HSC Public Health Agency

agenda

Title of Meeting	109th Meeting of the Public Health Agency Board
Date	21 February 2019 at 1.30pm
Venue	Fifth Floor Meeting Room, 12/22 Linenhall Street, Belfast

standing items

1 1.30	Welcome and apologies		Chair
2 1.30	Declaration of Interests		Chair
3 1.30	Minutes of Previous Meeting held on 20 December 2018		Chair
4 1.30	Matters Arising		Chair
5 1.35	Chair's Business		Chair
6 1.40	Chief Executive's Business		Chief Executive
7 1.50	Finance Report	**PHA/01/02/19**	Mr Cummings

items for approval

8 2.00	Newborn Blood Spot Screening in Northern Ireland Annual Report 2016-2017	**PHA/02/02/19**	Dr Mairs
9 2.15	Northern Ireland Infectious Diseases in Pregnancy Screening Programme Annual Report 2016-2017	**PHA/03/02/19**	Dr Mairs

items for noting

10 2.30	Surveillance of Antimicrobial Use and Resistance in Northern Ireland Annual Report 2018	**PHA/04/02/19**	Dr Mairs
11 2.45	Surveillance of Healthcare-associated Infections in Northern Ireland Annual Report 2017	**PHA/05/02/19**	Dr Mairs

12 3.00	Healthcare-Associated Infections and Antimicrobial Use in Long-Term Care Facilities (HALT3) 2017 survey	**PHA/06/02/19**	Dr Mairs
13 3.15	Gastrointestinal Infections in Northern Ireland Annual Surveillance Report 2017	**PHA/07/02/19**	Dr Mairs

closing items

14 Any other Business
3.30

15 Details of next meeting:

Thursday 21 March 2019 at 1:30pm

Board Room, Gransha Park House, 15 Gransha Park, Clooney Road, Derry / Londonderry BT47 6FN

HSC Public Health Agency

minutes

Title of Meeting	108th Meeting of the Public Health Agency Board
Date	20 December 2018 at 1.30pm
Venue	Fifth Floor Meeting Room, 12/22 Linenhall Street, Belfast

Present

Mr Andrew Dougal	-	Chair
Mrs Valerie Watts	-	Interim Chief Executive
Mr Edmond McClean	-	Interim Deputy Chief Executive / Director of Operations
Dr Adrian Mairs	-	Acting Director of Public Health
Ms Deirdre Webb	-	Children's Services Nurse (*on behalf of Mrs Hinds*)
Councillor William Ashe	-	Non-Executive Director
Mr John-Patrick Clayton	-	Non-Executive Director
Mr Leslie Drew	-	Non-Executive Director
Ms Deepa Mann-Kler	-	Non-Executive Director
Professor Nichola Rooney	-	Non-Executive Director
Mr Joseph Stewart	-	Non-Executive Director

In Attendance

Mr Paul Cummings	-	Director of Finance, HSCB
Ms Marie Roulston	-	Director of Social Care and Children, HSCB
Ms Nicola Woods	-	Boardroom Apprentice
Mr Robert Graham	-	Secretariat

Apologies

Mrs Mary Hinds	-	Director of Nursing and Allied Health Professionals
Alderman Paul Porter	-	Non-Executive Director
Mrs Joanne McKissick	-	External Relations Manager, PCC

124/18	**Item 1 – Welcome and Apologies** Before the commencement of the formal meeting, members received an overview of PHA's campaign programme from Mr Stephen Wilson. Mr Wilson played a video and audio clip of the Antimicrobial Resistance campaign and updated members on the proposed stroke and mental health campaigns.
124/18.1	The Chair welcomed everyone to the meeting. Apologies were noted from Mrs Mary Hinds, Alderman Paul Porter and Mrs Joanne McKissick.

125/18 **Item 2 - Declaration of Interests**

125/18.1 The Chair asked if anyone had interests to declare relevant to any items on the agenda. No interests were declared.

126/18 **Item 3 – Minutes of previous meeting held on 15 November 2018**

126/18.1 The minutes of the previous meeting, held on 15 November 2018, were approved as an accurate record of that meeting, subject to two amendments: the word "reduced" replaced by "increased" in paragraph 117/18.2, and the word "Centre" replaced by "Culture" in paragraph 118/18.11.

127/18 **Item 4 – Matters Arising**

127/18.1 There were no matters arising.

128/18 **Item 5 – Chair's Business**

128/18.1 The Chair thanked members for their good wishes following his recent hip operation, and he thanked Mr Drew for chairing the last meeting of the Board.

128/18.2 The Chair informed members that the NICON 2019 conference is taking place on Thursday 16 and Friday 17 May and any members interested should contact the Secretariat. PHA will cover costs of attendance.

128/18.3 The Chair told members that there had been discussion at PHA's recent Accountability Review meeting about staffing issues and vacancies, and he had drawn attention to the fact that in England a much higher proportion, almost 50%, of public health consultants, were from a purely scientific rather than a medical background.

128/18.4 Ms Mann-Kler said that she would like to revisit how PHA measures the effectiveness of public information campaigns. Mr McClean explained that measures of effectiveness would need to be built in at the planning stage of any campaign. The Chair recounted that the Permanent Secretary had been most emphatic that there should be robust analysis both before and after each campaign. The Chair sought firm assurance that PHA can demonstrate clearly and explicitly the effectiveness of such media expenditure.

128/18.5 Professor Rooney said that from a psychology point of view, she would be interested to learn more about how people's behaviours change as a result of a public information campaign. She agreed to send some literature on the subject to members.

128/18.6 Mr Clayton said that while it is positive that PHA has been able to use funding for campaigns this year, he asked whether there would be much opportunity for doing so again next year. Mr Cummings said that he felt

that there only a small chance of PHA's budget for campaigns being reinstated. He added that if PHA is able to find funding for campaigns through its own initial allocation, then it may be permitted to run one. Mr McClean said PHA looks at evidence from around the world as part of its ground work to look at how, and whether a mass media campaign could influence those that it is trying to reach.

128/18.7 Dr Mairs noted that, in terms of non-medical public health consultants, that all PHA's consultant posts are open to medical and non-medical staff, but that there is no training programme in place for non-medical consultants. He explained that they would have to be trained in PHA, but that Queen's University also offers a Masters in Public Health.

128/18.8 The Chair advised that the ongoing issue regarding problems with the funding of a certain voluntary organisation in County Antrim was raised by the Permanent Secretary. He said that the Permanent Secretary had asked for an assurance that there will be no further delay in resolving this matter.

129/18 Item 6 – Chief Executive's Business

129/18.1 The Interim Chief Executive began her Report with an update on the neurology call back exercise. She reminded member that following the review of 2,500 neurology patients earlier this year, a decision was taken to recall a further 1,044 people and that this further group consists of patients who had been seen by Consultant Neurologist Dr Michael Watt and discharged to the care of their GP.

129/18.2 The Interim Chief Executive explained that this latest review process is being concentrated on specific groups of patients taking specific, specialised medicines, and that of the 1044 people invited as part of this phase of the recall, 456 have been seen and 347 have appointments booked. She added that a further 148 either declined an appointment or no longer need to be seen. She said that it is expected that patients in this phase of the recall will have been seen by February 2019, with the vast majority of people being seen in Belfast Trust, including those who saw Dr Watt in the Ulster Independent Clinic, with a small number being seen in Hillsborough Private clinic, where they had previously seen Dr Watt.

129/18.3 The Interim Chief Executive said she wished to acknowledge the commitment and dedication of staff in the Belfast Trust for progressing this recall in such a well organised yet patient sensitive manner.

129/18.4 The Interim Chief Executive advised that the Department of Health has issued the terms of reference for a Review of Neurology Services. This will be chaired by Dr John Craig, Consultant Neurologist, and have public health and nursing/AHP input from the PHA.

129/18.5 The Interim Chief Executive informed members that an 'Independent

Breast Screening Review' was published by the House of Commons on 13 December following a request by the previous Secretary of State for Health and Social Care in England, Jeremy Hunt, to investigate a serious incident in the English Breast Screening Programme in May 2018, where a large number of women were informed they had not been invited for their final invitation for breast screening. She said that the Review has implications for the PHA and will require a specific work plan to address some of its recommendations, which primarily relate to IT governance and screening governance more generally.

129/18.6 The Interim Chief Executive explained that the main issue identified in the report was ambiguity regarding the age at which women cease to be invited for screening. She said that a service specification document, written in November 2013, stated that women should be invited for screening, "within 36 months of their previous screening, until they reach the age of 71." She went on to explain that this age definition was imprecise and, as a consequence, "did not align with the IT system then in use, and was not consistently implemented by the breast screening units which resulted in a considerable number of women not being invited in accordance with this requirement. She assured members that in Northern Ireland, a more specific 'age definition' is in place, therefore the systems here were not susceptible to the above issue.

129/18.7 The Interim Chief Executive told members that in early December, Deirdre Webb from Nursing in the Public Health Agency, along with Charlotte McArdle, the Chief Nursing Officer joined a group of leaders from Wales and Scotland gave oral evidence to the Health and Social Care Select Committee into the "First 1000 days". She said that the Committee is considering the strong evidence to invest public money much earlier and is considering national strategy, current spending and barriers to investment and local provision.

129/18.8 The Interim Chief Executive advised members that following a recent interview, Dr Gerry Waldron has been appointment on a permanent basis as the Assistant Director of Public Health (Health Protection).

129/18.9 The Interim Chief Executive said that the Permanent Secretary, Richard Pengelly, visited the PHA offices here in Linenhall Street yesterday as part of a round of visits across all HSC organisations. She added that he met with a range of staff in both PHA and HSCB on a directorate basis, and this was followed by a question and answer session. She said that the Permanent Secretary praised the aptitude and dedication of PHA staff and thanked them for their work.

129/18.10 The Interim Chief Executive said that she had also met with the Permanent Secretary last week as she and the Chair had attended the PHA's mid-year Accountability Review meeting.

129/18.11 The Interim Chief Executive advised that in order to continue to support the Winter pressures messaging through Stay Well this Winter, the PHA

has just produced, at the Department's request, a new leaflet tailored for each of the 5 Trust areas. She explained that this contains useful guidance and information about winter illnesses including symptom checker, self-care and accessing local services. She added that the leaflets have been distributed widely to outlets including GP's, Pharmacies, District Council facilities, Libraries and some voluntary/community organisations across Northern Ireland.

129/18.12 The Interim Chief Executive said that PHA will be active on social media over the next couple of weeks featuring a mixture of health promotion messaging relating to the holiday period and the opportunity to use the New Year as a date for changing behaviours e.g. setting a quit date, making small changes to your diet, committing to a more active lifestyle. Finally, she said that PHA's social media channels continue to attract new followers and PHA is delighted to have had significant success with its latest organic videos including falls prevention and button battery harm. She noted that the BBC channel, CBBC have requested permission to feature the button battery video on their website, which is great news given the reach that CBBC has to key audiences.

130/18 Item 7 – Finance Report (PHA/01/12/18)

130/18.1 Mr Cummings advised that the Finance Report for the period up to 31 October 2018 showed a year to date surplus of £1.6m, but that the year-end forecast position remains a break-even one. He said that this surplus will be used to fund additional activities in some areas, and that this work has to be completed by the year end.

130/18.2 Mr Cummings explained that there is an overspend in Trust budgets, but this will be realigned shortly due to funding for Lifeline not having been transferred to the Belfast Trust.

130/18.3 Mr Cummings advised that the underspend in the management and administration budget will continue through to the end of the financial year. With regard to R&D expenditure, he said that there is a slight surplus, but the projection is to break even.

130/18.4 Mr Drew asked about Transformation funding. Mr Cummings advised that there is significant slippage across the HSC with around £20m having to be reallocated. Mr Clayton asked how much Transformation funding had been returned by PHA, and Mr Cummings advised that £545k had been returned.

130/18.5 The Board noted the Finance Report.

131/18 Item 8 – Personal and Public Involvement Update (PHA/02/12/18)

131/18.1 The Chair welcomed Michelle Tennyson, Assistant Director, Martin Quinn, Regional PPI Lead and service user Ms Laura Collins to the

meeting.

131/18.2 Mr Quinn began with a brief overview of recent progress within the field of PPI. He advised that he, along with one of his colleagues, has been part-transferred to the Department of Health to assist with the implementation of the recommendations emanating from the Hyponatraemia Review. He said that PHA has been receiving many requests for PPI assistance as part of the wider Transformation work. He added that PHA has also helped the Department with the development of a consultation scheme. Furthermore, PHA has recently launched a bursary scheme which supports service users and carers who can avail of the scheme to attend courses and conferences. He added that a leadership programme has also been developed, and that this year PHA has received 45 applications for 25 places.

