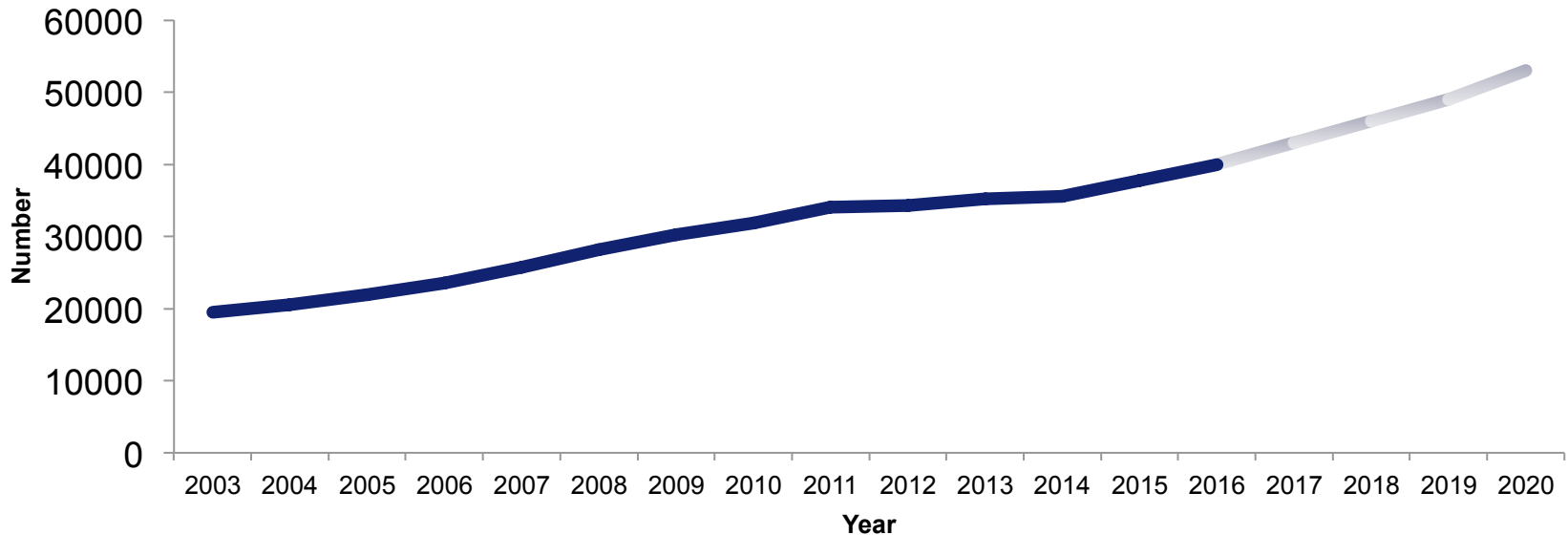
Gram-negative Bloodstream infection





If we don't act...

E. coli number of bloodstream infection, England 2003-2020 (2017-2020 predicted)

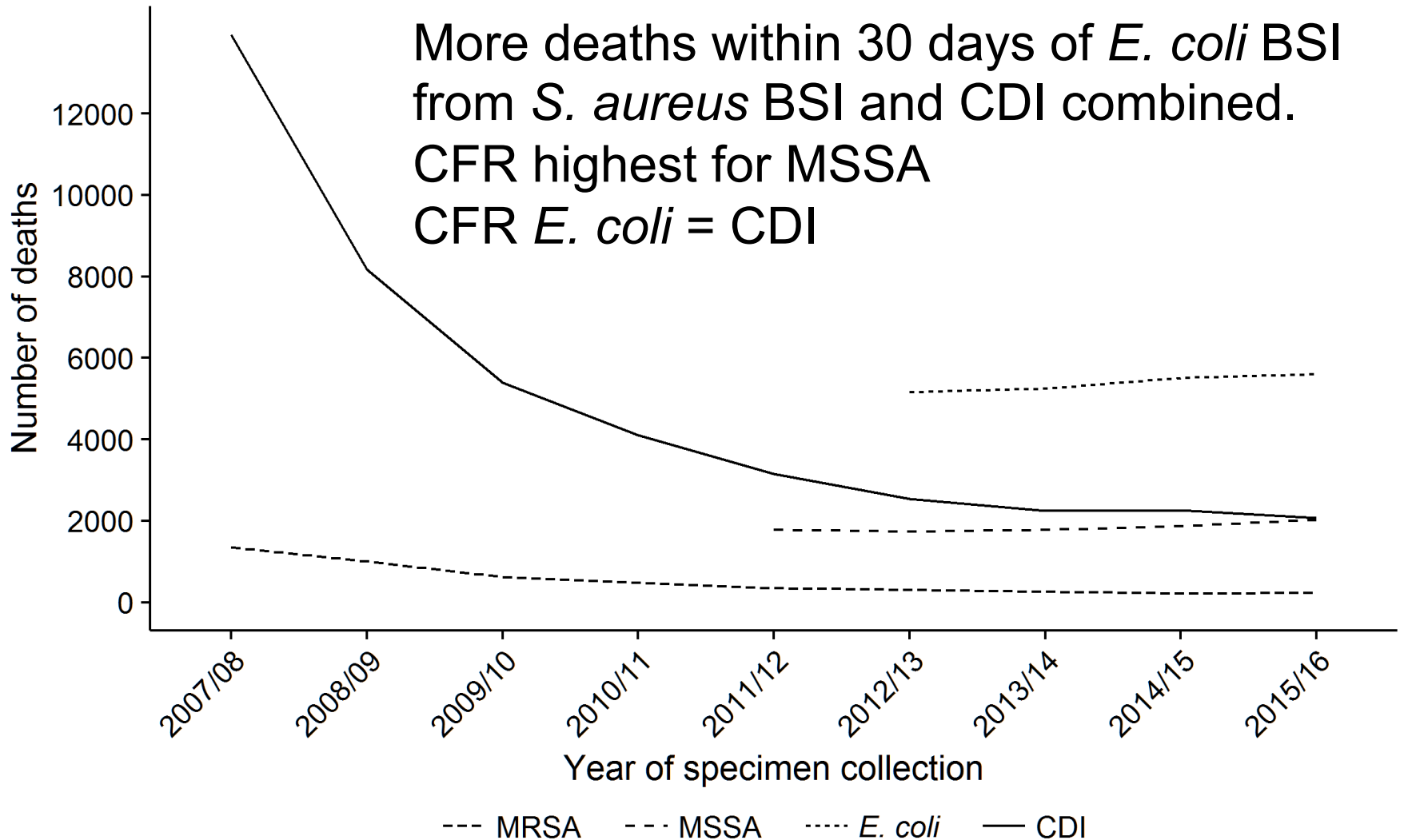


Rate highest in over 75years

Number of BSI in pts <75yrs = Number of BSI >75yrs

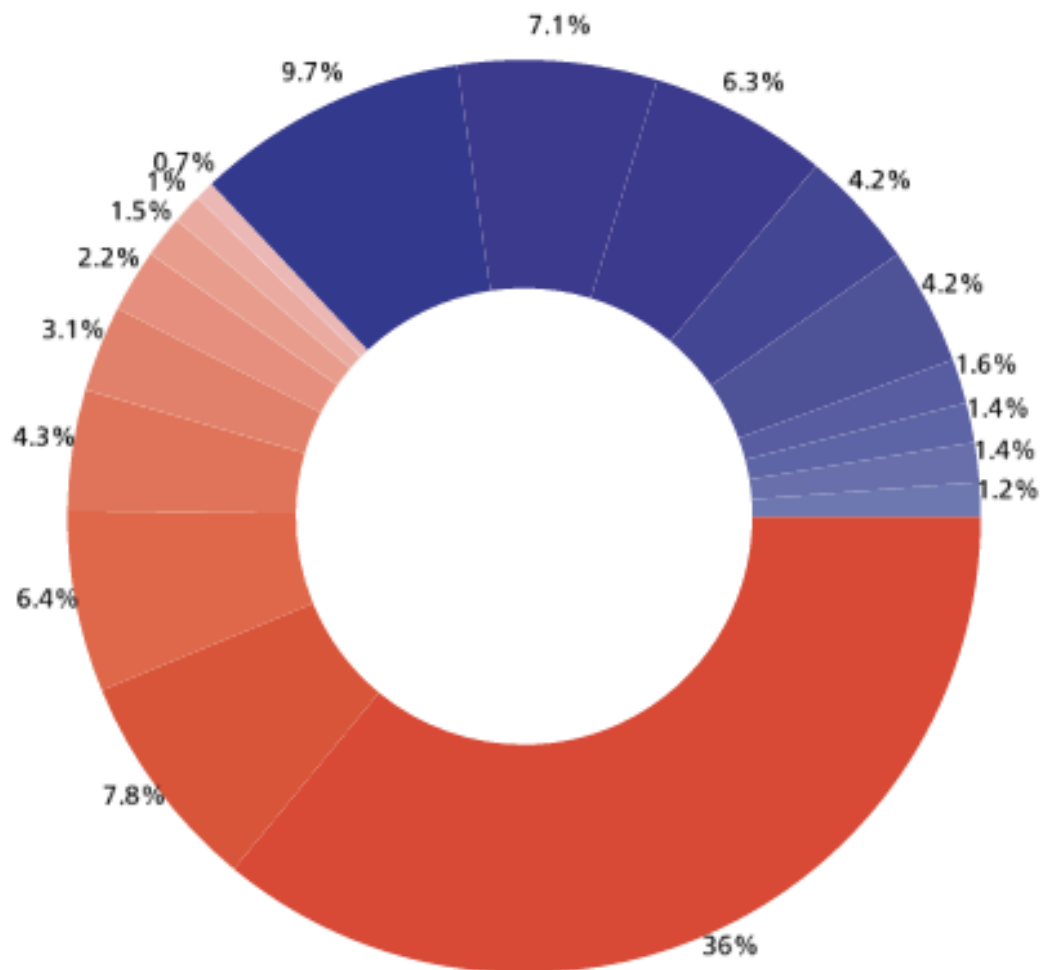


Mortality





Causes of HCAI, Prevalence Survey 2011



Gram negative

- Escherichia coli - 36%
- Klebsiella spp. - 7.8%
- Other Gram-negative - 6.4%
- Pseudomonas spp. - 4.3%
- Proteus spp. - 3.1%
- Enterobacter spp. - 2.2%
- Bacteroides spp. - 1.5%
- Serratia spp. - 1.0%
- Acinetobacter spp. - 0.7%

Gram positive

- Staphylococcus aureus (MSSA) - 9.7%
- Non-pyogenic streptococci - 7.1%
- Enterococcus spp. - 6.3%
- Streptococcus pneumoniae - 4.2%
- Other Gram-positive - 4.2%
- Staphylococcus aureus (MRSA) - 1.6%
- Group B Streptococci - 1.4%
- Group A Streptococci - 1.4%
- Diphtheroids - 1.2%



E. coli BSI and cost

	ESBL positive <i>E. coli</i>	ESBL negative <i>E. coli</i>
Hospital acquired	62%	45%
Healthcare associated	30%	24%
Community acquired	8%	31%

Length of stay prior to infection sig. longer for those ESBL+

Total hospital costs were sig. higher for a patient with an ESBL BSI than for patients with non-ESBL BSIs, EUR 13,709 V 8,683

Median hospital costs delivered AFTER the onset of infection with an ESBL+GN x2.9 times higher than ESBI-GN

Median cost for GN-BSI admission \$12,939 (IQR \$6k-\$38k)



Costs of Gram-negative BSI

Mean inpatient cost for an episode of Gram negative BSI was \$43,929

Median cost was \$12,939 (IQR \$6,205-\$38,278)

Significantly higher for patients with MDR BSI than patients with non-MDR BSI (\$59,266 vs. \$36,452; P=0.003)

