Introduction
Carbapenemases are broad spectrum antibiotics reserved for patients who are extremely ill or suspected of having an infection caused by a multidrug resistant organism (Nordmann et al., 2011). Over the past ten years there has been a dramatic increase in resistance to carbapenems, seen worldwide, which is a growing cause for concern (figure 1).

Carbapenemases are enzymes, produced by an array of common Gram-negative organisms, which hydrolyse this class of antibiotic, conferring resistance (Papp-Wallace et al., 2011). The main protagonists are the “big five” carbapenemases, KPC, OXA-48, IMP, VIM and NDM, which have been reported across the UK. However, these reports are often a result of reactive screening, outbreaks, inpatient surveillance and from diagnostic samples. To date, there have been no studies investigating the prevalence of carbapenemase-producing organisms (CPO) in the UK community.

Methods
Sources of samples
This study was performed at Barts Health NHS Trust (BHT), the largest trust in the UK, which serves 2.5 million patients across three London boroughs: Tower Hamlets, Newham and Waltham Forest. A total of 200 non-duplicate sources were included. Patient age, sex and foreign travel history were extracted from the laboratory information management system (LIMS), enabling the identification of potential risk factors for CPO carriage.

Screening method
Screening was performed by transferring a pea-sized portion of stool into nutrient broth and enriching overnight at 37°C. The broth was sub-cultured onto mSuperCARBA (EOlabs, UK) selective medium and incubated for a further 18 - 24 hours at 37°C. Colonies were identified by MALDI-TOF. All identified Enterobacteriaceae, Acinetobacter and Pseudomonas species underwent antibiotic susceptibility testing (AST) by disk diffusion, according to EUCAST guidelines, against meropenem, ertapenem, fosfomycin, mecillinam, amikacin, temocillin and piperacillin-tazobactam. All isolates, regardless of the AST results, were tested for possession of carbapenemase genes using a modified version of a published RT-PCR assay (Zee et al., 2014).

Discussion
PHE guidelines state that patients from high-risk geographical locations such as Bangladesh, India, South East Asia, Italy, Turkey, Greece and Israel are at risk of CPO carriage and infection. At BHT, a significant proportion of our patient population originate from these high-risk locations and 22/46 of our study patients visited them in the last 12 months. However, only one CPO was detected in our community, giving a prevalence of just 0.5%. Furthermore, the CPO was detected in a patient who had travelled to the Caribbean, suggesting that we need to reconsider who is high-risk for CPO carriage and the relevance of national CPO rates, at least at a local level. In addition to foreign travel, previous hospitalisation is also considered a risk factor, however this cannot be determined from this study.

The AST results demonstrate that carbapenem resistance testing cannot be used as the only tool for detecting carbapenemase producers.

Conclusion
Given the low CPO detection rate in this study, it could be expanded to include a larger sample size, which would enable the confirmation of the community prevalence rate observed here. The stool samples used in this study were from patients presenting with a suspected gastrointestinal infection. This could lead to an imbalance of bacteria and, therefore, not be truly representative of the normal gut microbiome of that individual. To overcome this, future work could also include otherwise healthy patients for a more representative sample of the community.

Given the large number of high-risk patients served by BHT (according to PHE guidance), it is reassuring that the prevalence observed here was low.

References