131/18.3 Ms Collins said that she has seen a change in the level of buy-in to PPI, and she thanked the staff for promoting it. She added that more members are signed up to become involved because they can see that it is leading to meaningful engagement. She feels that in Northern Ireland, people should start to be referred to as "patient leaders" or "carer leaders", and that thought needs to be given to be able to empower people, particularly young people, and support them in PPI work.

131/18.4 The Chair thanked Ms Collins for her enduring loyalty and commitment to the principles of PPI.

131/18.5 Ms Mann-Kler thanked the volunteers and staff for the work which they are undertaking. She congratulated Michelle Tennyson on receiving a Churchill fellowship. She said that is great to see the progress PPI is making in work areas such as Hyponatraemia, Encompass, the Reform of Adult Social Care. She asked why this change is happening. Mr Quinn said that people are now beginning to fully understand PPI and their legal obligations with regard to PPI. He said there is also now a realisation that the PHA PPI staff are a finite resource, so there is a need for more PPI champions within HSC organisations. Ms Collins agreed saying that things have moved on from a position of having only the equivalent of half of one person doing PPI for an entire Trust. She said that it is important that people's voices are heard.

131/18.6 Professor Rooney asked whether it is intended to start to remunerate service users for their time. Mr Quinn acknowledged that there are a lot of people who put in a range of effort but once you begin to pay people it changes the dynamic. Ms Collins added that is about co-production, and that the input of lay people has perhaps not been historically tracked, or even recorded in minutes of meetings.

131/18.7 The Chair thanked Ms Tennyson, Mr Quinn and Ms Collins for their contributions. Members noted the update on Personal and Public Involvement.

132/18	**Item 9 – Sexually Transmitted Infection Surveillance in Northern Ireland (PHA/03/12/18)**
132/18.1	The Chair welcomed Dr Neil Irvine to the meeting and invited him to give members an overview of the Sexually Transmitted Infection (STI) surveillance report.
132/18.2	Dr Irvine said that this Report is for the year 2017. He advised that one of the key findings for the Report is that there has been an increase in the number of cases of gonorrhoea, and that this is continuing to increase in 2018, predominately in the men who have sex with other men (MSM) group, but also in heterosexuals. He said that this is a critical issue because the infection is becoming more and more resistant to antibiotics. He explained that there are two antibiotics used to treat gonorrhoea, but that it has become resistant to one of them, and in England, a certain strain of gonorrhoea is showing high levels of resistance to the other. However, he added that there has only been a small number of cases of this strain in Northern Ireland.
132/18.3	In terms of other key findings, Dr Irvine said that there has been an increase in the number of cases of herpes, with an increased risk of transmission of HIV. He added that there has been a decrease in instances of genital warts, which he contributed to the success of the HPV vaccine.
132/18.4	The Chair noted that the number of cases of gonorrhoea has trebled in recent times. Dr Irvine explained that may be due to the rollout of a more sensitive test, and more people being tested.
132/18.5	Mr Clayton said that it was concerning that the figures are increasing, and he asked if PHA should consider a campaign in this area. Dr Irvine said that there was a campaign in 2014 specifically aimed at MSM, and there was a also a general campaign regarding safe sex messaging. He said that it is difficult to change people's behaviour, but that there is a need to make it easier to access testing.
132/18.6	Ms Mann-Kler said that given that gonorrhoea is now becoming more resistant to antibiotics, and that 82% of new cases of STIs is in the 16-34 age group, PHA should be highlighting this issue. Dr Irvine suggested that a campaign could scare people, but he pointed out that the number of cases is quite small.
132/18.7	Mr Stewart said that Report needed an action plan. Dr Irvine was also asked about whether there was an opportunity for discussing these issues on a media platform. Dr Irvine responded saying that when the Report is published, there are messages issued, but there is a perception that the media is not interested in material aimed at MSM. Mr McClean advised that PHA works with the Rainbow Project. He said that it is important to get the key messages out to those who are most at risk, and he highlighted a campaign that was done 10 years ago when

posters were placed in toilets in bars and clubs promoting the safe sex message.

132/18.8 Dr Mairs pointed out that this Report is a surveillance report, but he assured members that actions are taken forward through other pieces of work. Mr Stewart said that it would be helpful to see more details in terms of key findings and actions.

132/18.9 Ms Mann-Kler asked about receiving this information on a more timely basis. Dr Irvine said that there is data published on a quarterly basis and aimed to bring next year's Report sooner as it should be finalised by August.

132/18.10 The Board noted the Sexually Transmitted Infection Surveillance in Northern Ireland report.

133/18 Item 10 – HSC R&D Division Annual Report (PHA/04/12/18)

133/18.1 The Chair welcomed Dr Janice Bailie to the meeting who gave members an overview of R&D work in 2017/18, and some highlights to date for 2018/19.

133/18.2 Dr Bailie said that the Report summarised how R&D used its initial budget allocation, as well as some additional in-year funding, and gave an overview of R&D governance and how Northern Ireland links in with the rest of the UK. In 2018/19, Dr Bailie said that R&D is on target to break even. She added that investment in R&D infrastructure is being reviewed. She added that following the standing down of the Controls Assurance Standards in Research Governance, Professor Ian Young has developed a new template for reporting activity.

133/18.3 Dr Bailie advised that funding for the NICOLA project has been extended for a further 3 years. She said that R&D has access to some funding from the European Commission, but she was not sure what the future of this following Brexit.

133/18.4 The Chair asked how research is evaluated post-research. Dr Bailie explained that when funding for research is being awarded, the overriding criterion is the quality of the research, and the methodology is independently evaluated by a peer review panel. She added that every study had a project plan with aims and deadlines which are monitored by auditors. She advised that annual reports are now inputted into a database called Research Fish, and that to date four years' worth of data are now available through this resource.

133/18.5 Mr Stewart asked what difference R&D is making given an annual investment of £10m. Dr Bailie said that she could compile a report based on the information that has been inputted into Research Fish. The Interim Chief Executive asked when this might be available for Non Executives. Dr Bailie said that she could bring something to the Board

before summer 2019.

133/18.6 The Chair noted that there can be a long lead time between research being commissioned and knowing what outcomes it has led to. Dr Bailie gave an example of a COPD programme that has been put in place by respiratory physiotherapists where a model that is used in Canada was introduced on a trial basis in Northern Ireland, but is now in use across all respiratory services. The Chair said that it is important that stakeholders know about this type of success and that it is celebrated.

133/18.7 Ms Mann-Kler asked about the implications of Brexit in terms of EU funding. Dr Bailie said that the SAPHIRE programme has recently commenced and funding is guaranteed for 3 years. She added that funding is also eligible for Horizon 2020 programmes. She explained that R&D has only recently begun to receive EU funding, and it would be a tragedy to lose the availability of this funding.

133/18.8 Ms Mann-Kler asked if funding could be accessed through strategic joint working. Dr Bailie said that contributions can still be made to Horizon Europe which would allow a certain level of access for Northern Ireland, or the UK can be a "third country" where you pay for your own research, but are eligible to apply for funding.

133/18.9 Mr Drew asked how many people are involved in R&D work across the HSC. Dr Bailie said that the number would be over 200, and in response to a query from Mr Drew about the governance of these posts, she said that for any post that PHA is providing R&D funding to, there is a letter of support to the relevant Trust.

133/1/.10 Members noted the update on Research and Development.

134/18 Item 11 – Public Consultation on the Northern Ireland Diabetic Eye Screening Programme (PHA/05/12/18)

134/18.1 The Chair welcomed Dr Stephen Bergin to the meeting and invited him to speak to members regarding the Diabetic Eye Screening Programme.

134/18.2 By way of background, Dr Bergin advised members that diabetes is becoming a major public health issue as its prevalence has doubled in the last decade. He explained that a leakage in the eye can cause blindness, and therefore early intervention is necessary, hence the need for a screening programme. However, he noted that for the last year, the uptake of this particular programme was not as high as other screening programme with only around 70% of the 60,000 invited attending, and only 51% of those aged between 18 and 30. He added that ideally, individuals should be screened once a year, but this is slipping to once every 16/18 months.

134/18.3 Dr Bergin explained that the current model for delivering the programme, which is overseen by the Belfast Trust, is mixed, and includes both

mobile and fixed sites. He added that there is a fixed site model operating within the Western Trust, and that the Western Trust is the best performing Trust in Northern Ireland in terms of delivering the programme.

134/18.4 Dr Bergin advised members that following a pre-consultation scoping exercise of a number of options, a public consultation exercise will now commence which focuses on 3 options; however the preferred option is one which would see the programme delivered in 22 fixed sites across Northern Ireland. He said that a communications plan has been developed for the consultation exercise, and that there will be consultation events taking place. He said that he would return to the PHA Board with the outcome of the consultation.

134/18.5 Mr Clayton stated that he had an interest in this issue as the outcome of this exercise may impact on some of his trade union members.

134/18.6 Mr Clayton said that the documentation was very clear, but he noted that the pre-consultation suggested a different model to the one being proposed, and asked if this could be challenged. Dr Mairs said that there are issues in terms of the other models being able to deliver the programme as required.

134/18.7 Mr Stewart congratulated Mr Bergin on the development of the options paper and said that he supported the preferred option. He asked how PHA could be confident that the model of 22 fixed sites will improve uptake. Dr Mairs noted that the highest uptake of the programme is in the Western Trust where the fixed site model is in place, but he acknowledged that there could be a downturn if the number of locations for delivering the programme is reduced from 300 to 22. However, he said that the AAA Screening Programme is delivered on 26 sites and has an uptake rate of 84%. Dr Bergin added that in the current model, if an individual misses their annual visit at their local GP practice, they would have to travel to Belfast in order to have the screening. Dr Mairs explained that with the fixed site model, an individual can choose where they wish to attend for screening.

134/18.8 Mr Stewart asked if the capacity to deliver this programme has been assessed. Dr Bergin said there is ongoing engagement with the local commissioning groups (LCGs). Mr Clayton noted that there may be job losses and asked who currently employs the screening staff. Dr Mairs said that they are employed by the Belfast Trust, with the exception of those in the Western Trust area as they are employed by the host Trust. Dr Bergin added that if prevalence rates continue to increase, it may be necessary to employ more screeners. Mr Clayton asked if there has been any engagement with the trade unions. Dr Bergin said that this is scheduled to commence in January 2019.

134/18.9 The Chair asked why there is a preferred model. Dr Bergin explained that this is good practice, but PHA is not trying to influence the

consultation.

134/18.10 Ms Webb suggested that as children may also be screened, there should be an "easy read" version of the consultation.

134/18.11 Members **approved** the public consultation on the Northern Ireland Diabetic Eye Screening Programme.

135/18 Item 12 – Information Governance Strategy incorporating the Information Governance Framework 2018-2022 (PHA/06/12/18)

135/18.1 Mr McClean acknowledged the work of those PHA staff involved in the compilation of this updated Information Governance Strategy. He said that building on this Strategy, there is a need to ensure there is awareness among staff of their obligations, and for staff training and monitoring of same. He added that PHA will continue to work with both HSCB and BSO as and when required.

135/18.2 Members **approved** the updated Information Governance Strategy which incorporates the Information Governance Framework.

136/18 Item 13 – Update from Governance and Audit Committee (PHA/07/12/18)

136/18.1 Mr Drew updated members on the last meeting of the Governance and Audit Committee which took place on 12 December. He said that BSO had provided an update on the most recent audit of Payroll Shared Services, and that although the level of assurance remained "limited", there is a lot of work ongoing.

136/18.2 Mr Drew informed members that the Committee received an update on an ongoing fraud case and were assured that a contingency plan is in place. He said that there is a procurement process currently underway for the appointment of new external auditors, the outcome of which should be known shortly.

136/18.3 Mr Drew advised that two new risks have been added to the Corporate Risk Register, one relating to EU Exit, and the other relating to the difficulties in filling vacant consultant posts.

136/18.4 Mr Drew said that the 2017/18 report in relation to emergency planning had been considered, and although he had some concerns as to how the emergency planning arrangements had been implemented during Storm Ophelia, he was assured that following a de-brief, these issues had been addressed.