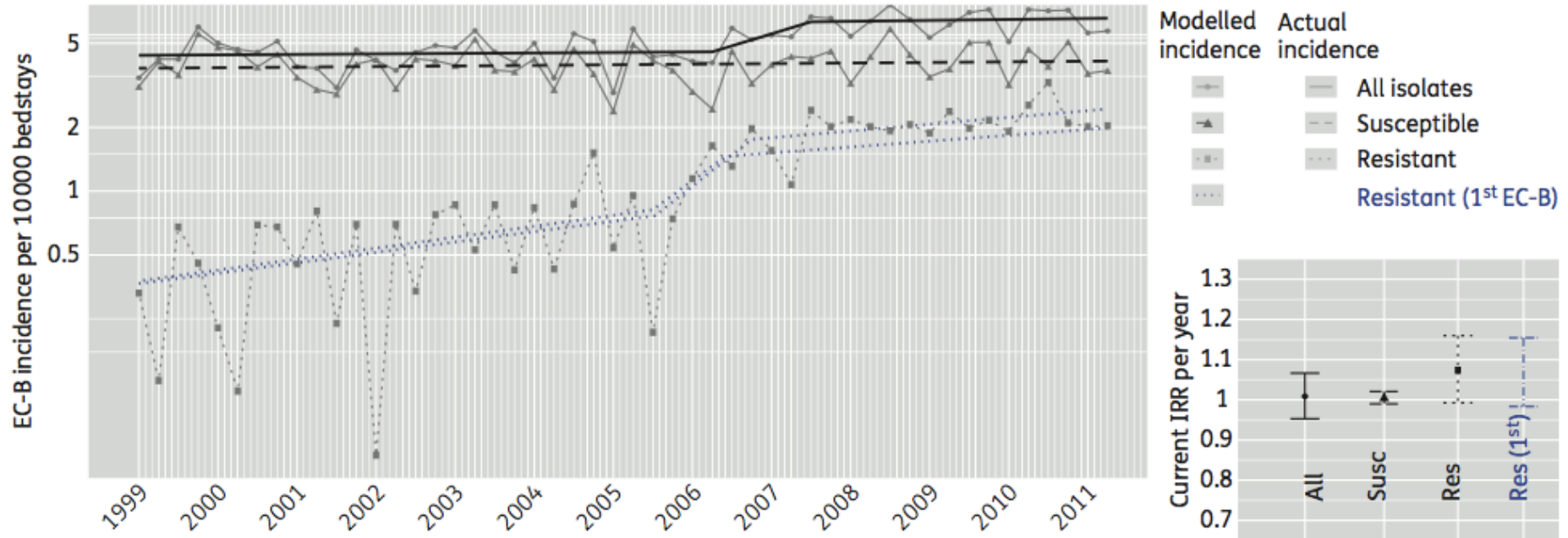
Hospital-acquired MDR BSI mean inpatient costs were higher (\$136,945 vs. \$89,197; P=0.02)

Community-acquired MDR BSI mean costs also higher (MDR: \$18,190 V \$15,893, NS)



Rises in *E. coli* BSI related to rising resistance

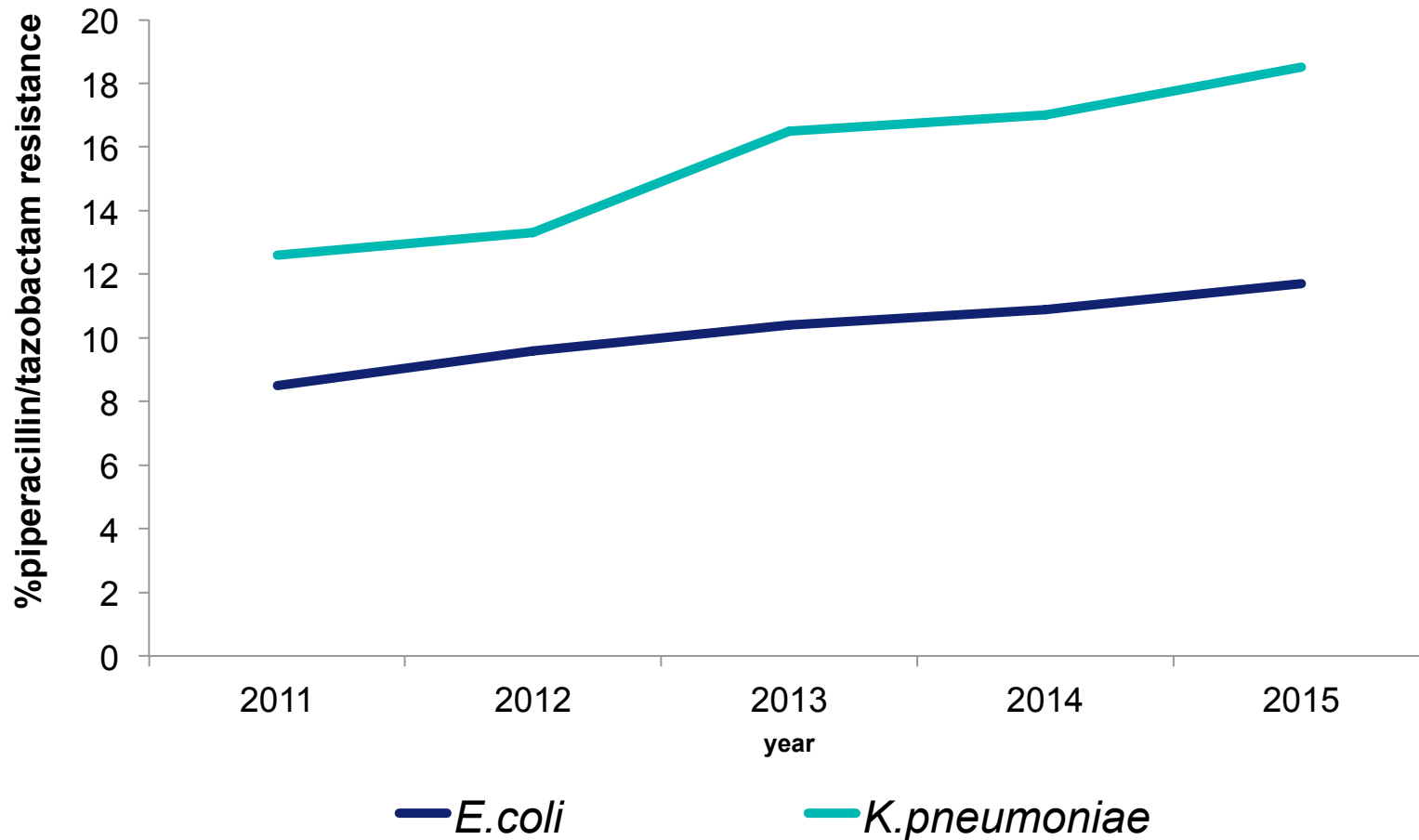
(a) Changes in EC-B incidence in 1999–2011



- “*E. coli* BSI rates risen due to rising rates resistant organisms”
- Increase not just observed in hospital populations
- No difference in outcome observed (yet)