136/18.5 Professor Rooney asked about Lifeline and whether the management of the service by the Belfast Trust remains an interim measure. Mr McClean said that it is still an interim service, and that the priority in the short term has been to stabilise the service ahead of a future

	procurement exercise. However, he did not feel that there is a market for this type of service.
136/18.6	Members noted the update from the Governance and Audit Committee.
137/18	**Item 14 – Update from Remuneration Committee (PHA/08/12/18)**
137/18.1	The Chair informed members that the Department of Health has written to HSC organisations regarding senior executive pay and the need for Remuneration Committees and Boards to endorse a 1% increase in pay for 2016/17 based on performance in 2015/16. He advised that the Remuneration Committee had endorsed this.
137/18.2	Members endorsed the decision of the Remuneration Committee.
138/18	**Item 15 – Any Other Business**
138/18.1	The Interim Chief Executive expressed her thanks to all of the Non-Executives for their support to PHA staff in 2018. She wished members a Merry Christmas and a Happy New Year.
138/18.2	The Chair thanked Mr Graham for his highly efficient servicing of the Board of the Agency. On a personal note he commended him for his outstanding support and forbearance. The Chair also paid tribute to the Interim Chief Executive and Executive Directors for their steadfastness in extremely challenging times. The Chair also recorded the fact that Mrs Watts had now continued for more than two years to play a multiplicity of roles.
139/18	**Item 16 – Details of Next Meeting**
	Thursday 21 February 2019 at 1.30pm
	Fifth Floor Meeting Room, 12/22 Linenhall Street, Belfast
	Signed by Chair:
	
	Date: 21 February 2019

Public Health Agency

Finance Report

2018-19

Month 9 - December 2018

PHA Financial Report - Executive Summary

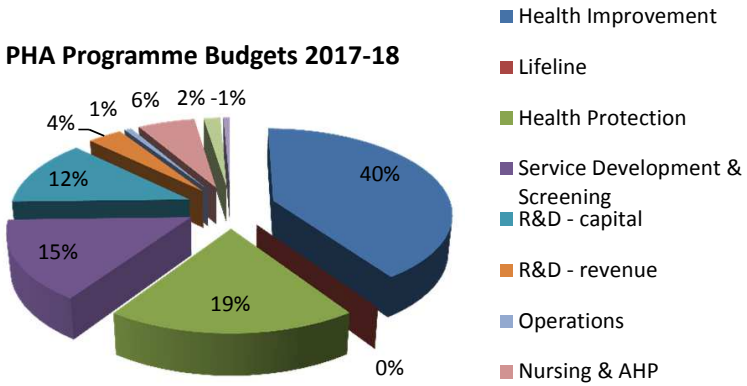
Year to Date Financial Position (page 2)

At the end of month 9 PHA is underspent against its profiled budget by approximately £3.8m. This underspend is primarily within Public Health Programme budgets (page 4), and also includes some underspends on Administration budgets, as shown in more detail on page 5.

This underspend is mainly due to the difficulty of accurately profiling expenditure, particularly within Health Protection. Budget managers are being encouraged to closely review their positions to ensure the PHA meets its breakeven obligations at year-end.

Programme Budgets (pages 3&4)

The chart below illustrates how the Programme budget is broken down across the main areas of expenditure.

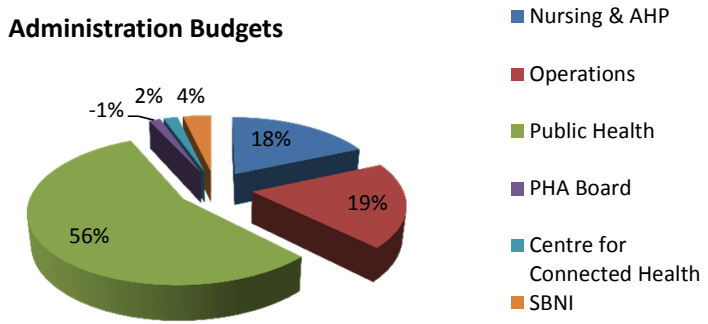


Administration Budgets (page 5)

Approximately half of the Administration budget relates to the Directorate of Public Health, as shown in the chart below.

A significant number of vacant posts remain within PHA, and this is creating slippage on the Administration budget.

Management is proactively working to fill vacant posts and to ensure business needs continue to be met.



Full Year Forecast Position & Risks (page 2)

PHA is currently forecasting a breakeven position for the full year. Slippage is expected to arise from Administration budgets in particular, however management expect this to be used to fund a range of in-year pressures and initiatives. A retraction of £1.7m unspent ringfenced funds, including Confidence and Supply Transformation Funds, has been assumed at month 9.

Public Health Agency
2018-19 Summary Position - December 2018

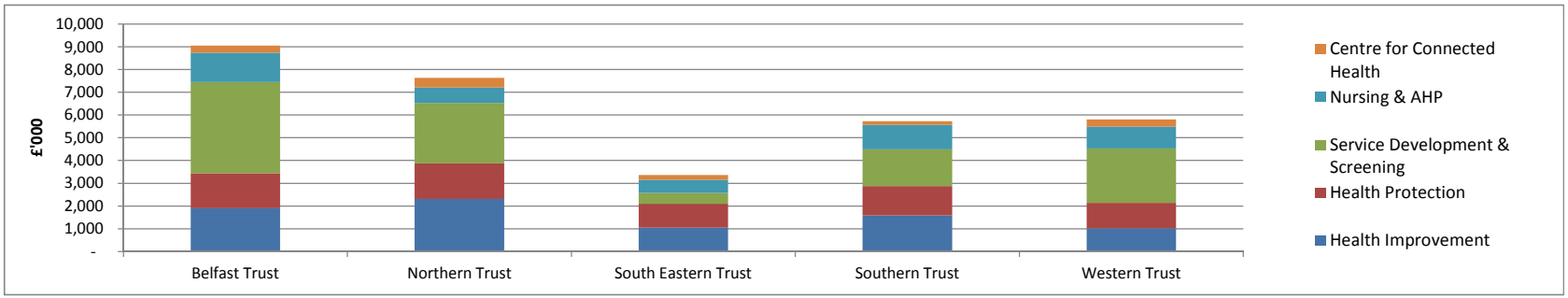
	Annual Budget					Year to Date				
	Programme		Ringfenced	Mgt &	Total	Programme		Ringfenced	Mgt &	Total
	Trust	PHA Direct	Trust & Direct	Admin		Trust	PHA Direct	Trust & Direct	Admin	
	£'000	£'000	£'000	£'000	£'000	£'000	£'000	£'000	£'000	£'000
Available Resources										
Departmental Revenue Allocation	33,462	41,941	8,517	18,989	**102,910**	23,371	29,849	4,224	14,003	**71,446**
Revenue Income from Other Sources	28	309		692	**1,029**	21	309	-	516	**846**
Departmental Allocation Retraction			(1,732)		**(1,732)**					
Total Available Resources	33,490	42,250	6,785	19,681	**102,207**	23,393	30,158	4,224	14,518	**72,292**
Expenditure										
Trusts	31,659	-	3,512	-	**35,171**	25,469	-	2,634	-	**28,103**
PHA Direct Programme *	-	44,851	3,274	-	**48,125**	-	24,828	1,508	-	**26,336**
PHA Administration	-	-		18,912	**18,912**	-	-		14,016	**14,016**
Total Proposed Budgets	31,659	44,851	6,785	18,912	**102,207**	25,469	24,828	4,142	14,016	**68,454**
Surplus/(Deficit) - Revenue	1,831	(2,601)	(0)	769	(0)	(2,077)	5,330	82	502	**3,838**
Cumulative variance (%)						***-8.88%***	***17.67%***	***1.94%***	***3.46%***	***5.31%***

The year to date financial position for the PHA shows an underspend against profiled budget of approximately £3.8m, mainly due to spend behind profile on Health Protection, Health Improvement and Nursing budgets (see page 4), and also a year to date underspend on Administration budgets (see page 5). This is due to the timing of payments only, and it is currently anticipated that the PHA will achieve breakeven for the full year.

An allocation retraction by the DoH for £1.7m (mainly Confidence and Supply Transformation Funds) has been assumed against ringfenced budgets at this point.

** PHA Direct Programme includes amounts which may transfer to Trusts later in the year*

Programme Expenditure with Trusts



Current Trust RRLs	Belfast Trust £'000	Northern Trust £'000	South Eastern Trust £'000	Southern Trust £'000	Western Trust £'000	NIAS Trust £'000	NIMDTA Trust £'000	Total Planned Expenditure £'000	YTD Budget £'000	YTD Expenditure £'000	YTD Surplus / (Deficit) £'000
Health Improvement	1,899	2,314	1,051	1,587	1,019	-	-	**7,870**	5,895	7,627	(1,733)
Health Protection	1,544	1,560	1,048	1,290	1,120	-	-	**6,561**	4,575	4,921	(346)
Service Development & Screening	4,004	2,650	477	1,613	2,392	-	-	**11,135**	8,352	8,352	(0)
Nursing & AHP	1,290	685	579	1,078	956	-	-	**4,588**	3,443	3,441	2
Centre for Connected Health	319	420	204	164	325	-	-	**1,432**	1,074	1,074	(0)
Other	24	13	11	12	11	-	-	**72**	54	54	0
Total current RRLs	**9,080**	**7,641**	**3,370**	**5,744**	**5,823**	**-**	**-**	**31,659**	**23,393**	**25,469**	(2,077)
Cumulative variance (%)											***-8.88%***

	Belfast Trust £'000	Northern Trust £'000	South Eastern £'000	Southern Trust £'000	Western Trust £'000	NIAS Trust £'000	NIMDTA Trust £'000	Total Planned Expenditure £'000	YTD Budget £'000	YTD Expenditure £'000	YTD Surplus / £'000
Ringfenced	**742**	**516**	**732**	**549**	**781**	**89**	**102**	**3,512**	**2,634**	**2,634**	0
											0.00%

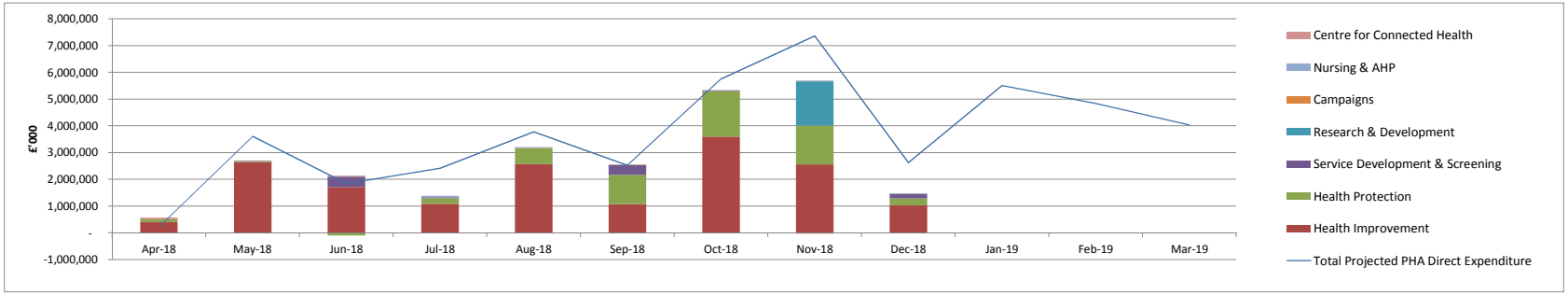
The above table shows the current Trust allocations split by budget area.

The year to date overspend on Trust budgets is primarily due to an outstanding budget transfer to BHSCT for Lifeline Contract (£1.9m year to date effect). The budget is currently held in the PHA Direct budget on page 4, and will be moved to the Trust budget when the IPT is formally agreed.

The Other line relates to general allocations to Trusts for items such as the Apprenticeship Levy and Inflation.

Ringfenced funds allocated to Trusts are currently expected to breakeven.

PHA Direct Programme Expenditure



	Apr-18 £'000	May-18 £'000	Jun-18 £'000	Jul-18 £'000	Aug-18 £'000	Sep-18 £'000	Oct-18 £'000	Nov-18 £'000	Dec-18 £'000	Jan-19 £'000	Feb-19 £'000	Mar-19 £'000	Total £'000	YTD Budget £'000	YTD Spend £'000	Variance £'000	
Projected Expenditure																	
Health Improvement	88	3,053	1,155	2,225	3,121	1,291	2,625	3,941	1,274	2,706	3,545	2,925	**27,946**	18,770	16,694	2,076	*11.1%*
Health Protection	56	347	93	78	446	888	2,960	1,471	1,021	1,069	707	1,147	**10,283**	7,360	5,353	2,007	*27.3%*
Service Development & Screening	18	140	524	74	74	328	130	80	306	48	145	403	**2,271**	1,675	1,327	347	*20.7%*
Research & Development	-	-	-	-	-	-	-	1,648	-	1,563	-	-	**3,211**	1,648	1,652	(4)	*0.0%*
Campaigns	9	9	9	9	9	9	9	24	14	86	292	165	**646**	104	27	77	*-100.0%*
Nursing & AHP	17	17	20	24	130	16	34	199	15	40	155	74	**741**	472	151	322	*68.1%*
Safeguarding Board	-	-	-	-	-	-	-	-	-	-	-	10	**10**	-	-	-	*0.0%*
Centre for Connected Health	40	40	40	8	-	-	-	-	-	-	-	-	**128**	128	64	64	*49.9%*
Other	-	-	-	-	-	-	-	-	-	-	-	(686)	**(686)**	0	(440)	440	*100.0%*
Total Projected PHA Direct Expenditure	**227**	**3,607**	**1,842**	**2,418**	**3,780**	**2,533**	**5,757**	**7,363**	**2,630**	**5,512**	**4,843**	**4,037**	**44,551**	**30,158**	**24,828**	5,330	
Cumulative variance (%)																***17.67%***	
Actual Expenditure	**570**	**2,784**	**2,007**	**1,380**	**3,097**	**2,563**	**5,214**	**5,702**	**1,511**	**-**	**-**	**-**	**24,828**				
Variance	**(343)**	**824**	**(165)**	**1,038**	**683**	**(30)**	**543**	**1,661**	**1,119**				**5,330**				

	Apr-18 £'000	May-18 £'000	Jun-18 £'000	Jul-18 £'000	Aug-18 £'000	Sep-18 £'000	Oct-18 £'000	Nov-18 £'000	Dec-18 £'000	Jan-19 £'000	Feb-19 £'000	Mar-19 £'000	Total £'000	YTD Budget £'000	YTD Spend £'000	Variance £'000
Total Projected Ringfenced PHA Direct Expenditure	**-**	**3**	**19**	**501**	**146**	**(24)**	**373**	**156**	**415**	**71**	**79**	**3,266**	**5,006**	**1,590**	**1,508**	**82**
																5.16%
Actual Expenditure	**-**	**170**	**55**	**299**	**24**	**68**	**279**	**321**	**292**				**1,508**			
Variance	**-**	**(167)**	**(35)**	**202**	**122**	**(92)**	**94**	**(165)**	**123**				**82**			

The budgets and profiles are shown after adjusting for retractions and new allocations from DoH.

The year-to-date position shows a £5.3m surplus, which is mainly due to (i) delays in payments within Health Protection (£2.0m), and (ii) Lifeline funding (£1.9m) remaining in the Health Improvement budget but which is due to transfer to BHSCT. Budget managers are being reminded to closely monitor expenditure against profile to ensure full spend by year-end. The Other line shows a balancing adjustment to reflect the Administration underspend having been issued to Programme budgets to allow PHA to achieve its breakeven obligation for the year.

Non-Trust Ringfenced funds are showing a small underspend at the end of month 9. A breakeven position is anticipated at year end based on an assumed allocation retraction of £1.7m from Confidence and Supply Transformation Funds.

PHA Administration
2018-19 Directorate Budgets

	Nursing & AHP £'000	Operations £'000	Public Health £'000	PHA Board £'000	Centre for Connected Health £'000	SBNI £'000	Total £'000
Annual Budget							
Salaries	3,561	2,605	10,891	173	319	484	**18,033**
Goods & Services	168	1,269	376	35	54	246	**2,148**
Savings target				(500)			**(500)**
Total Budget	**3,729**	**3,874**	**11,267**	**(292)**	**373**	**730**	**19,681**
Budget profiled to date							
Salaries	2,528	1,953	8,168	130	239	363	**13,381**
Goods & Services	120	880	276	(349)	44	166	**1,137**
Total	**2,648**	**2,833**	**8,445**	**(219)**	**283**	**529**	**14,518**
Actual expenditure to date							
Salaries	2,385	1,811	7,829	85	250	259	**12,619**
Goods & Services	163	772	291	0	42	128	**1,397**
Total	**2,548**	**2,583**	**8,120**	**86**	**292**	**387**	**14,016**
Surplus/(Deficit) to date							
Salaries	143	142	339	45	(11)	104	**762**
Goods & Services	(43)	108	(14)	(349)	2	37	**(260)**
Surplus/(Deficit)	**100**	**250**	**325**	**(304)**	**(9)**	**142**	**502**
Cumulative variance (%)	*3.76%*	*8.82%*	*3.84%*	*139.11%*	*-3.24%*	*26.78%*	***3.46%***

A savings target of £0.5m was applied to the PHA's Administration budget in 2018-19. This is currently held centrally within PHA Board, and will be managed across the Agency through scrutiny and other measures.

The year to date salaries position is showing a surplus which has been generated by a number of vacancies during the year. Senior management continue to monitor this closely in the context of PHA's obligation to achieve a breakeven position for the financial year. SBNI budget is ringfenced and any underspend will be returned to DoH prior to year end.

December 2018

Public Health Agency
2017-18 Capital Position

	Annual Budget				Year to Date			
	Programme				Programme			
	Trust	PHA Direct	Mgt & Admin	Total	Trust	PHA Direct	Mgt & Admin	Total
	£'000	£'000	£'000	£'000	£'000	£'000	£'000	£'000
Available Resources								
Capital Grant Allocation & Income	6,890	4,261	-	**11,151**	5,167	2,442	-	**7,609**
Expenditure								
Capital Expenditure - Trusts	6,890			**6,890**	5,167			**5,167**
Capital Expenditure - PHA Direct		4,261		**4,261**		1,610		**1,610**
	6,890	4,261	-	**11,151**	5,167	1,610	-	**6,777**
Surplus/(Deficit) - Capital	-	-	-	-	-	832	-	**832**
Cumulative variance (%)					*0.00%*	*34.09%*	*0.00%*	***10.94%***

PHA has received a Capital budget of £11.2m in 2018-19, most of which relates to Research & Development projects in Trusts and other organisations. A surplus of £0.8m is shown for the year to date, and a breakeven position is anticipated for the full year.

PHA Prompt Payment

Prompt Payment Statistics

	December 2018 Value	December 2018 Volume	Cumulative position as at 31 December 2018 Value	Cumulative position as at 31 December 2018 Volume
Total bills paid (relating to Prompt Payment target)	£6,054,222	384	£33,939,959	3,896
Total bills paid on time (within 30 days or under other agreed terms)	£5,789,349	343	£33,395,659	3,691
Percentage of bills paid on time	**95.6%**	**89.3%**	**98.4%**	**94.7%**

Prompt Payment performance for the year to date shows that on value the PHA is achieving its 30 day target of 95.0%, although the volume percentage dipped slightly in December. PHA is making good progress on ensuring invoices are processed promptly, and efforts to maintain this good performance will continue for the remainder of the year.

The 10 day prompt payment performance remained strong at 93.2% by value for the year to date, which significantly exceeds the 10 day DoH target for 2018-19 of 60%.

HSC Public Health Agency

item 8

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Newborn Blood Spot Screening in Northern Ireland Annual Report 2016-2017
Reference	PHA/02/02/19
Prepared by	Newborn Screening team
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☒ For **Noting** ☐

1 Purpose

This report, the first annual report of the Northern Ireland Newborn Blood Spot Screening Programme (NBSP), summarises the performance of the programme against key standards for the financial year 2016-17.

The report is being presented to the PHA Board for approval.

2 Background Information

Under PHA's Corporate Plan Objective 1, "All children and young people have the best start in life", there is a target that PHA will "introduce and develop antenatal and new-born screening programmes in line with the recommendations of the national and local screening committees". Part of PHA's work in this area is to produce an annual report.

The NBSP in Northern Ireland offers all newborn babies a blood spot screening test to identify if they are at increased risk of five rare, but serious, inherited conditions. The aim of the programme is to improve the outcomes for babies born with one of these conditions, which can cause critical illness, severe disability and death, by achieving early diagnosis and treatment.

Throughout the United Kingdom, NBSP performance is monitored against national standards, which promote safety and quality within the programme.

3 Key Issues

The most recently published national report (2016-17), which describes performance against national standards in each region of the UK, shows that the NBSP in Northern Ireland is of high quality and performing well.

Regional and national data relating to the Northern Ireland NBSP highlight that in 2016-17:

- In terms of coverage, >98% of 'born and resident' babies in Northern Ireland had a conclusive screening result for each of the five conditions recorded on the child health system by 17 days of age.
- NI was the best performing UK region in relation to timing of sample collection and processing, with 98.3 % of samples collected between 5-8 days of age, and 99.5% of samples received in the newborn screening laboratory within 4 working days of collection.
- 100% of positive screening results (for PKU, CHT and MCADD) were available, and clinical referral had been initiated, within 3 days of the sample being received by the screening laboratory.
- In relation to timeliness of receipt into clinical care, the programme in NI exceeded acceptable national standards. NI was also the only region of the UK to meet the achievable standard for timeliness of first appointment for CF screen positive babies with 2 mutations, with 100% of babies seen by 28 days.
- Over 23,000 babies had newborn blood spot screening testing. In total, across all of the five conditions tested for, 44 babies were identified as screen positive and 32 of these babies were confirmed as having one of the conditions.

At a national level, meeting the standard (acceptable = ≤2%; achievable = ≤0.5%) in relation to 'avoidable repeats' has proved challenging since the introduction of the programmes, and variation exists across the UK. An avoidable repeat refers to a sample that has not met the required quality standard to be accepted by the laboratory for analysis, e.g. an insufficient quantity of blood may have been collected and the laboratory will request a repeat sample.

In Northern Ireland the avoidable repeat rate was 4.39% in 2016-17. The regional NBSP Quality Improvement (QI) group continues to work to understand and reduce avoidable repeats.

4 Next Steps

This finalised report will be published and publically available on the PHA website.

The 2017-18 annual report will be produced by June 2019.

Newborn Hearing Screening in Northern Ireland

Annual Report 2016 - 17

HSC Public Health Agency

Newborn Hearing Screening Programme

CONTENTS:

Executive Summary

Background

One to two babies in every 1,000 is born with a hearing loss in one or both ears[1]. Research studies have demonstrated the importance of detecting a hearing loss as early as possible. The Newborn Hearing Screening Programme (NHSP) is offered to all babies, who are born or resident in Northern Ireland, up to 6 months of age. The aim of the screening programme is to identify babies with who have a significant permanent childhood hearing loss[2] to allow early referral, diagnosis and intervention. Early detection and effective interventions result in improved outcomes for children. This is the first annual report of the Northern Ireland NHSP and summarises the performance of the programme from 1st April 2016- 31st March 2017.

Programme Delivery

The NHSP is commissioned and quality assured by the Public Health Agency (PHA) in collaboration with the five Health and Social Care Trusts (HSCTs) in Northern Ireland, who manage and deliver the programme. It is a complex programme involving a wide range of professional staff including local newborn hearing screening co-ordinators, hearing test screeners, child health system staff, midwives, paediatric staff, neonatal and special care baby unit staff, health visitors, community and hospital audiology and ear, nose and throat (ENT) specialist staff.

[1] PHA Your baby's hearing screen NINHSP Information for parents accessed via: https://www.publichealth.hscni.net/sites/default/files/ENGLISH%20%20L1%20%20Your%20Baby%27s%20Hearing%20Screen%20%28Well%20Baby%29.pdf

[2] 'NHSP defines this as a bilateral permanent hearing loss averaging ≥ 40dBnHL across 0.5 to 4kHz". Sutton et al Guidelines for surveillance and audiological referral of infants & children following the newborn hearing screen, July 2012.

Screening tests

The programme follows two separate screening protocols (outlined in detail in appendices 1 and 2) depending on whether a baby has been in a neonatal/special care baby unit for more than 48 hours prior to screening.

There are also two types of hearing screening tests provided. The type of test that a baby requires and is offered will depend on (a) which screening protocol is applicable (see appendix 1 and 2) and (b) the results of their initial test if they have been following a well baby/early discharge protocol.

Key developments

During 2016-17 there were a number of developments within the NHSP, most notably scoping the potential to procure a regional managed IT service to support the programme and enhance current data processing and quality assurance practice.

Headline results

The key highlights of the NHSP during 1st April 2016 – 31st March 2017 include that:

- There were 23,936 'current residents' (i.e. babies) eligible for screening. Of these:
    - 99.6% (23,830) were offered screening
    - 96.8% (23,167) completed screening by the age of 4 weeks; this increased to 98.9% (23,675) by 3 months
    - 2% (467) were referred by the age of 3 months to audiology services for diagnostic assessment.

In relation to 'live births' in hospitals in Northern Ireland during the same period:

72.9% (17,577/24,127) of babies had their hearing screening test completed before discharge from hospital.