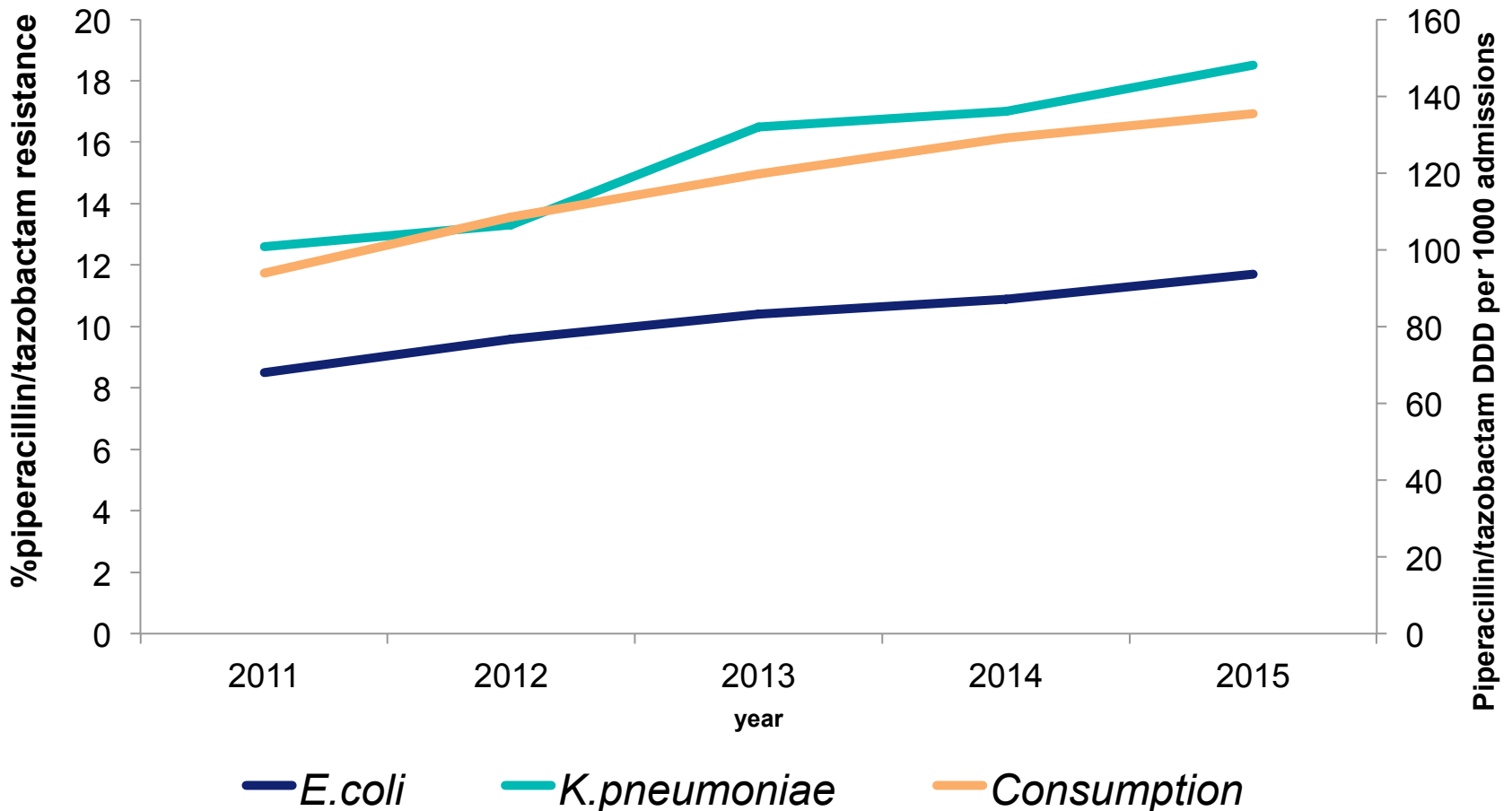


Relationship between Antibiotic Use and Resistance e.g. piperacillin-tazobactam



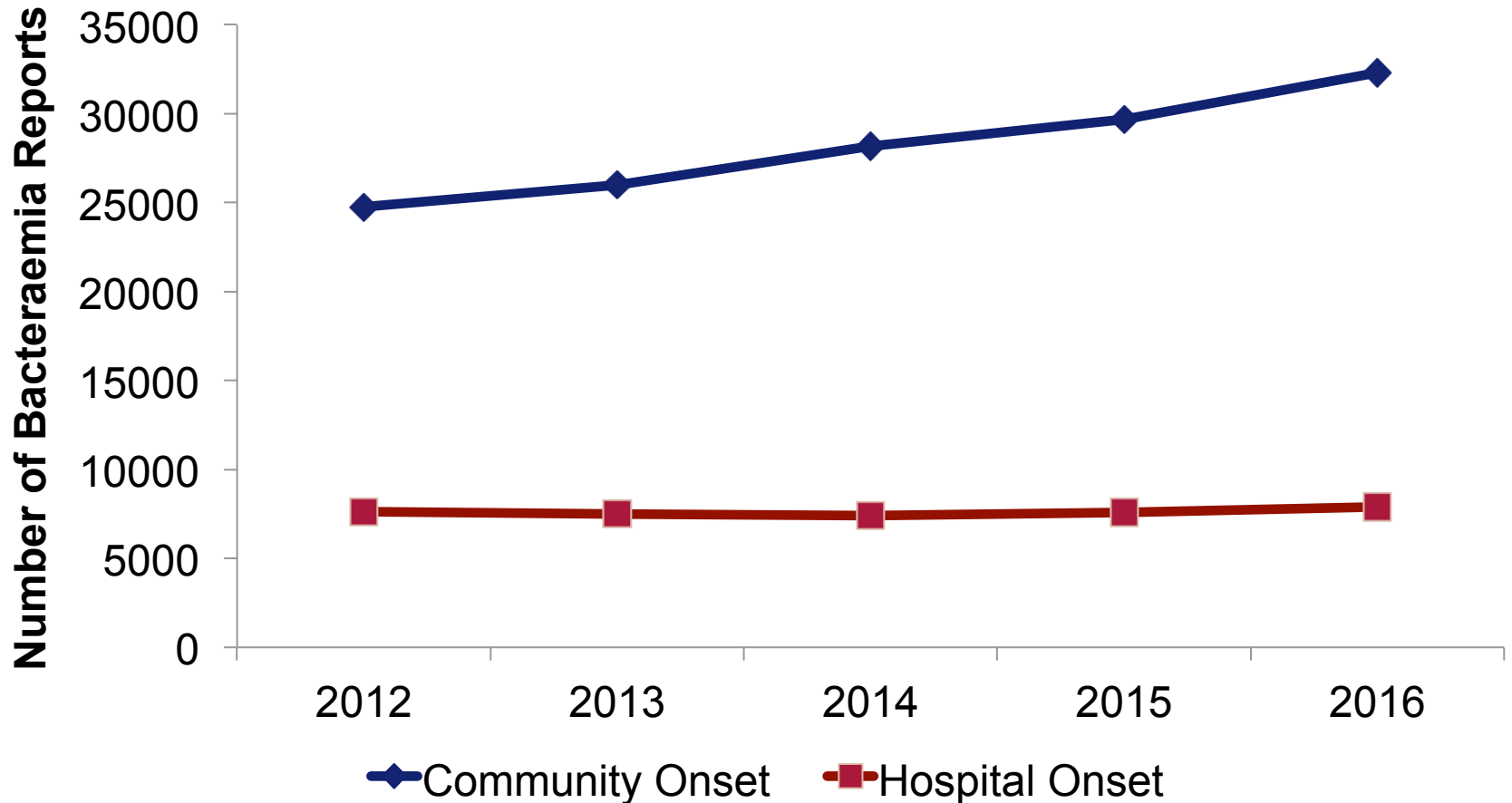


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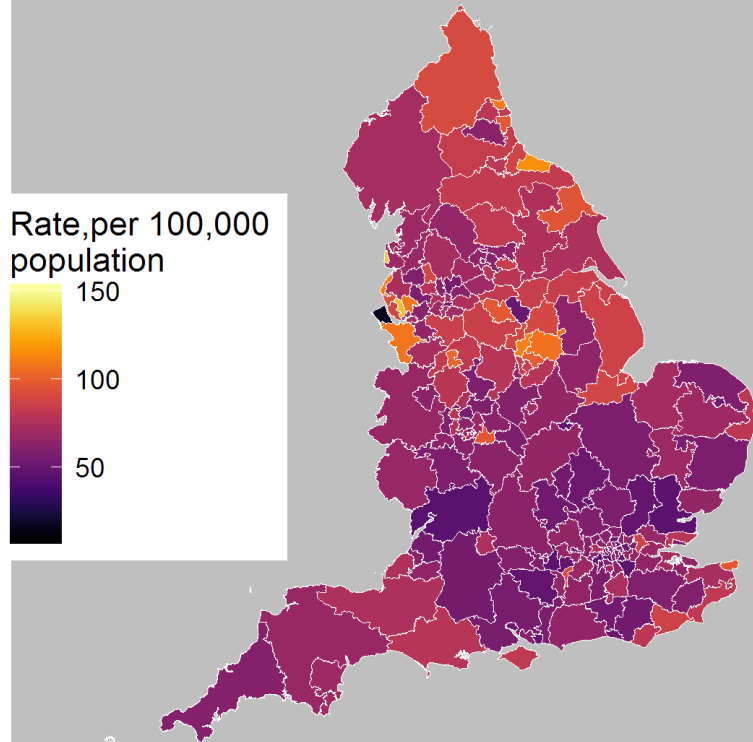
E. coli BSI: where do they start?



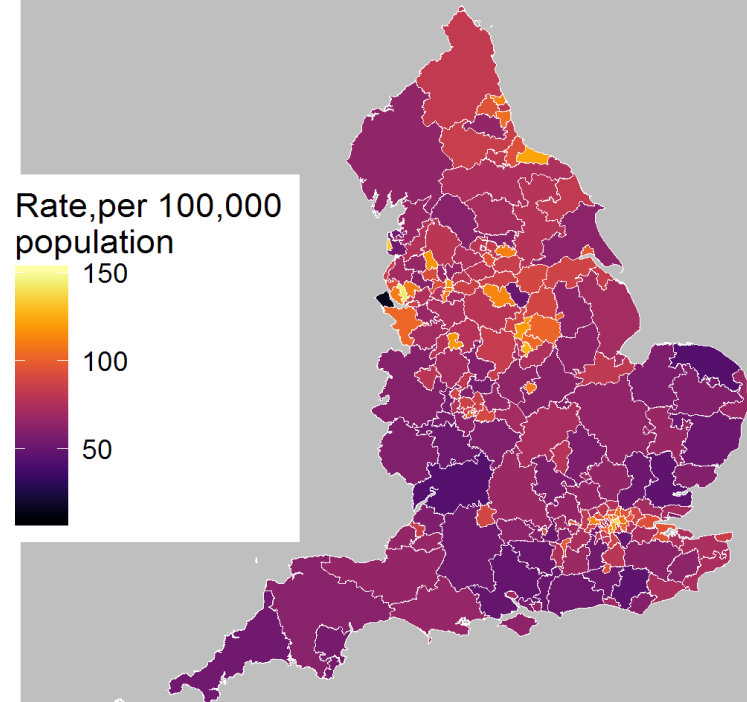


CCG *E. coli* BSI rates crude and standardised

Raw rates of *E. coli* bacteraemia.
England, 2016/16

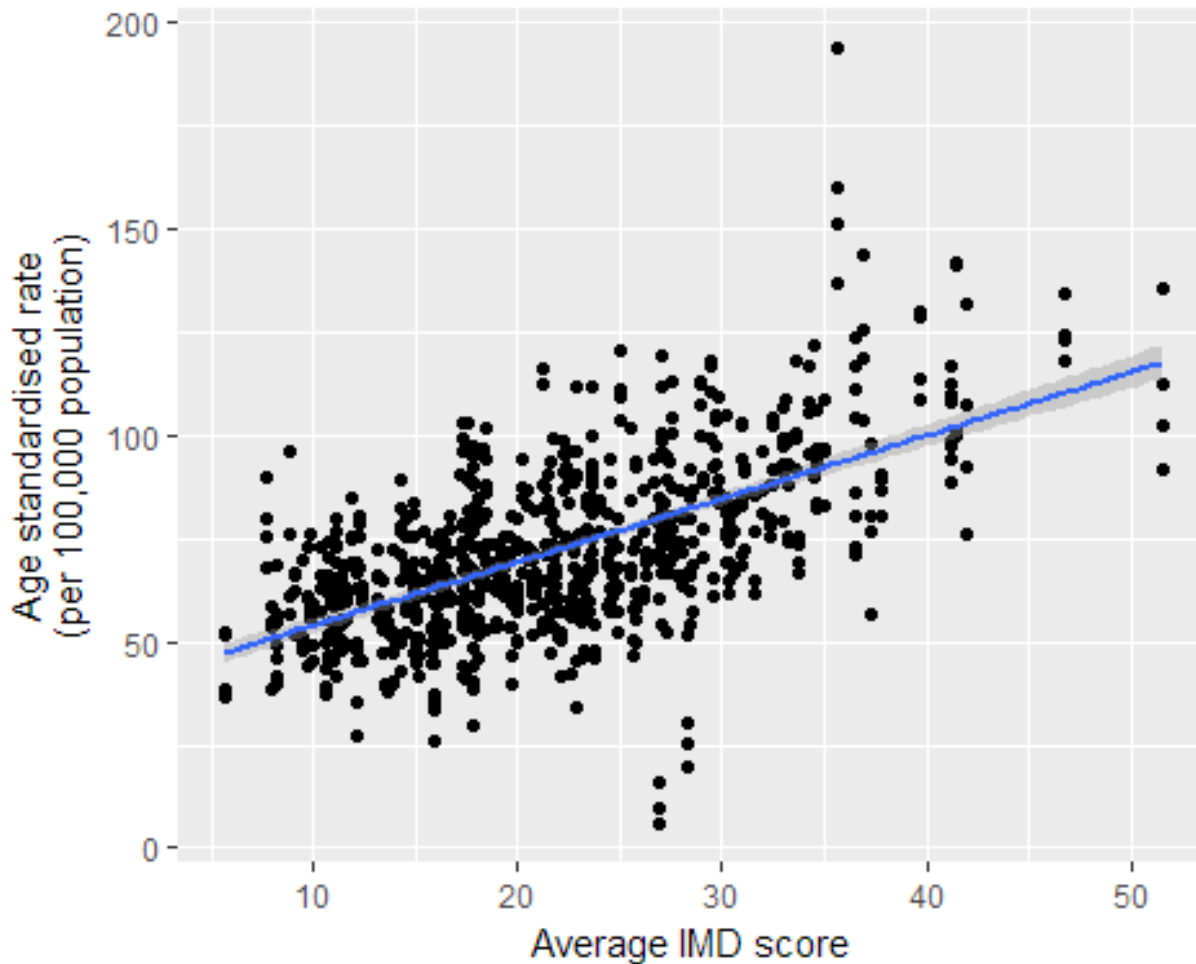


Age and sex standardised rates of
E. coli bacteraemia.
England, 2016/16





Deprivation & *E. coli* BSI rates, CCG, 2012/13-2015/16

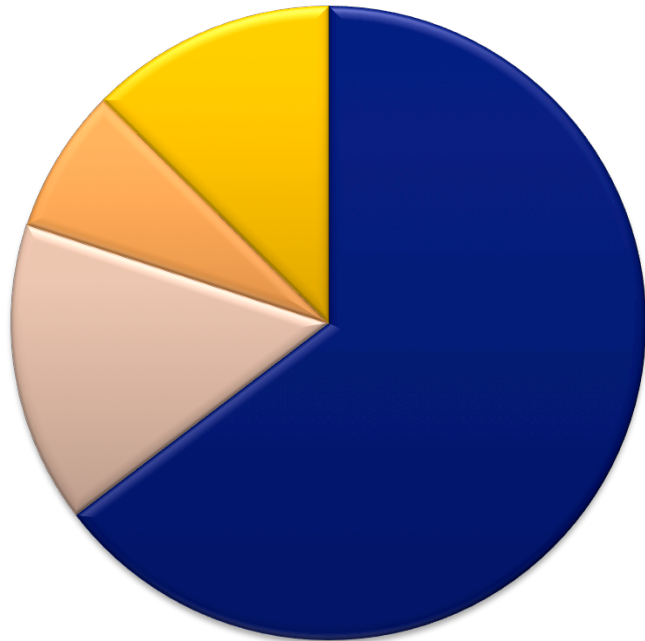


~ 40% variation explained by deprivation

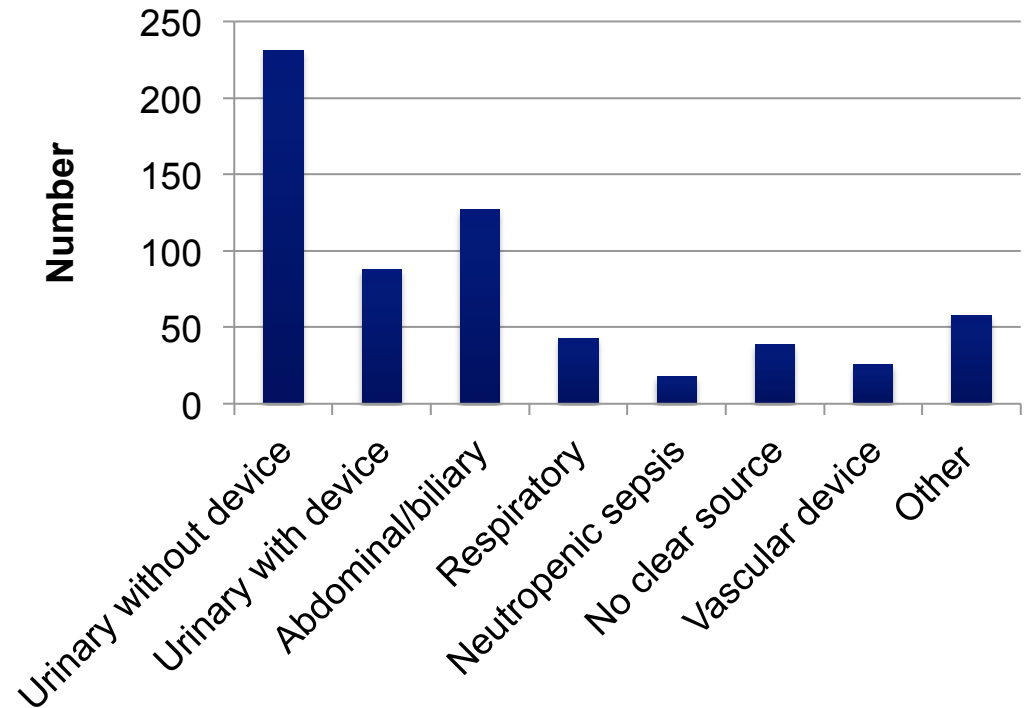


Unselected Gram-negative BSI in England, n=679

87% *E. coli*, *Klebsiella* or *Pseudomonas*; median NEWS = 4
54% were defined as HCAI or nosocomial
15% 30 day mortality