BACKGROUND

Screening is defined as 'the process of identifying healthy people who may have an increased chance of a disease or condition and offering them information, screening tests and, if required, further confirmatory (diagnostic) tests and treatment'[3]. The aim of screening is to reduce the problems and complications associated with the underlying disease / condition.

Following the recommendation from the UK National Screening Committee (UKNSC) that a national neonatal hearing screening programme should be established, the Northern Ireland Newborn Hearing Screening Programme (NHSP) was launched in October 2005.

Hearing screening is offered to all babies, who are born or resident in Northern Ireland, up to 6 months of age (i.e. from birth (day 0) until day 182 of life inclusive). This is the first annual report of the Northern Ireland NHSP and summarises the performance of the programme from 1st April 2016- 31st March 2017.

Aim of newborn hearing screening

One to two babies in every 1,000 is born with a hearing loss in one or both ears. Research studies have demonstrated the importance of detecting a hearing loss as early as possible. The aim of the NHSP is to identify babies who have a significant permanent childhood hearing loss[4], i.e. a bilateral hearing loss of 40

[3] PHE Screening explained https://www.gov.uk/guidance/nhs-population-screening-explained

[4] 'NHSP defines this as a bilateral permanent hearing loss averaging ≥ 40dBnHL across 0.5 to 4kHz" Sutton et al *Guidelines for surveillance and audiological referral of infants & children following the newborn hearing screen*, July 2012.

dBnHL or more[5], in order to detect permanent childhood hearing impairment (PCHI) at the earliest stage, ideally within 4 weeks of birth. This allows timely referral, diagnosis and intervention. Early detection and effective interventions result in improved outcomes for children, in particular, normal speech and language development.

Programme delivery

In Northern Ireland the NHSP is commissioned and quality assured by the Public Health Agency (PHA) in collaboration with the five Health and Social Care Trusts (HSCTs), who manage and deliver the programme. It is a complex programme involving a wide range of professional staff including local newborn hearing screening co-ordinators, screeners, Child Health System staff, midwives, paediatric staff, neonatal and special care baby unit staff, health visitors, community and hospital audiology and ear, nose and throat (ENT) specialist staff.

Screening pathway

Offer of screening

All babies resident in Northern Ireland (including those born in or who have moved in to NI) are offered screening from over 34 weeks gestational age up until the age of 6 months[6].

Exclusions

For some babies hearing screening can be inappropriate if the infant has a condition, including atresia, bacterial meningitis or temporal bone fracture, which requires direct referral for diagnostic testing, or if the infant is receiving palliative care and screening is not therefore indicated.

[5] Davis A, Bamford J, Wilson I, Ramkalawan T, Forshaw M - A critical review of the role of neonatal hearing screening in the detection of congenital hearing impairment. Health Technol Assess 1997;1(10)

[6] 6 months is defined as day 182 of life, with birth being day 0

Screening protocols and tests

The programme follows two separate screening protocols (outlined in detail in appendices 1 and 2) depending on whether a baby has been in a neonatal/special care baby unit for more than 48 hours prior to screening. This is because babies who have spent at least 48 hours in a special care unit have a slightly increased risk of hearing loss. Whilst About 1 in every 900 babies has hearing loss in one or both ears, this increases to about 1 in every 100 babies who have spent at least 48 hours in a special care unit[7].

There are also two types of hearing screening tests provided. The type of test that a baby requires and is offered will depend on (a) which screening protocol is applicable (see appendix 1 and 2) and (b) the results of their initial test if they have been following a well baby/early discharge protocol.

A baby's newborn hearing screening test is often conducted prior to discharge from hospital, but can also be performed following discharge at an outpatient clinic. The screening tests are described below.

- Automated Otoacoustic Emission (AOAE)

An **AOAE** test involves placing a small soft tipped earpiece in the outer part of a baby's ear to send clicking sounds to the inner ear. Using a computer, the screener carrying out the test can detect how the baby's inner ear responds to sound. The test causes no discomfort to the baby and is often conducted while they are asleep. This test measures the mechanical function of the inner ear. In the cochlea, when a noise is heard, acoustic energy is generated which will cause vibration of hair cells in the inner ear (these are known as otoacoustic

[7] PHE *Babies in special care units: screening tests for you and* your babies (Information leaflet) accessed at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712824/NICU1_Babies_in_special_care_units_Screening_tests_for_you_and_your_baby.pdf

emissions). The AOAE test screens for these otoacoustic emissions. All babies are offered this test.

- Automated Auditory Brainstem Response (AABR)

An **AABR** is a different type of test. Rather than measure acoustic energy within the inner ear, it measures electrical brain activity. This screening test involves placing small sensors on a baby's head, shoulder and nape of the neck. Soft headphones are placed over baby's ears and a series of clicking sounds are played. A computer measures how baby's ears respond to these sounds. This test is usually not required for all babies.

Referral

Depending on the results of these screening tests, a child may require referral for further specialist assessment by audiology services. This is to confirm a diagnosis and allow timely follow up and treatment if required.

Hearing loss

It is, however, important to remember that no screening test is 100% accurate and also that hearing loss can occur at any stage of life. It is therefore important that parents remain vigilant for any changes or concerns regarding their child's hearing.

A developmental checklist (see appendix 3) is shared with parents via the Personal Childhood Health Record (PCHR), to encourage monitoring of their baby's hearing throughout the early stages of life. Should a parent/guardian have any concern about hearing, this can be discussed with the health visitor or GP

Risk factors and 'targeted' follow up

As outlined above, hearing loss can occur at any time in childhood, even in the absence of specific risk factors. The prevalence of hearing loss is higher among infants who have one or more of the following known risk factors:

Congenital Infection	Proven or possible congenital infection due to toxoplasmosis, rubella, cytomegalovirus (CMV) or herpes as determined by TORCH[8] screen, and notified at any age.
Craniofacial Anomalies	A (noticeable) craniofacial anomaly (excluding minor pits and ear tags) at any age, e.g. cleft palate.
Syndrome	Confirmed syndrome related to hearing loss, e.g. Down's syndrome.
NNU[9] protocol results	Bilateral clear response at AABR and the infant has not acquired a clear response in at least one ear at AOAE.

At the time of newborn hearing screening, a child identified as having one or more of these known, nationally agreed, risk factors for hearing loss, is referred for a further hearing assessment at the age of 8 months, regardless of their hearing screening result.

[8] a TORCH screen is a blood test used to screen for a number of infectious diseases that are known by the acronym TORCH – Toxoplasmosis, Other agents (including syphilis and HIV), Rubella, Cytomegalovirus and Herpes simplex

[9] NNU = neonatal unit

Failsafe

A failsafe is a back-up mechanism which, in addition to usual care, ensures that if something does not go to plan in the screening pathway, the back-up process identifies what has happened and initiates appropriate action.

The NHSP includes a robust mechanism to capture babies who have not been offered, or taken part, in screening. This failsafe 'mop up' report identifies all babies from age 14 days until age 182 days (i.e. for the duration of the programme) with a nil or inconclusive result. The report is run each week by the NHSP Coordinator in each Trust, using the Child Health Information System. Once a baby has been identified on this list, their parent/guardian will be contacted to offer a screening hearing test.

Key developments 2016-17

During 2016-17 there were a number of developments within the NHSP, most notably scoping out the potential to procure a managed regional IT service to support the programme and enhance current data processing and quality assurance practice. Currently, results from screening tests are recorded on handwritten daily worklists which are input into the Child Health System.

The screening programme has identified the considerable advantages associated with a bespoke IT infrastructure that would reduce the need for manual entry of data. An electronic mechanism would facilitate an automated capture and retention of NHSP screening results. This would support patient management and allow data reporting against national standards, which is limited at present. Significant business processes to procure this system occurred during 2016-17, including engagement with regional stakeholders and service providers in order to shape the implementation of this complex system.

The programme also continues to utilise published information from the 'Northern Ireland Health and Social Care Interpreting Service' as a guide to

ensure that the most up-to-date translated leaflets are provided to service users. Translated leaflets are currently available in multiple languages.

Programme performance 2016-17

The NHSP routinely collects and collates data to measure and monitor programme performance. The procurement of a managed IT service will improve the data reports that can be produced, including in relation to timeliness of diagnostic assessment and outcomes in line with national standards.[10]

Programme data

- Cohort: data is produced on the offer, uptake and outcome of newborn hearing screening of:
    - 'Livebirths' before discharge from hospital and
    - 'Current residents'
- Key definitions:
    - 'Livebirths' – this includes all babies who were born alive in hospitals in Northern Ireland from 1st April 2016 to 31st March 2017.
    - 'Current residents' – this includes all babies who were:
        - born between 1st April 2016 and 31st March 2017 and
        - were resident in Northern Ireland, at some point, between 1st April 2016 and 31st March 2017.
    - The current resident cohort may include babies who were not born in hospital, or who were born outside

[10] PHE NHS Newborn Hearing Screening Programme Standards 2016 to 2017 available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685452/NHSP_Standards_2016_-_17.pdf

Northern Ireland and moved into Northern Ireland within the first six months of life. It may also vary from the total number of 'live births' as children may have been born in Northern Ireland hospitals but moved out of Northern Ireland.

- *Source*: Data on the performance of the programme is provided by the Child Health System (CHS). There are four CHS areas in Northern Ireland and these collectively cover the five health and social care trust geographies, i.e. Eastern (Belfast Health and Social Care Trust and South Eastern Health and Social Care Trust), Northern (Northern Health and Social Care Trust), Southern (Southern Health and Social Care Trust) and Western (Western Health and Social Care Trust).

- *Frequency of reporting*: data is produced quarterly to cover the periods April to June, July to September, October to December and January to March. The reports that produce the data for a given quarter are run four months after the end of a quarter.

- *Methodology*: the annual figures included in this report have been calculated by summing the figures in each quarter.

Headline results

Regional data relating to the NI Newborn Hearing Screening Programme highlights that from 1st April 2016 – 31st March 2017:

- There were 23,936 'current residents' eligible for screening. Of these:
    - 99.6% (23,830) were offered screening
    - 96.8% (23,167) completed screening by the age of 4 weeks; this increased to 98.9% (23,675) by 3 months

- 2% (467) were referred by the age of 3 months to audiology services for diagnostic assessment.

In relation to 'live births' in hospitals in Northern Ireland during the same period:

- 72.9% (17,577/24,127) of babies had hearing screening completed before discharge from hospital**.**

Trends in data

Figure 1 shows that in 2016-17, as in 2014-15 and 2015-16, over 99% of current residents were offered hearing screening and 98.9% had completed screening by 3 months of age. As outlined above, babies may decline screening, or in some instances screening may not be appropriate.