- Escherichia coli
- Klebsiella spp.
- Pseudomonas spp.
- Others

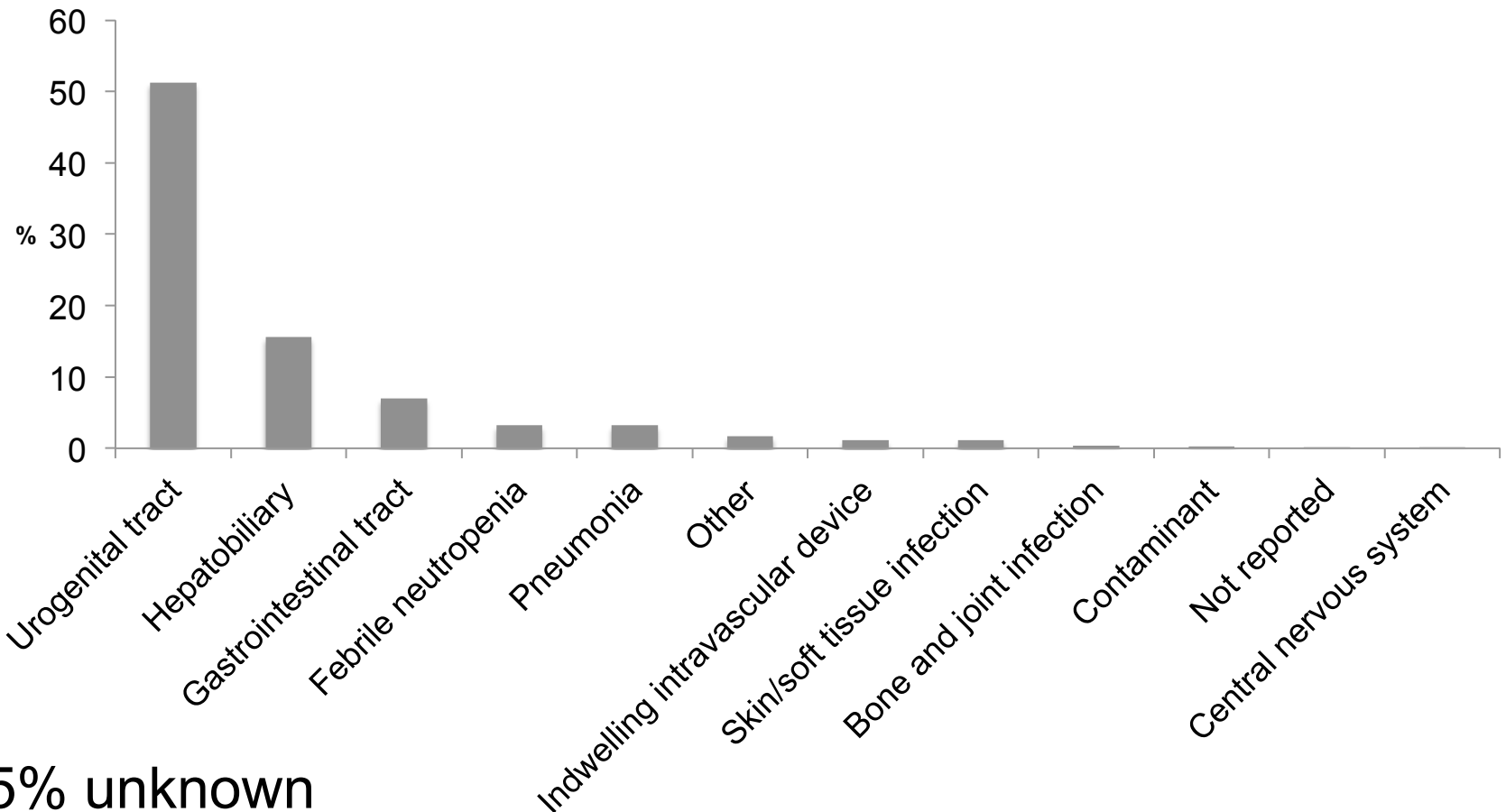




Source of *E. coli* BSI

n=1700, 35 sentinel sites

Source of *E. coli* bloodstream infection



15% unknown



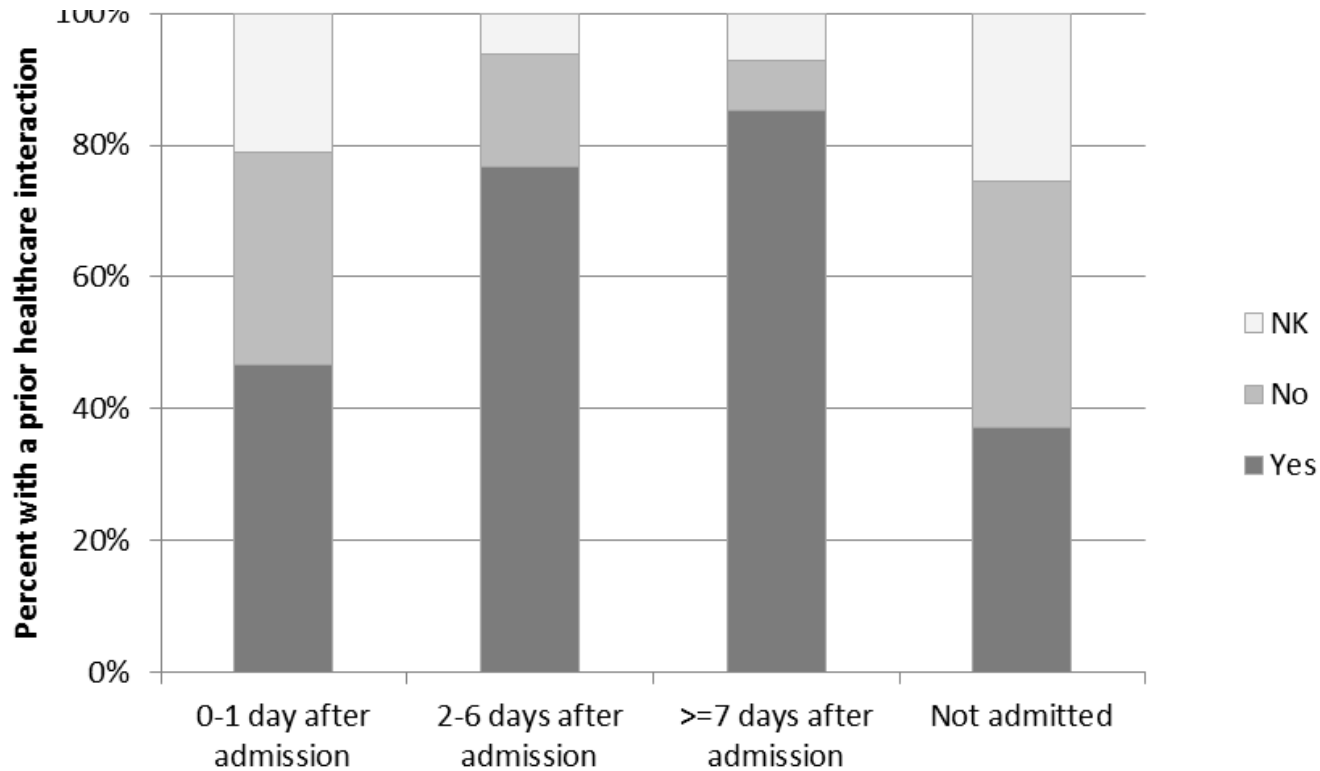
Prior healthcare events

Half had ≥ 1 healthcare exposure in the month prior to BSI
24% hospital onset (nosocomial)

Key events related to BSI	%
Antibiotics (prior 4 wks)	32.4
Urinary catheter in situ, inserted, removed, manipulated (prior 7 days)	21.0
Other devices in situ or removed (prior 4 wks)	7.3
Other procedures (prior 4 wks)	12.4