Figure 1: Proportion of 'current residents' in NI offered newborn hearing screening and completion rates by 4 weeks and 3 months of age 2014-17

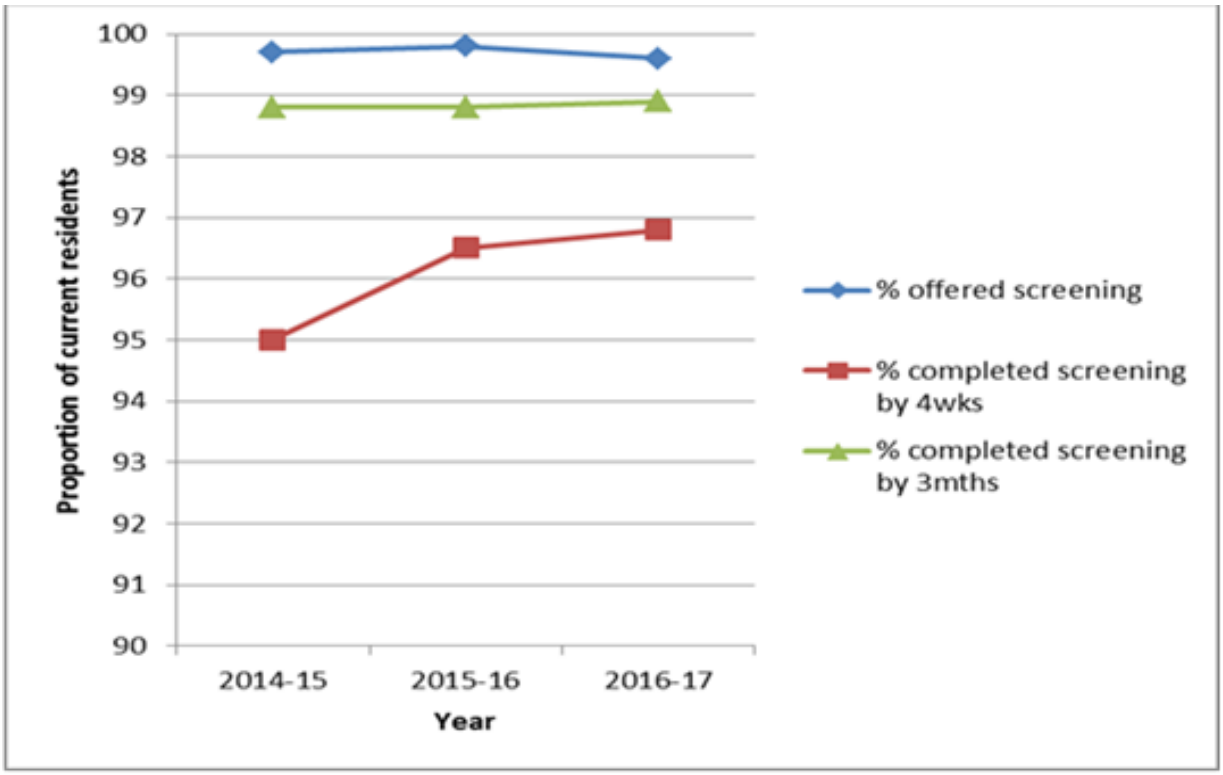


Table 1: Proportion of 'current residents' in NI offered newborn hearing screening and completion rates by 4 weeks and 3 months of age 2014-17

Year	Number of current residents	No. offered screen	% offered	No. completed by		% completed by	
				4 wks	3mths	4wks	3mths
2014-15	24149	24073	99.7	22944	23859	95.0%	98.8%
2015-16	24190	24130	99.8	23340	23901	96.5%	98.8%
2016-17	23936	23830	99.6	23167	23675	96.8%	98.9%

Table 2 shows that from 2014-2017 there has also been a consistently high proportion of current residents (>98%) who have completed screening by 3 months of age. Of these, approximately 2% per year require referral to audiology services for further testing following the result of their screening test.

Table 2: Proportion of 'current residents' in NI with screening outcome (bilateral clear response or referral for ABR) by 4 weeks and 3 months of age 2014-17

Year	**Number of current residents**	**by 4 weeks**			**by 3 months**		
		% completed	**% with BCR**	**% referred**	**% completed**	**% with BCR**	**% referred**
2014-15	24149	95.0% (22944)	93.1% (22482)	1.9% (462)	98.8% (23859)	96.7% (23351)	2.1% (508)
2015-16	24190	96.5% (23340)	94.5% (22856)	2.0% (484)	98.8% (23901)	96.7% (23390)	2.1% (511)
2016-17	23936	96.8% (23167)	95.0% (22730)	1.8% (437)	98.9% (23675)	97.0% (23208)	2.0% (467)

Data from 2014-17 (table 3) also indicates that >70% of babies born alive in hospitals in Northern Ireland per year completed hearing screening before discharge from hospital.

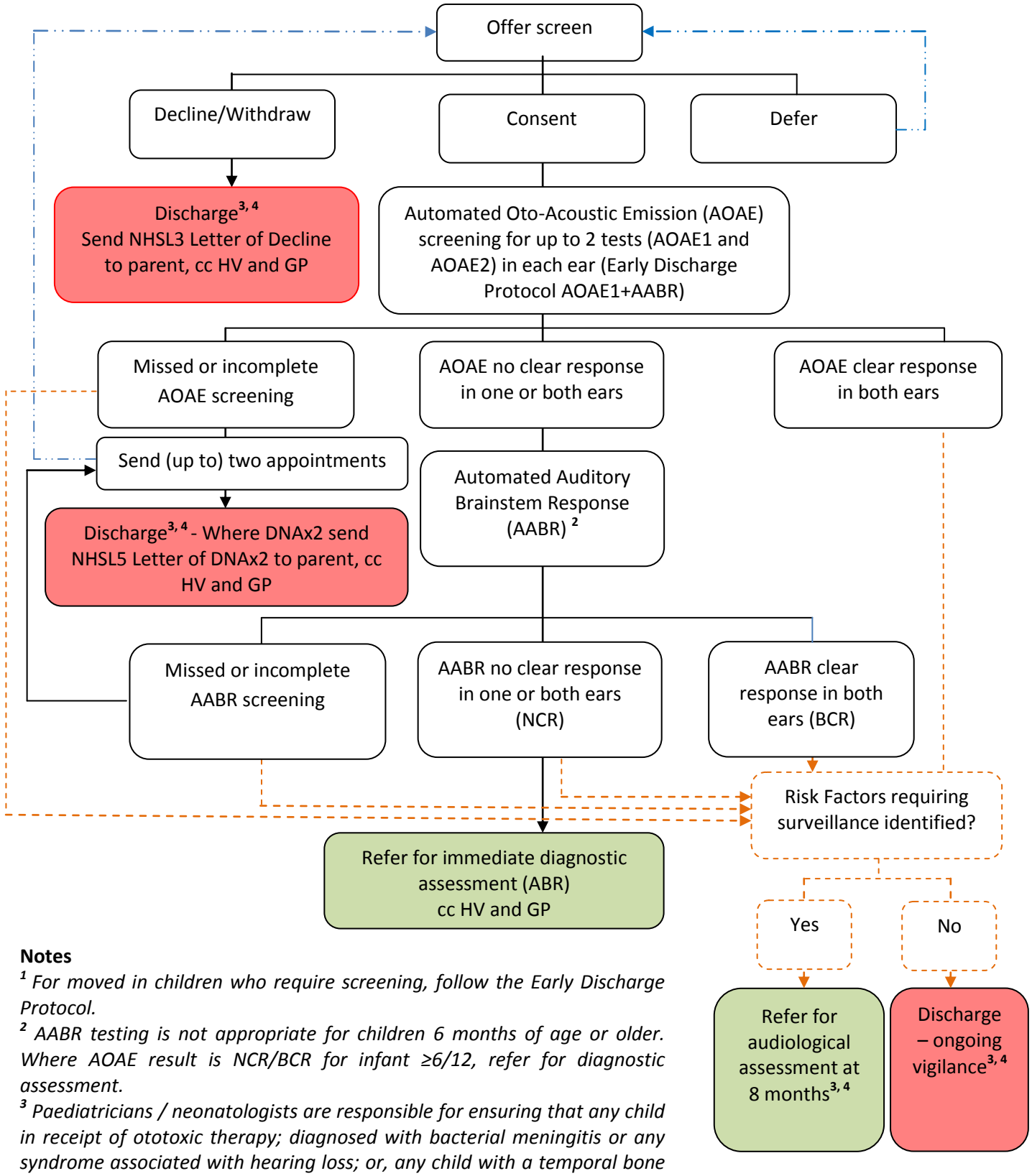
Table 3: Proportion of 'livebirths' in NI offered and completed hearing screening before discharge from hospital 2014-17

Year	Number of livebirths	No. completed screen before discharge	% completed screen before discharge
2014-15	24438	17574	71.9%
2015-16	24480	17786	72.7%
2016-17	24127	17577	72.9%

Appendix 1: Northern Ireland Newborn Hearing Screening Programme

Well Baby / Early Discharge Protocol - Patient Journey

Residents (including moved in children) up to 6 months of Age[1]



Notes

[1] For moved in children who require screening, follow the Early Discharge Protocol.

[2] AABR testing is not appropriate for children 6 months of age or older. Where AOAE result is NCR/BCR for infant ≥6/12, refer for diagnostic assessment.

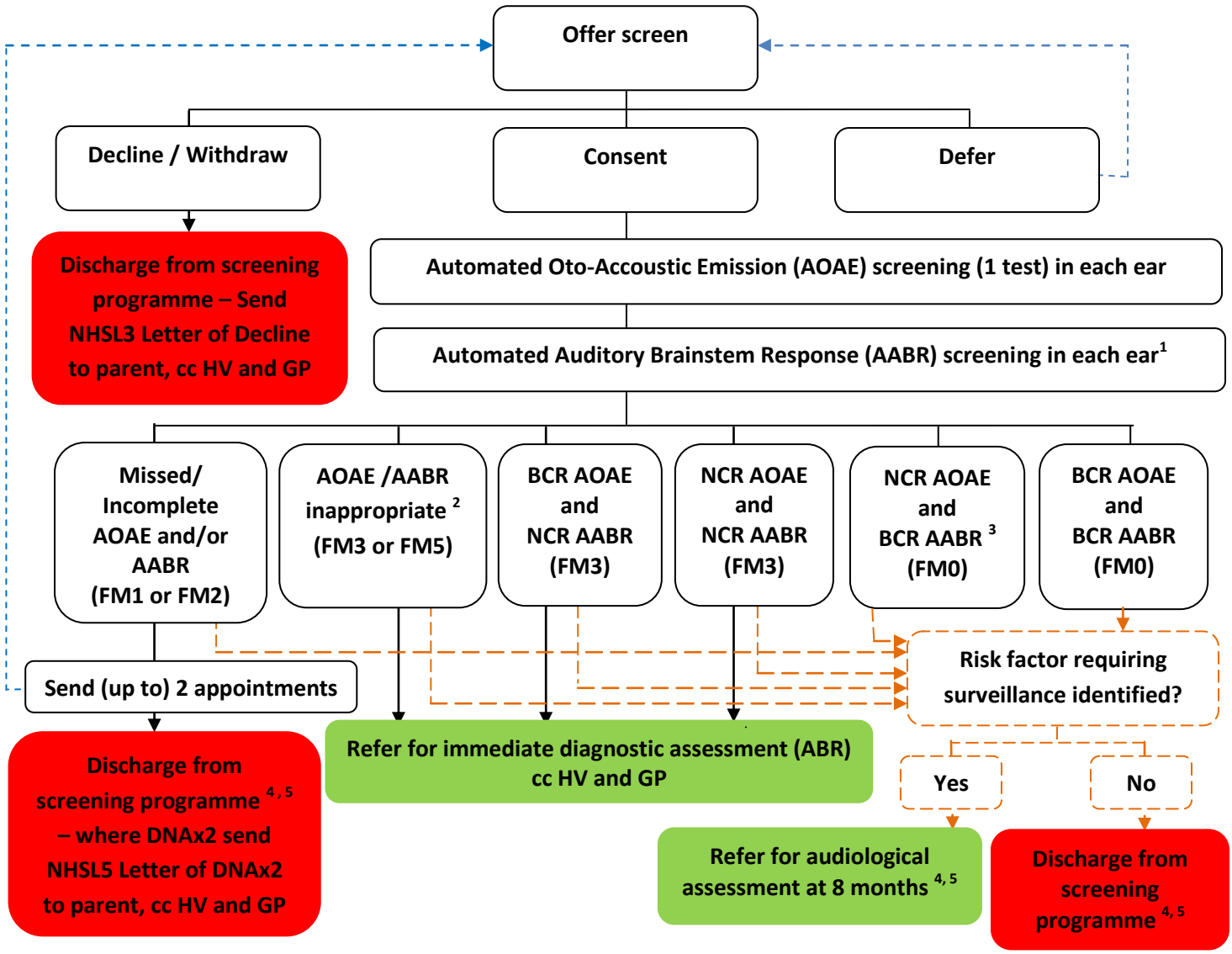
[3] Paediatricians / neonatologists are responsible for ensuring that any child in receipt of ototoxic therapy; diagnosed with bacterial meningitis or any syndrome associated with hearing loss; or, any child with a temporal bone fracture is referred immediately for diagnostic assessment (irrespective of whether newborn hearing screening has taken place or the results of newborn hearing screening).

[4] Children should be referred for appropriate audiological assessment where there is any parental or professional concern.