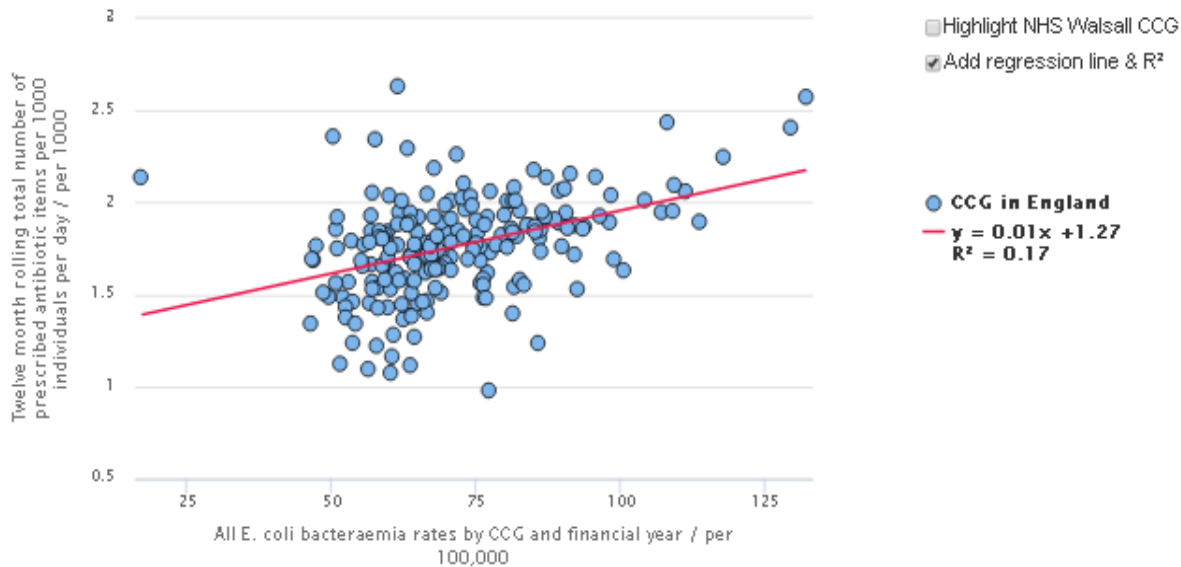
Healthcare exposure frequent



Healthcare exposures: antibiotics, devices, procedures



Relationship between antibiotic use and *E. coli* BSI

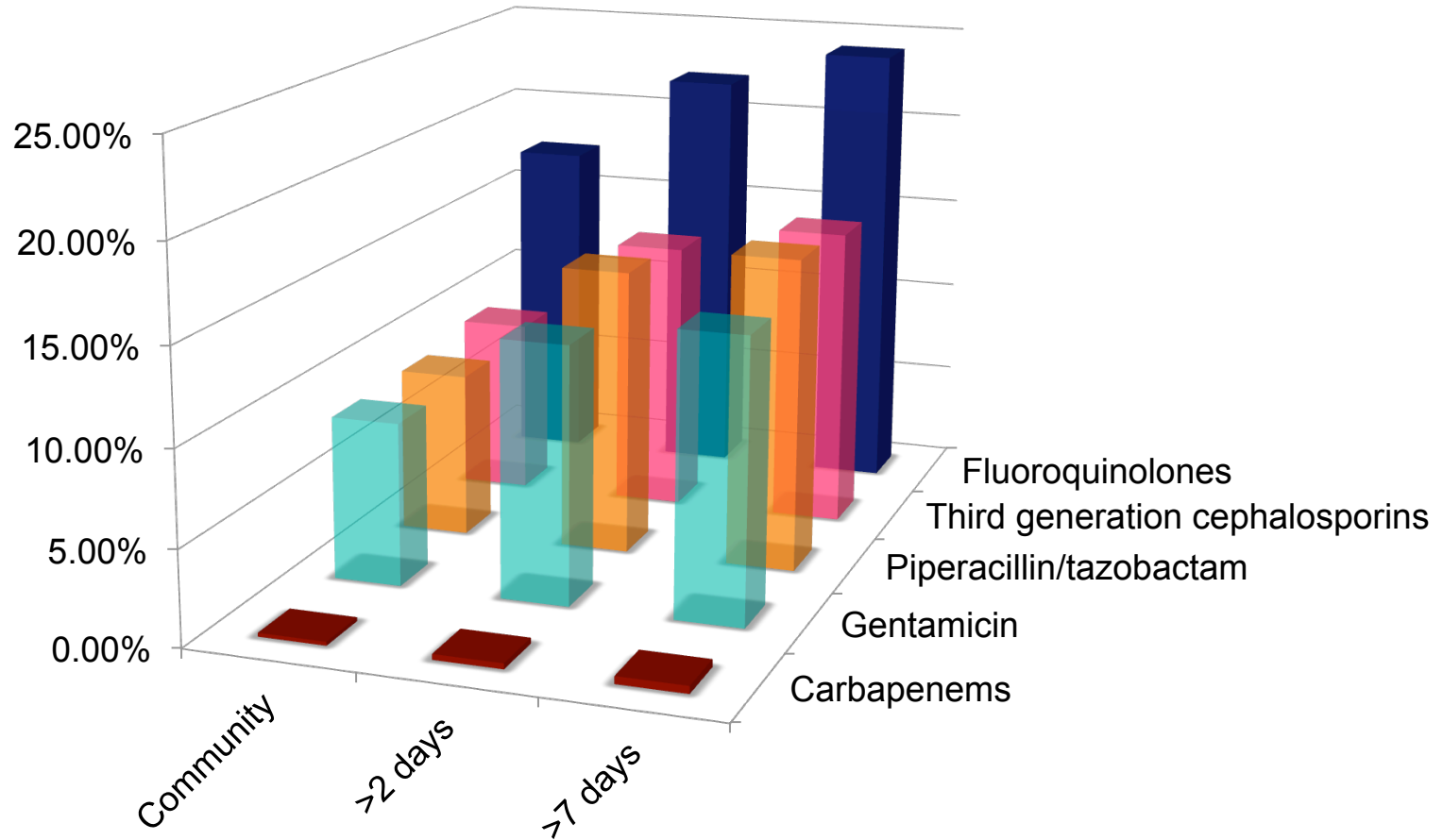


Between 20-60% of positive urine samples in NHS labs resistant to Trimethoprim

Trimethoprim is the commonest antibiotic prescribed for UTI



E. coli Resistance & Hospitals



	Fluoroquinolones	Third generation cephalosporins	Piperacillin/tazobactam	Gentamicin	Carbapenems
Community onset	17.4%	9.3%	8.7%	8.6%	0.2%
>2 Days	22.1%	14.4%	15.1%	13.5%	0.3%
>7 Days	24.1%	15.9%	16.5%	14.8%	0.4%



Antimicrobial therapy

- 32% had an antibiotic in the previous 4 weeks
- 58.4% received one antibiotic, 23.1% received two; remainder 3 or more
- Infection Treatment – 79%
 - urogenital tract 31.8% [most commonly trimethoprim or co-amoxiclav]
 - respiratory tract 17.1%
- Prophylaxis - 14%



Urogenital tract

21% had UC inserted/ removed/ manipulated in prior 7 days

Surgical specialities a bigger risk

Reasons for catheterisation:

- Urinary retention 27%
- Fluid balance 22%
- Incontinence 11%
- Unknown 19%

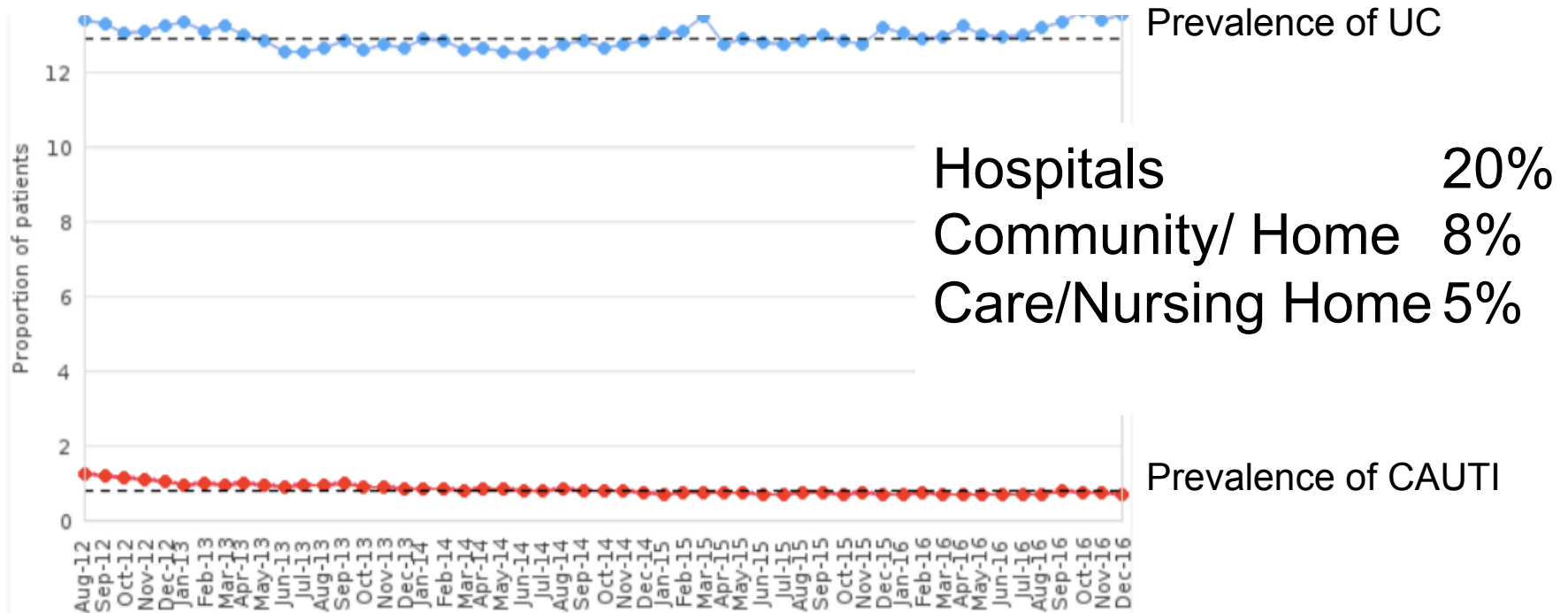
Type of urinary catheter

- Long-term 41%
- Short-term 38%
- Temporary 20% (e.g. perioperative)

Time of onset of BSI	Presence of UC In previous 7 days
On admission/ <d2	15%
Day 2-6	36%
Day 7 or >	40%



How many people have UC?



1.5% of those with UC have a CAUTI in hospital & 0.5% in LTCF
~500,000 CAUTI in hospital & 750,000 in LTCF each yr



Multimodal interventions reduce Catheter-associated UTI

Intervention: training sessions, urinary catheter (UC) reminders, surveillance systems, staff feedback

Outcome: frequency of UC use and incidence of CAUTIs

FINDINGS:

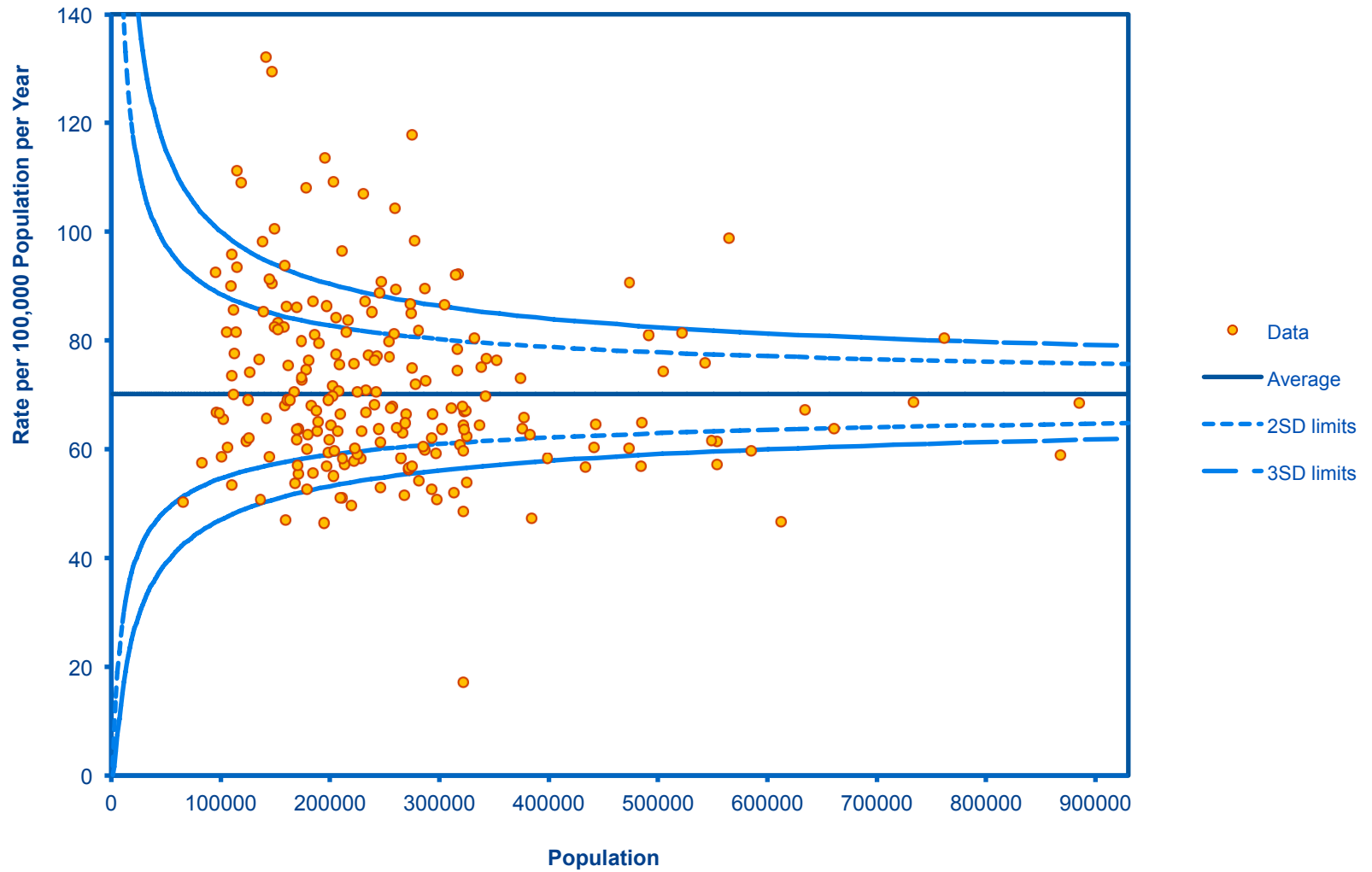
Decreased UC rate 27.8% vs 16.9%; relative risk (RR): 0.61; 95% confidence interval (CI): 0.57-0.65

Resulted in reduction in CAUTI risk: 18.3 vs 9.8%; RR: 0.53; 95% CI: 0.30-0.93

Reduction in the CAUTI rate per 1000 patient-days: 5.5 vs 2.8; incidence ratio (IR): 0.52; 95% CI: 0.28-0.94

Non-significant decrease in the CAUTI rate per 1000 catheter-days: 19.3 vs 16.9; IR: 0.85; 95% CI: 0.46-1.55

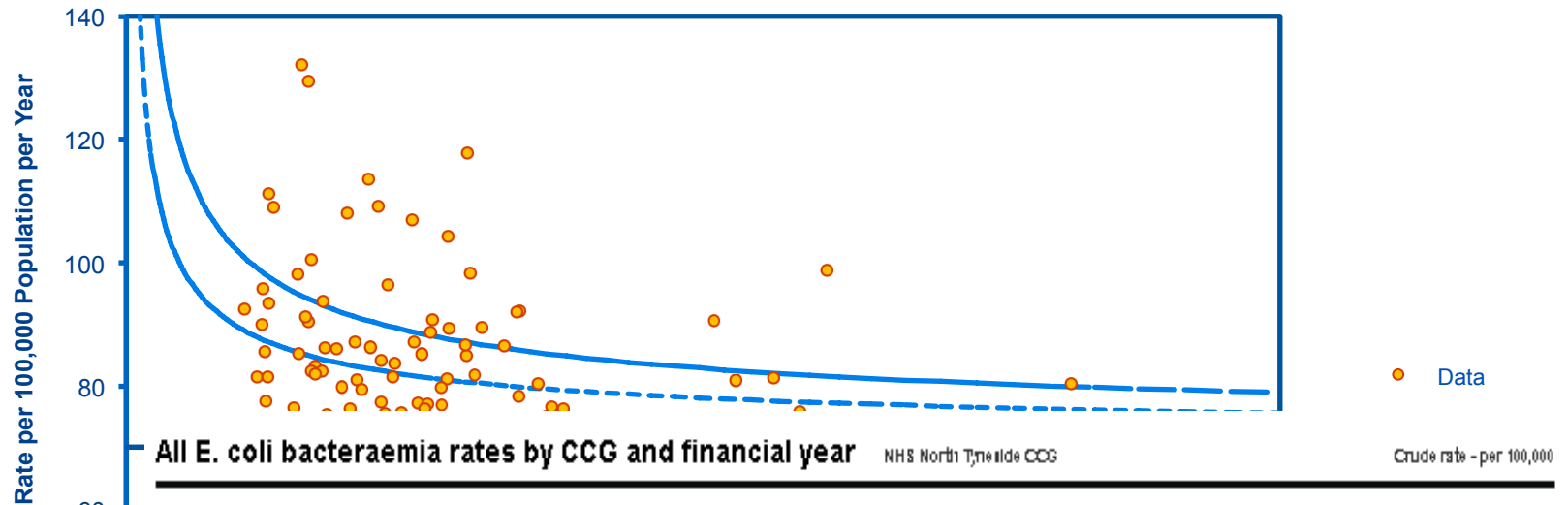
E. coli bloodstream infection rate by CCG 2015/16



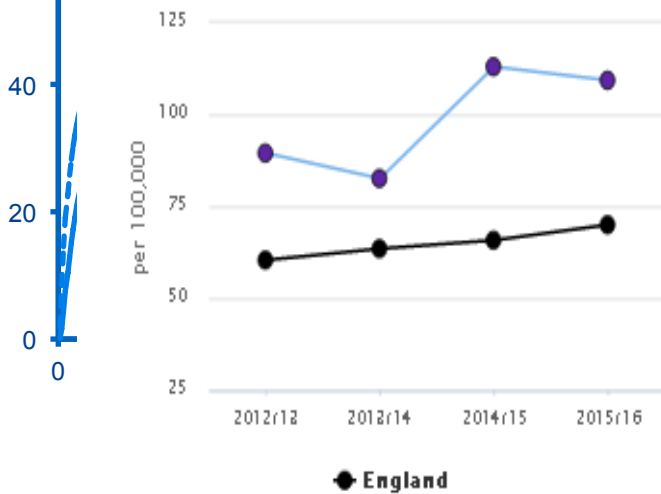
Source: Fingertips

Note: Population is adjusted due to Standardisation Calculations

E. coli bloodstream infection rate by CCG 2015/16



Export chart as image [Show confidence intervals](#)



Period	Count	Value	Lower CI	Upper CI	Cumbria and North East	England
2012/13	180	89.5	-	-	76.1	60.4
2013/14	167	82.6	-	-	73.7	63.5
2014/15	229	113.0	-	-	81.6	65.8
2015/16	222	109.3	-	-	87.5	70.0

Source: HCAI Mandatory Surveillance Data

Source: Fingert

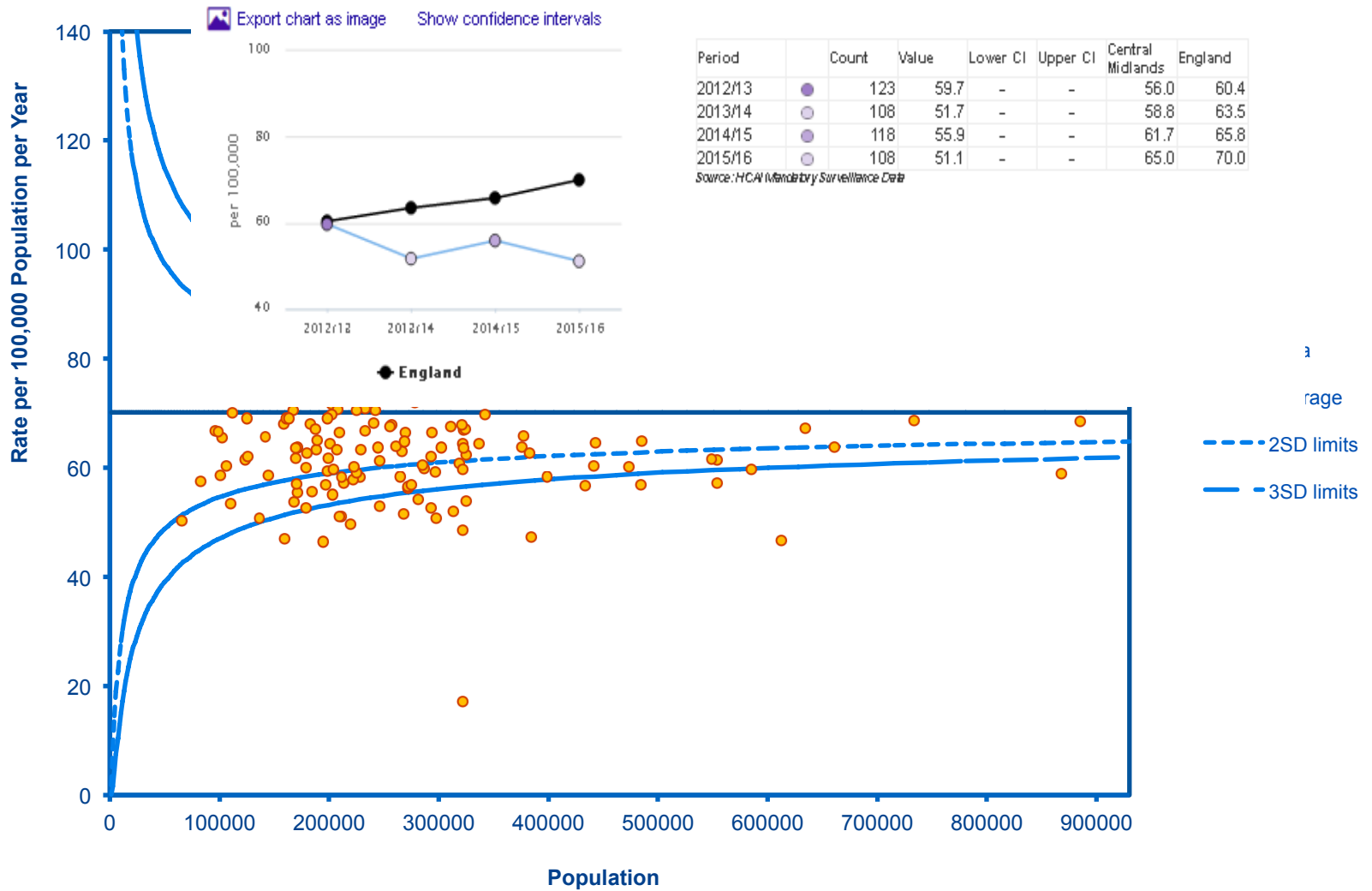
Note: Population is adjusted due to Standardisation Calculations