Appendix 2: Northern Ireland Newborn Hearing Screening Programme

NICU/SCBU (> 48hrs) Protocol – Patient Journey

Residents (including moved in infants) up to 6 months of age



Notes

[1] *AABR testing is not appropriate for children who are 6 months of age or older. Where an AOAE result is NCR and the child has reached 6 months of age or older, refer for diagnostic assessment.*

[2] *Screening can be inappropriate because an infant has a condition, e.g. atresia, and requires direct referral for neurological ABR testing (FM3), or where an infant is receiving palliative care and screening is not indicated and referral for ABR is not required (FM5). Where (FM3) infants are seen by screeners before referral, risk assessment should be carried out, but risk factors should not be assessed where an infant is receiving palliative care (FM5).*

[3] *This outcome is Risk Factor 10 and infants are automatically referred for audiological assessment at 8 months.*

[4] *Paediatricians / neonatologists are responsible for ensuring that any child in receipt of ototoxic therapy; diagnosed with bacterial meningitis or any syndrome associated with hearing loss; or, any child with a temporal bone fracture is referred immediately for diagnostic assessment (irrespective of whether newborn hearing screening has taken place or the results of newborn hearing screening).*

[5] *Children should be referred for appropriate audiological assessment where there is any parental or professional concern.*

Screening Outcomes: BCR – clear response achieved in both ears; or
NCR – no clear response in one or both ears

Further Management Codes: FM0 – no further action;
FM1 – for first screen;
FM2 - for further screen;
FM3 – refer for ABR test (to diagnostic audiology); and,
FM5 – not indicated

Appendix 3

YOUR BABY'S DEVELOPMENT (HEARING, SPEECH AND LANGUAGE)

Extracted from the Northern Ireland Personal Child Health Record (PCHR – 'red book') for translation of newborn hearing screening programme information. The full version of 'Your Baby's Development' is available within the PCHR, pages 10-14 (revised 2014).

Birth to 8 weeks

- Is startled by sudden loud noises, e.g. a hand clap or a door slamming.
- Blinks or opens eyes widely, stops sucking or starts to cry at loud noises.
- Pauses, appears to listen and may turn towards sudden ongoing sounds when they begin, e.g. a vacuum cleaner.

9-16 weeks

- Quietens or smiles to familiar voices even when unable to see speaker. Turns eyes or head towards voice. Shows excitement at sounds, e.g. voices, footsteps.
- Makes soft sounds when awake. Gurgles and coos.

5-9 months

- Makes laughter-like and sing-song sounds. e.g. 'a-a', 'muh', 'goo', 'der', 'aroo', 'adagh'.
- Turns immediately to familiar voices across the room or to very quiet noises on each side (if not too occupied with other things).
- Listens closely to familiar everyday sounds and looks for very quiet sounds made out of sight. Makes sounds to show friendliness or annoyance.
- Babbles, e.g. 'da da da', 'ma ma ma', 'ba ba ba'. Shows pleasure in babbling loudly and tunefully in response to others. Starts to copy other sounds like coughing or smacking lips.

9-12 months

- Shows some response to own name.

- Babbles loudly, often making sounds with rhythm that sound like a simple conversation.
- Responds to words like ‘no’ and ‘bye bye’ even when the speakers gestures cannot be seen.
- Waves ‘bye bye’ and claps hands.
- Around 12 months, may use 1 or 2 words.

1-2 years

- Around 15 months, makes lots of speech like sounds. Uses 2-6 words correctly that you understand, e.g. ‘teddy’ when seeing or wanting a teddy bear.
- Around 18 months, when playing, makes speech-like sounds with rhythm that sound like a simple conversation. Uses 6-20 words that you understand. Follows simple instructions, e.g. ‘show me your shoes’.
- Finds and points to pictures in books by using words ‘look’ and ‘see’. Turns pages one at a time.
- Around 24 months, uses 50 or more words correctly that you understand. Puts 2 or more words together to make simple sentences, e.g. ‘more milk’. Joins in nursery rhymes and songs. Talks to self during play – speech may be unclear to others.

2-3 years

- Around 30 months, uses 200 or more words that you understand. Uses pronouns, e.g. ‘I’, ‘me’ and ‘you’. Uses sentences but many will lack adult structure. Talks to self during play. Asks questions. Says a few nursery rhymes.
- Around 36 months, uses a large number of words – speech is clear to familiar listeners.

3-5 years

- Speech is clear to unfamiliar listeners. Around 4-5 years, talks in sentences, where words and grammar are mostly in the correct order.

References: B. McCormick, Children's Hearing Assessment Centre, Nottingham, UK – 'Can Your Baby Hear You?' (1982)
Mary D. Sheridan – 'Birth to Five Years' (1997)

Other translations of this leaflet are available to view/download at:

https://www.publichealth.hscni.net/publications/newborn-hearing-screening-english-and-translations

Reproduced by the Northern Ireland Newborn Hearing Screening Quality Management Group

January 2015

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item 9

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Northern Ireland Infectious Diseases in Pregnancy Screening Programme Annual report 2016-2017
Reference	PHA/03/02/19
Prepared by	Lorna Hawe
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☒ For **Noting** ☐

1 Purpose

This report provides an overview of the Northern Ireland Infectious Diseases in Pregnancy Screening (IDPS) programme performance in relation to UK National Standards. The IDPS programme offers screening for human immunodeficiency virus (HIV), hepatitis B, syphilis and susceptibility of pregnant women to rubella.

The report is being presented to the PHA Board for approval.

2 Background Information

Under PHA's Corporate Plan Objective 1, "All children and young people have the best start in life", there is a target that PHA will "introduce and develop antenatal and new-born screening programmes in line with the recommendations of the national and local screening committees". Part of PHA's work in this area is to produce an annual report.

The objective of screening is to enable early identification of these conditions among pregnant women, to allow early intervention and reduce the risk of mother-to-child transmission (MTCT). Pregnant women identified as susceptible to rubella are offered postnatal measles, mumps, and rubella (MMR) vaccination to prevent infection in future pregnancies.

IDPS is a complex programme, involving a wide range of professionals working in maternity units, laboratories, pharmacy, hepatology, genito-urinary medicine, neonatology and paediatric services. The PHA and partner organisations are responsible for ensuring that pregnant women have access to a safe, effective, high quality and equitable screening programme.

3 Key Issues

The headline results from the report are as follows:

- 24,866 women were identified as eligible for screening; 24,860 (99.98%) consented to screening and had a confirmed screening result within the reporting period.
- In terms of test turnaround time, i.e. the number of screening test results available within 8 working days of the sample being received by the laboratory (excluding samples requiring a repeat test):
    - For all results, both positive and negative, 97.4% (23,857/24,489) achieved the standard
    - For positive results, the following achieved the standard:
        - HIV - 17/17 (100%)
        - Hepatitis B - 25/27 (93%): maximum turnaround was 18 working days
        - Syphilis - 17/20 (85%) (maximum turnaround was13 working days)
- In total, 64 women tested positive for one of the three infections, which equates to a rate of 2.6 per 1,000 women screened. The number seen by maternity services within 10 working days was:
    - HIV - 17/17 (100%)
    - Hepatitis B - 25/27 (89%): maximum interval to be seen was 17 working days
    - Syphilis - 20/20 (100%)
- The proportion of women identified as susceptible to rubella increased from 6.9% in 2015/2016 to 19.3% in 2016/2017. This increase is likely to be attributable to the introduction, in April 2016, of a new chemiluminescent immunoassay (CLIA) for rubella susceptibility testing.
- 27 women were confirmed as hepatitis B positive:
    - 22/27 (82%) were offered an appointment within the recommended 6 weeks of the referral being received by hepatology services
    - 17/27 (62.9%) were seen by hepatology services within 6 weeks of the referral being received
    - This standard is reported in line with a previous local agreement, that hepatitis B positive women should be reviewed within 6 weeks of the referral being received by hepatology
- Of the 27 babies born to hepatitis B positive mothers who booked between 1st April 2016 and 31st March 2017, 100% received a first dose of monovalent hepatitis B vaccine within 24 hours of birth and 100% of babies born to hepatitis B e antigen (HBeAg) positive mothers received hepatitis B immunoglobulin (HBIG) at birth.

The programme in Northern Ireland is achieving the required standards in terms of the offer, uptake and testing among pregnant women and in the test turnaround times for the results of these tests. While the vast majority of women testing positive

for these infections are reviewed by specialist teams in a timely manner, and within the acceptable national standards, work will continue to improve timeliness of assessment and intervention, particularly for women who are hepatitis B positive.

4 Next Steps

This finalised report will be published and publically available on the PHA website. The 2017-18 annual report will be produced by June 2019.

Northern Ireland Infectious Diseases in Pregnancy Screening Programme

Annual report
April 2016 - March 2017

HSC Public Health Agency

About this publication:-

Document Title	Northern Ireland Infectious Diseases in Pregnancy Screening Programme Performance Report April 2016 – March 2017
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Approved by –to be approved by	Agency Management Team PHA (AMT)
Final Approved date	To be confirmed
Distribution to	To be confirmed

Contents

NORTHERN IRELAND INFECTIOUS DISEASES IN PREGNANCY SCREENING PROGRAMME

Performance report

1st April 2016 – 31st March 2017

1 EXECUTIVE SUMMARY

This initial Annual Report of the Northern Ireland Infectious Diseases in Pregnancy Screening (IDPS) programme provides an overview of performance in relation to UK National Standards. These standards were updated in 2016[1]. Performance data in relation to the screening offer, uptake and positive/rubella susceptible results from 1st April 2016 to 31st March 2017 are outlined.

The programme is commissioned and quality assured by the Public Health Agency (PHA). Monitoring against nationally agreed standards for screening is an important element of quality assurance for the IDPS programme and allows those involved in its organisation and delivery to identify potential areas for improvement. As evidenced by the data in this report, the programme is performing well and in line with most national standards.

1.1 Background

The IDPS programme offers screening for: human immunodeficiency virus (HIV), hepatitis B, syphilis and susceptibility of pregnant women to rubella.

In keeping with the National Institute for Health and Care Excellence (NICE) guidance[2], the screening blood tests are routinely offered at the mother's pregnancy booking appointment, ideally by 10 weeks gestation or at the earliest opportunity thereafter where the woman presents to maternity services. The objective of screening is to enable early identification of these conditions among pregnant women, to allow early intervention and reduce the risk of mother-to-child transmission (MTCT). Pregnant women identified as susceptible to rubella are offered postnatal measles, mumps, and rubella (MMR) vaccination to prevent infection in future pregnancies[3].

1.2 Headline results

Performance of the IDPS programme between 1st April 2016 and 31st March 2017 is summarised below:

- **Standard 1-3:** Identifying population and coverage.

[1] The new standards were formally endorsed for Northern Ireland in October 2018.
[2] www.nice.org.uk/guidance/cg62/chapter/appendix-d-antenatal-appointments-schedule-and-content
[3] In 2016 screening for rubella susceptibility was discontinued in England, Scotland and Wales. However, following a review of the implications of this change in practice, the Northern Ireland Screening Committee recommended that screening should continue here.

- 24,866 women were identified as eligible for screening of infectious diseases in pregnancy. Of these women, 24,860 (99.98%) consented to screening and had a confirmed screening result within the reporting period.

- **Standard 4:** The test turnaround time, i.e. the number of screening test results available within 8 working days of the sample being received by the laboratory (excludes samples requiring a repeat test). Programmme performance was:

  - **For all results, both positive and negative,** 23,857/24,489 (97.4 %)[4].
  - **For positive results**
    - HIV - 17/17 (100%)
    - Hepatitis B - 25/27 (93%) (maximum turnaround was18 working days)
    - Syphilis - 17/20 (85%) (maximum turnaround was13 working days)

- **Standard 5:** The proportion of women with screen positive results seen by maternity services within 10 working days of the positive result being reported to them.

  - 64 women tested positive for one of the three infections which equates to a rate of 2.6 per 1,000 women screened. The number seen within 10 working days was as follows:

    - HIV - 17/17 (100%)
    - Hepatitis B - 25/27 (89%) (maximum was 17 working days to be seen)
    - Syphilis - 20/20 (100%)

  - The proportion of women identified as susceptible to rubella increased from 6.9% in 2015/2016 to 19.3% in 2016/2017. This increase is likely to be attributable to the introduction of a new chemiluminescent immunoassay (CLIA) for Rubella susceptibility testing in April 2016.

- **Standard 6:** Timely assessment for those women with hepatitis B.

  - 27 women were confirmed as hepatitis B positive.
  - 22/27 (82%) were offered an appointment within the recommended 6 weeks of the referral being received by hepatology services.
  - 17/27 (62.9%) were seen by hepatology services within 6 weeks of the referral being received.
  - This standard is reported in line with a previous local agreement, that hepatitis B positive women should be reviewed within 6 weeks of the referral being received by hepatology.

[4] NIBTS work towards a standard turnaround time of 3 days for non-referred (negative) samples, so were unable to produce data for 8 day turnaround. Incomplete data is available for turnaround time for late booking samples (i.e. taken at gestation >20 weeks) referred directly to RVL that were negative. This turnaround time denominator does not include samples of all late bookers or rejected samples.

- **Standard 7:** Intervention and treatment of babies.

The PHA Health Protection Service monitors vaccine coverage for the neonatal hepatitis B vaccination programme for infants born to hepatitis B positive mothers. By one year of age an infant should have received three doses of monovalent hepatitis B vaccine (at birth, one and two months of age) and four doses (three doses plus fourth dose at 12 months) by two years of age.