E. coli bloodstream

All E. coli bacteraemia rates by CCG and financial year

NHS Luton CCG

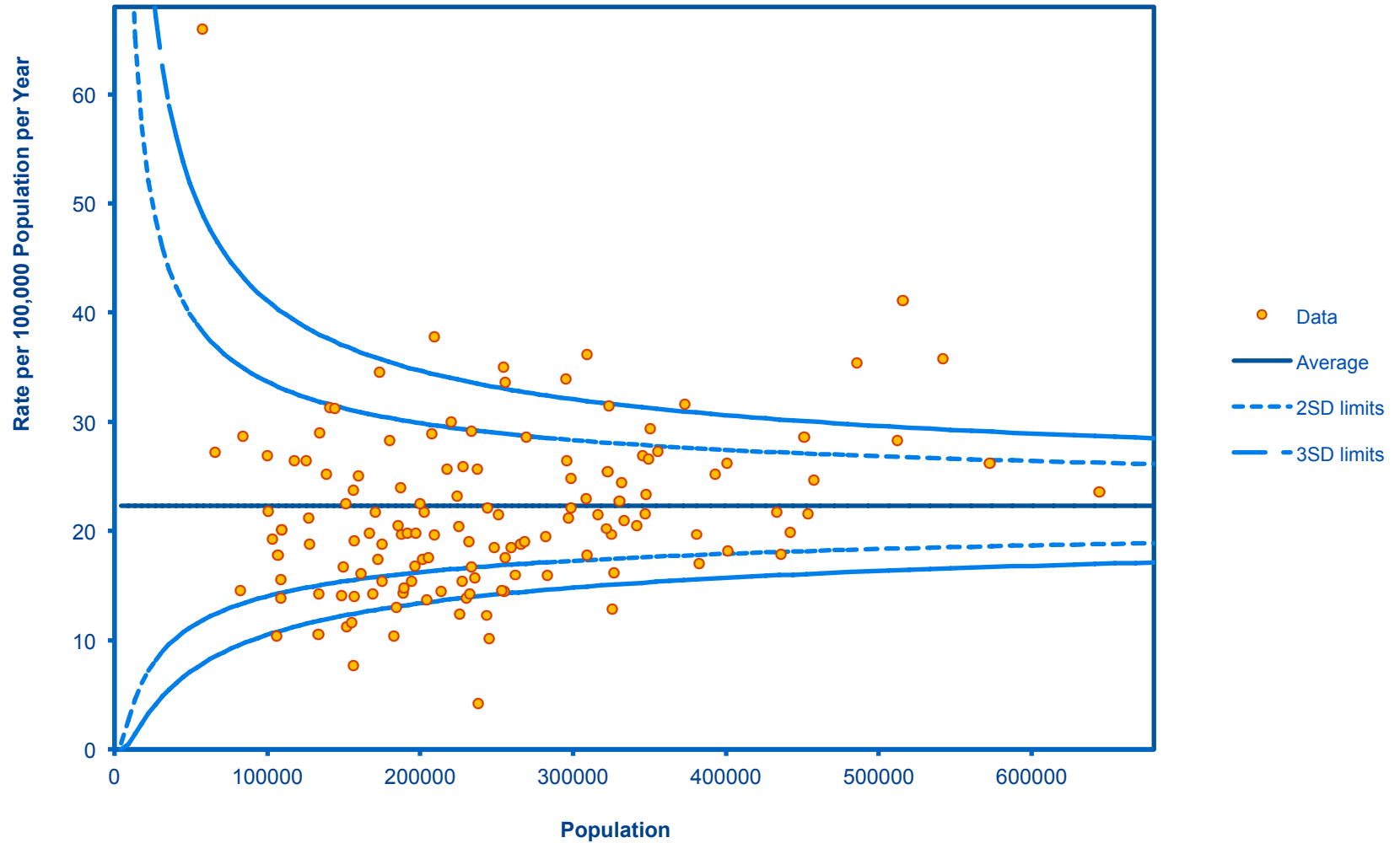
Crude rate - per 100,000



Source: Fingertips

Note: Population is adjusted due to Standardisation Calculations

E.coli BSI hospital onset non-specialist Trusts

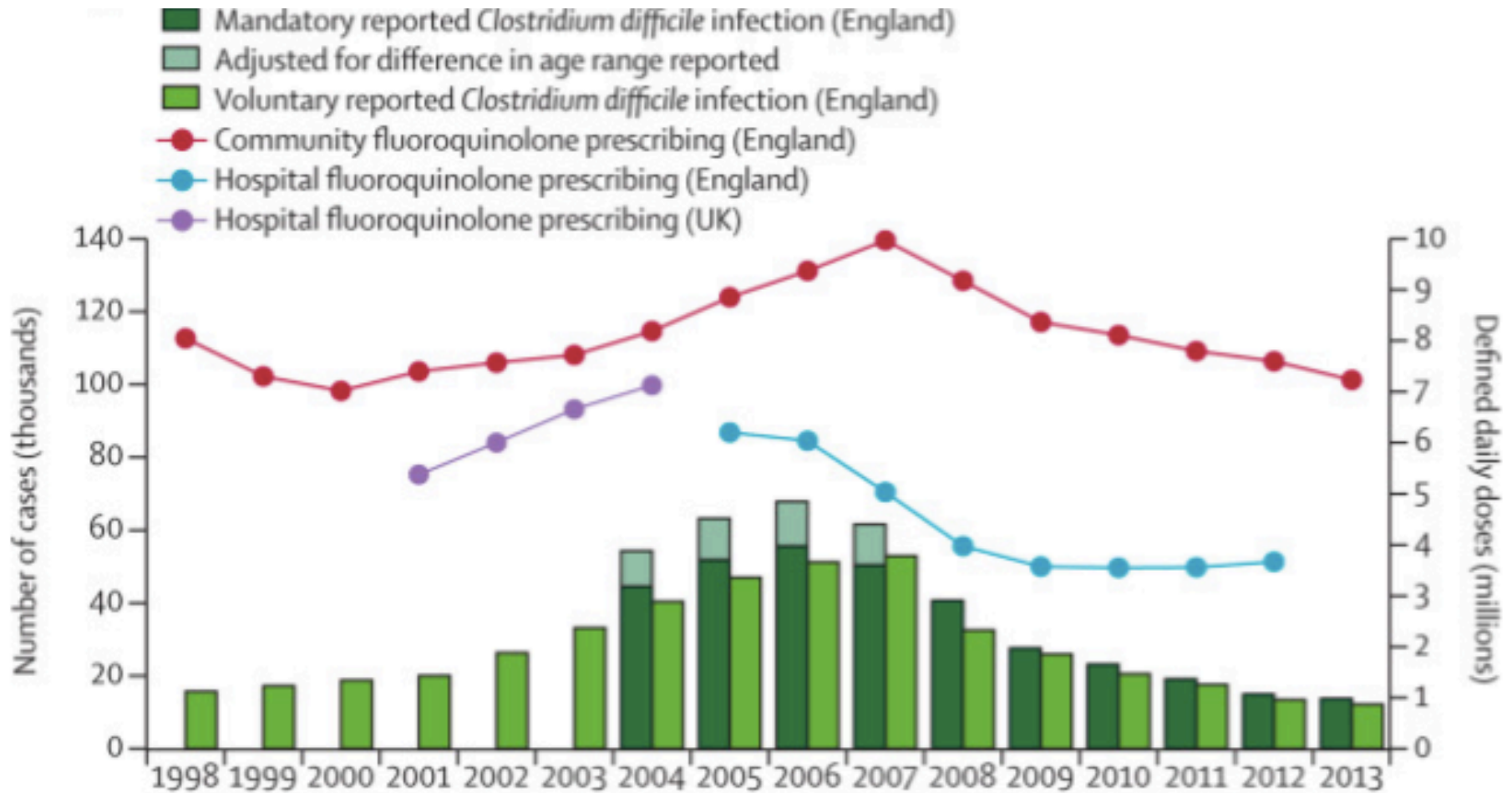


Source: Fingertips

Note: Population is adjusted due to Standardisation Calculations



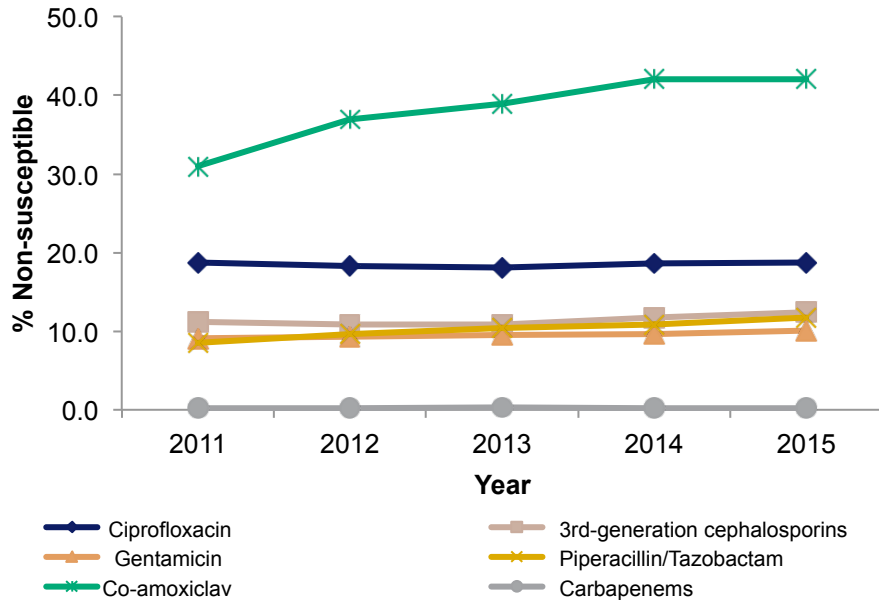
Relationship between Antibiotic resistance & use



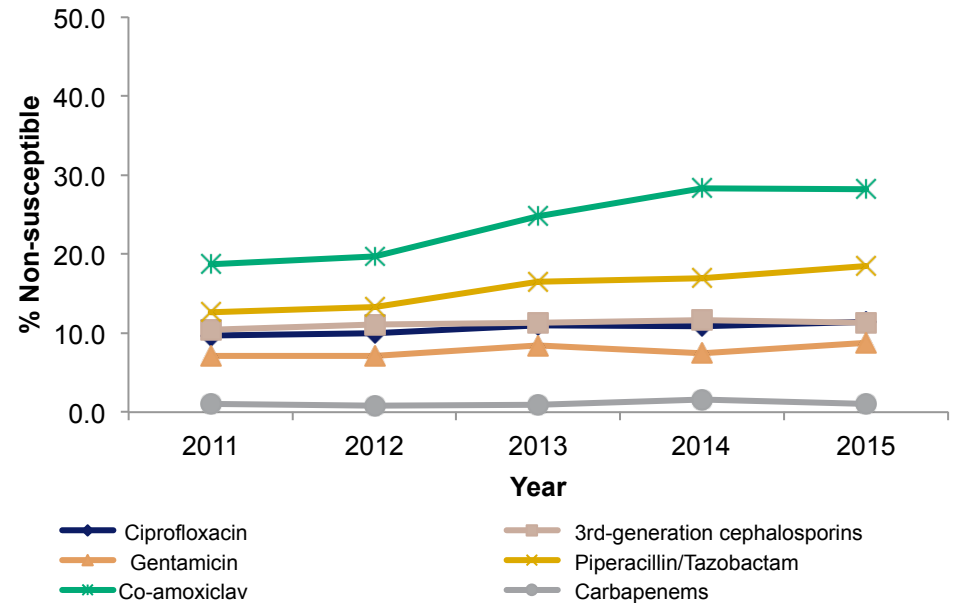


Resistance in key Gram-negatives

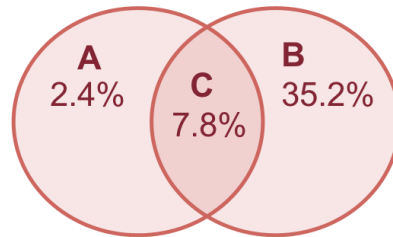
E. coli



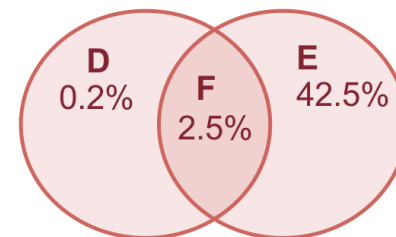
Klebsiella pneumoniae



Using MDR data
to develop new
treatment
algorithms
e.g. *E. coli*



A, Gentamicin
B, Co-amoxiclav
C, Gentamicin/co-amoxiclav

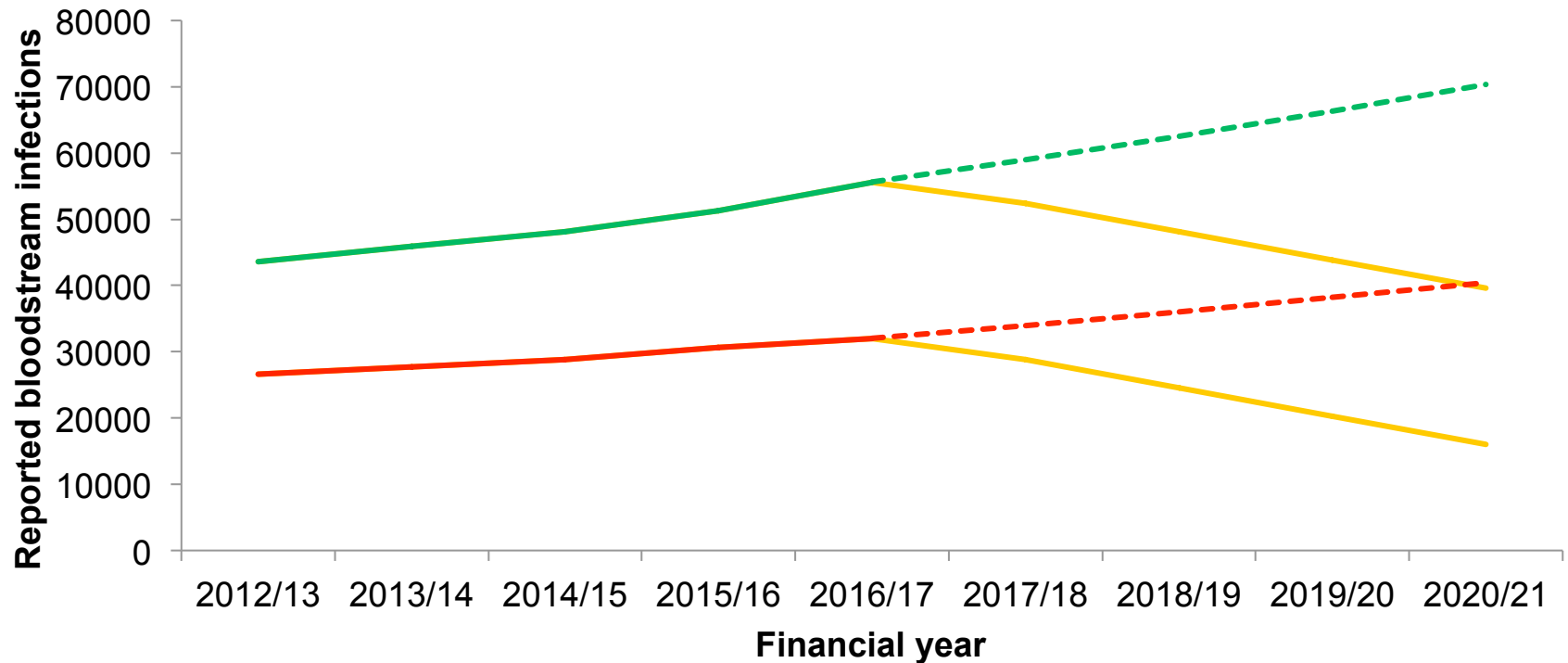


D, Amikacin
E, Co-amoxiclav
F, Amikacin/co-amoxiclav



Public Health
England

Gram-negative BSI 50% reduction by FY 2020/21



— Total GNBSI

- - - Est. total GNBSI

— Ambition

— Total HA-GNBSI

- - - Est. total HA-GNBSI



Public Health
England

Financial incentives or indicators

❖ Incentives can be effective while in place

QP 2017-19

? NHS contract

?Improvement visits

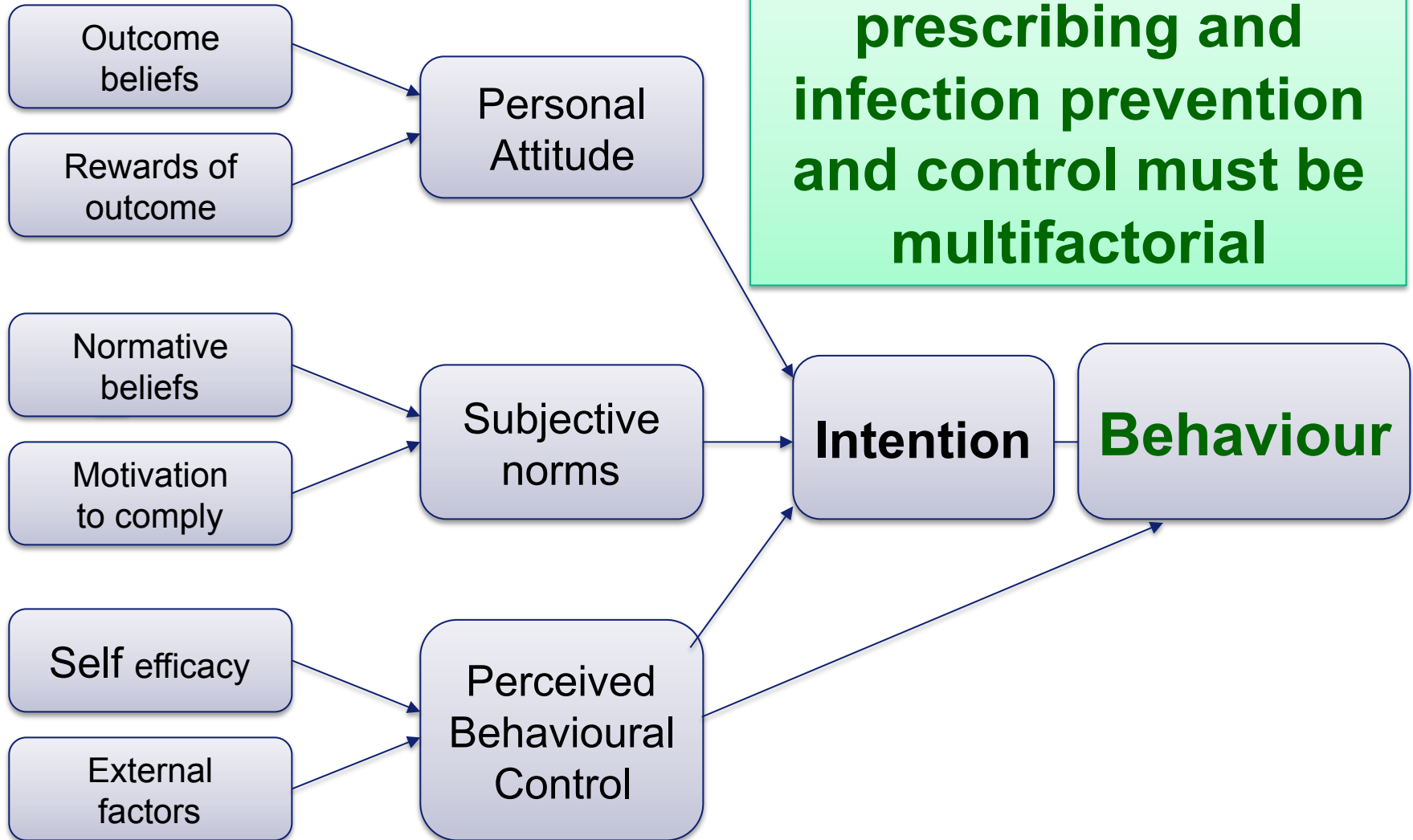


**Decreasing the
number of *E. coli* BSI**



**Increasing prescribing
in line with guidance**

**Tactics to improve
prescribing and
infection prevention
and control must be
multifactorial**



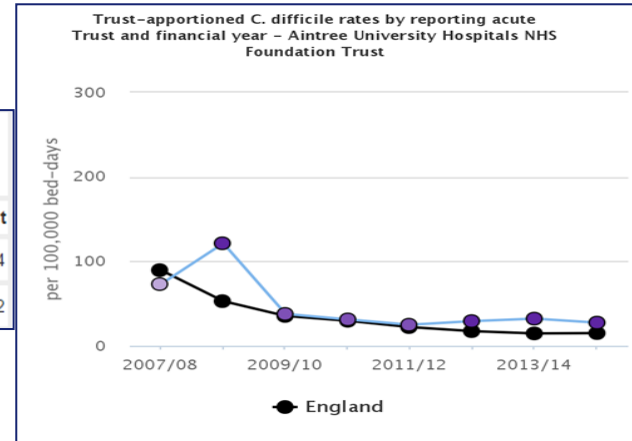


Summary

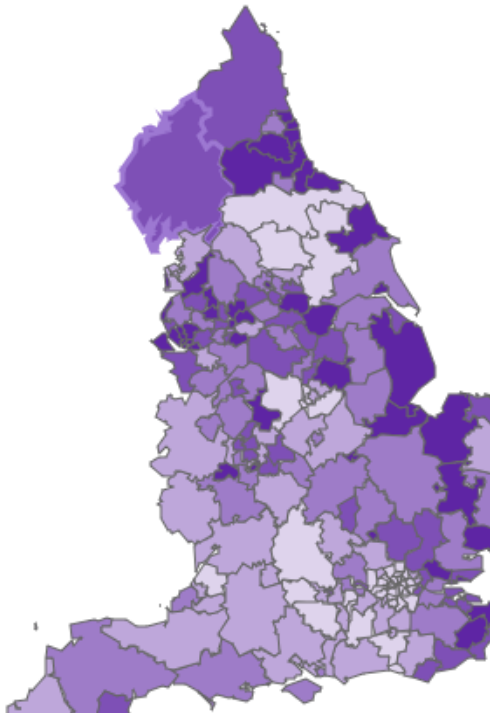
- Gram-negative BSI increasing by ~ 10%/year
- High 30 day all cause mortality
- Increased MDR infections in hospital onset
- Consistent underlying causes of BSI – UTI, CAUTI, SSI
- Need to focus on prevention of underlying cause
 - improve treatment of UTIs in the community
 - prevention of nosocomial cases
- High costs to the NHS
- Incentives for CCGs
- Need to change our behaviour and beliefs



Indicator	Period	Aintree University Hospitals		England			
		Count	Value	Value	Lowest	Range	Highest
All C. difficile rates by reporting acute Trust and financial year	2014/15	134	57.6	41.0	0.0		114.4
Trust-apportioned C. difficile rates by reporting acute Trust and financial year	2014/15	64	27.5	15.1	0.0		62.2



Map of CCGs in England for Total number of prescribed antibiotic items per 1000 resident individuals by quarter (Crude rate - per 1000, 2015 Q4)



Indicator	Period	England	London NHS region	NHS Barking And D.	NHS Barnet CCG	NHS Bexley CCG	NHS Brent CCG	NHS Bromley CCG	NHS Camden CCG	NHS Central London	NHS City And Hack	NHS Croydon CCG	NHS Ealing CCG	NHS Enfield CCG	NHS Greenwich CC	NHS Hammersmith
Percentage of E. coli blood specimens with susceptibility tests to a carbapenem, 2015 by Quarter	2015 Q4															
		97.5	94.2	100.0	59.2	100.0	45.5	100.0	97.4	100.0	100.0	100.0	65.5	95.4	97.9	100.0

Legend: <70% (red), 70% to 100% (yellow), ≥100% (green)

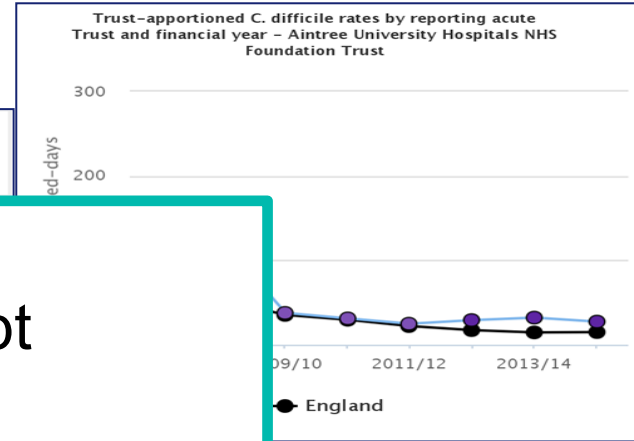
Antibiotic Guardians per 100,000 population per calendar year by CCGs 2015 Crude rate - per 100,000

Area	Count	Value	95% Lower CI	95% Upper CI
England	10,598	19.5	19.1	19.9
South West NHS region	545	17.2	15.8	18.7
NHS Bristol CCG	111	25.1	20.6	30.2
NHS Kernow CCG	84	15.3	12.2	19.0
NHS North Somerset CCG	60	28.8	22.0	37.1
NHS Northern, Eastern And...	136	15.4	12.9	18.2
NHS Somerset CCG	88	16.2	13.0	20.0
NHS South Devon And Torba...	39	14.1	10.0	19.2
NHS South Gloucestershire...	27	9.9	6.6	14.5

Source: Antibiotic Guardian counts and postcodes are extracted from www.antibioticguardian.com and include all healthcare professional, public and education sector pledges. Population estimates are based on ONS mid-year estimates.

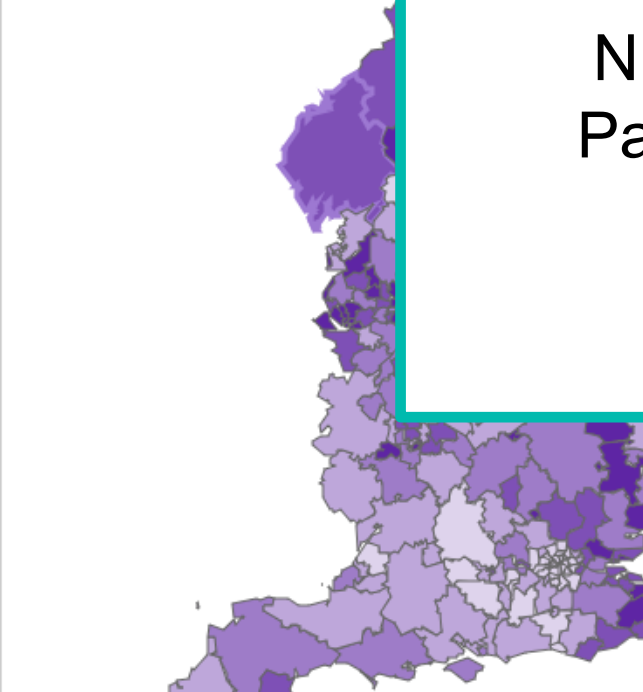
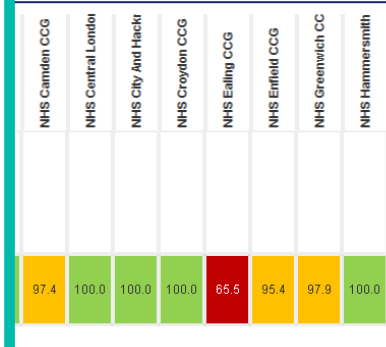


Indicator	Period	Aintree University Hospitals	England
All C. difficile rates by reporting acute Trust and financial year			
Trust-apportioned C. difficile rates by reporting acute Trust and financial year			



Map of CCGs in England for Total number of resident individuals (Crude rate - per 100,000)

PHE HCAI & AMR dept
 AMR PB
 APRHAI
 NHSI AMR and IPC teams
 Participants IPC workshops
 NHS trusts
 CCGs



	Crude rate - per 100,000	95% Lower CI	95% Upper CI
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