- Of the 27 babies born to hepatitis B positive mothers who booked between 1st April 2016 and 31st March 2017, 100% received a first dose of monovalent hepatitis B vaccine within 24 hours of birth and 100% of babies born to hepatitis B e antigen (HBeAg) positive mothers received hepatitis B immunoglobulin (HBIG) at birth.
- 25/25 (100%) of babies born (birth cohort 2016/2017), received three doses of hepatitis B vaccination by the age of 1 year.
- 27/31 (87.1%) of infants born to hepatitis B positive mothers (birth cohort 2015/2016) received 4 doses of hepatitis B vaccination by two years of age.

Acknowledgement

Ms Jackie McGeagh retired from her role as the Regional Antenatal Screening Co-ordinator in 2016. Jackie was one of the first antenatal screening co-ordinators to be appointed in Northern Ireland back in 2003 and was involved in piloting the introduction of HIV screening in pregnancy. We would like to acknowledge and thank Jackie for her dedication and commitment to the programme over the years and also take this opportunity to wish her all the best in retirement.

2 INTRODUCTION

The Northern Ireland IDPS programme offers screening to all pregnant women for a number of infectious conditions including human immunodeficiency virus (HIV); hepatitis B; syphilis infection and for susceptibility to rubella infection. This report provides an overview of the IDPS programme for the year from 1st April 2016 to 31st March 2017, including performance data in relation to uptake and positive/rubella susceptible results.

2.1 Aims of the screening programme are to:

- Reduce the risk of MTCT of the above infections during pregnancy, at birth or postnatally.
- Promote a positive health outcome for mother and child.
- Prevent infection in future pregnancies.

2.2 Rationale for the screening programme

The screening tests for infectious diseases offered in pregnancy, look for possible health problems that could affect a mother's health and the health of her baby. Having the tests can help when making decisions about care, both before and after birth, to protect the health of the mother and baby.

Whilst the vast majority of women screened will not be infected with these conditions, or be susceptible to the rubella virus, the benefits of screening are substantial. The diagnosis, treatment and management offered to mothers or vaccination given, once the baby is born, means the health of the mother can be improved and the chances of the baby being infected can be greatly reduced. The importance of being tested for each of these conditions is outlined below.

2.3 HIV

HIV infection can be transmitted from an infected mother to her baby during pregnancy, at the time of birth or by breast feeding. The risk of transmission in the absence of intervention ranges from 15 - 45%[5]. The risk of MTCT of HIV can be reduced to < 0.5% through interventions. Screening in pregnancy aims to identify HIV infected mothers and, with early treatment and appropriate management, reduce the risk of MTCT.

In June 2016 the World Health Organisation (WHO)[6] issued new guidance on the use of antiretroviral drugs for the treatment and prevention of HIV infection. They recommended that all pregnant women should be commenced on antiretroviral therapy (ART) as soon as possible after diagnosis, in the second trimester (or earlier if the viral load is very high) and that they should continue on the treatment for life.

[5] http://www.who.int/hiv/topics/mtct/about/en/

[6] http://apps.who.int/iris/bitstream/handle/10665/186275/9789241509565_eng.pdf;jsessionid=8DF7A3839376199A6F5DFA2034A31FC1?sequence=1

Correct management of the mother following diagnosis in pregnancy, and of the baby following delivery, is imperative in order to prevent MTCT. Breastfeeding is not recommended.

Care is provided by a multidisciplinary team (MDT) encompassing obstetricians, antenatal screening co-ordinators, the wider maternity team, including genitourinary consultants and their team, neonatologists, paediatric infectious disease specialists, and pharmacists. The majority of HIV positive pregnant women are currently delivered in the BHSCT; however, in cases where a woman has requested to deliver in her own Trust, this has been facilitated.

2.4 Hepatitis B

Hepatitis B infection can occur at or around the time of birth (perinatal transmission). Babies acquiring infection at this time have a high risk of becoming chronically infected with the virus. Such carriers, as well as being infectious to others, are at increased risk of developing chronic liver disease and some will die prematurely from cirrhosis or hepatocellular (liver) cancer. The development of the carrier state after perinatal transmission can be prevented in over 90% of cases by appropriate vaccination, starting immediately at birth[7].

Screening in pregnancy aims to identify women who have hepatitis B infection and to provide effective interventions, including onward referral to a hepatologist and immunisation of the baby, to reduce the risks of perinatal transmission.

Treatment with antiviral drugs during pregnancy has also been shown to be effective in reducing the risk of MTCT in some women depending on their hepatitis B e antigen marker and viral load. In these cases the baby will require hepatitis B immunoglobulin (HBIG) as well as the vaccination at birth.

All previous sexual partners, previous siblings and household contacts are also identified, if possible, and offered screening and / or immunisation to reduce the risk of hepatitis transmission to them.

2.5 Syphilis

Syphilis infection readily crosses the placenta and may be transmitted to the foetus at any stage of pregnancy. The risk of transmission varies with syphilis stage and is greatest in early disease. Infection during pregnancy can result in miscarriage, stillbirth or congenital syphilis. Maternal infection is detectable and treatable, so with early detection in pregnancy transmission to the baby can be prevented. See attached guidelines for management of syphilis in pregnancy[8] [9].

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/628602/Greenbook_chapter__18.pdf

[8] https://www.bashhguidelines.org/media/1053/syphilis-2015.pdf

[9] http://www.publichealth.hscni.net/sites/default/files/Regional%20syphilis%20guidelines.pdf

Babies born with congenital syphilis may have an early manifestation of the disease (within the first 2 years of life) or a later manifestation (after 2 years of life), including stigmata of congenital syphilis.

2.6 Rubella

Rubella is generally a mild disease caused by a togavirus. However, rubella during pregnancy can be serious, especially in early pregnancy, as infection may cause abnormalities in the unborn baby known as congenital rubella syndrome (CRS). These can include mental handicap, cataract, deafness, cardiac abnormalities, intra–uterine growth retardation and inflammatory lesions of the brain, liver, lungs and bone marrow.[10]

Screening maternal blood for rubella susceptibility allows identification of rubella susceptible women who can then be offered the Measles, Mumps and Rubella (MMR) vaccination after delivery. Of note, vaccination during the current pregnancy is not possible given that MMR, being a live vaccine, is contraindicated during pregnancy[11]. Giving MMR postnatally provides protection against rubella in future pregnancies.

3 IDPS PROGRAMME DELIVERY

IDPS is a complex programme involving a wide range of professionals working in maternity units, laboratories, pharmacy, hepatology, genito-urinary medicine, and neonatology and paediatric services. Together with the PHA, these partner organisations work closely together to ensure that pregnant women have access to safe, effective, high quality and equitable screening.

Screening tests for HIV, hepatitis B, syphilis infections and rubella susceptibility are routinely offered to all pregnant women at the maternity booking appointment, or at the earliest opportunity when a pregnant woman presents to maternity services. A blood sample is taken by a health professional, usually a midwife or maternity support worker.

The lead antenatal screening co-ordinator (ANSC) in each Trust, with support from at least one deputy ANSC, oversees the screening programme and ensures that positive results are followed up. The lead/deputy ANSC arrangement ensures that essential duties are addressed continually, e.g. if the lead ANSC is absent.

At a regional level, within the PHA, there is a regional antenatal infectious disease screening programme coordinator and a consultant in public health medicine who oversee quality assurance of the programme.

[10] https://www.gov.uk/government/publications/vaccine-in-pregnancy-advice-for-pregnant-women/mmr-measles-mumps-rubella-vaccine-advice-for-pregnant-women

[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/147968/Green-Book-Chapter-21-v2_0.pdf

The screening tests are processed by Northern Ireland Blood Transfusion Service (NIBTS) with confirmatory testing for HIV, hepatitis B, and syphilis being provided by the Regional Virology Laboratory (RVL) in BHSCT. All screening samples taken at or after 20 weeks of pregnancy are managed in line with an agreed late booking protocol and tested by the RVL.

4 FAILSAFES

A failsafe is a backup mechanism, in addition to usual care, which ensures that if something does not go according to plan in the screening pathway, processes are in place to identify what has happened and thereafter action is taken to ensure a safe outcome.

Failsafe processes minimise the risks in the screening pathways used by population screening programmes. There are a number of failsafe processes within the IDPS programme in Northern Ireland.

4.1 The failsafe report

A failsafe is operational in each Trust to identify any pregnant woman who has not completed the antenatal infection screening (AIS) tests. The failsafe report is produced electronically from the Northern Ireland Maternity System (NIMATS) on a weekly basis and is sent from Business Services Organisation (BSO) to the Trust ANSCs or their deputy for review and appropriate action. It identifies all women booked for care where:

- The screening bloods have not been initiated on NIMATS.
- They have declined the AIS tests.
- Results from the AIS tests are missing >14 days from the booking date.

4.2 The mismatch report

Since the establishment of an electronic link between NIMATS and the NIBTS IT system, a “mismatch report” is now available on NIMATS. This report highlights all:

- Positive results.
- Rejected tests which need repeated.
- Results where there is no Health and Care (H&C) number for the mother.
- Results where the details on NIMATS do not match those on NIBTS.
- Tests that have not been initiated on NIMATS and therefore cannot cross the systems electronically.

This allows the ANSCs or their deputies to identify the above women and take appropriate action to ensure that these women are followed up in a timely manner.

4.3 Generic email accounts

Generic email accounts have been set up for all Trust antenatal screening teams, so that when a positive result for HIV, hepatitis B or syphilis is identified in either NIBTS

or RVL, a secure email is sent to these email addresses alerting the ANSC or their deputy of the positive result and the need for action to be taken.

5 PROGRAMME DEVELOPMENTS

The key developments within the IDPS programme during 2016 - 2017 included:

5.1 Electronic transfer of results

The successful rollout of the electronic link between the NIBTS and NIMATS in 2015 enabled the electronic transfer of the AIS results from NIBTS into the record results section on NIMATS. Since then, work has progressed on the electronic transfer of the blood group and antibody screen. This work, completed in early in 2017, means that all screening blood tests sent to NIBTS in pregnancy are automatically transferred onto NIMATS. This, importantly, has reduced the risk of manual error when inputting results, as well as reducing the workload associated with inputting results. While the processing of hard copy results remains a considerable burden a future benefit of this electronic transfer system is that a paperless system will eventually be adopted.

At present the same link is not possible for late booking results which go directly to RVL; these results still have to be manually inputted onto NIMATS. However, a new Laboratory Information Management System (LIMS) is being introduced that, in due course, will encompass all laboratory results regionally. This issue has been raised for consideration by the LIMS implementation group.

5.2 NIBTS change testing assays for Rubella testing

In April 2016 NIBTS awarded the contract for rubella testing to Abbotts Diagnostics. It has been assessed as suitable for use in diagnostic screening by the National Health Service Blood Transfusion (NHSBT) evaluation group. All National External Quality Assessment Services (NEQAS) exercises performed to date by NIBTS using the “new” assay have been satisfactory, with no errors. Of note, the chemical assay employed by this company is different from previous testing assays. This change is likely to explain the increase in the number of samples now testing as rubella susceptible.

6 DATA COLLECTION

NIMATS is in use across all maternity units in Northern Ireland. At the booking visit, once consent has been obtained and the screening tests have been taken, the tests are initiated on NIMATS. This allows results to be automatically downloaded from NIBTS to NIMATS as they become available. This information is then used to provide performance data for: offer, uptake (the proportion (%) of women who accepted the offer), tested and both positive and negative results. The denominator for data performance analysis is the total number of women booked for maternity care, per quarter, for each maternity unit in all Trusts.

Completed data (Table 2) is reported quarterly by the five Health and Social Care Trusts (HSCT) to the PHA for collation and analysis at both individual Trust and overall Northern Ireland levels.

Table: 1 screening data collected 2016/2017

1	Total number of women booked for maternity care per quarter for each maternity unit in all Trusts
2	Number of women offered testing
3	Number of women declining testing
4	Total number of women tested
5	Number of positive screening test results for HIV, hepatitis B surface antigen and syphilis, and the number of rubella susceptible (non-immune) test results

For each of the four infections the following is collated by the PHA:

Table: 2 screening data percentages

1	**Percentage offered screening – coverage.** number of women offered the test / number of women booked x 100
2	**Percentage uptake.** number of women accepting the offer of screening / number of women offered x 100
3	**Percentage tested.** number of women tested / number of women offered x 100
4	**Percentage HIV, Syphilis, Hepatitis B positive.** number positive test results / number of HIV, hepatitis B and syphilis tests performed x 100
5	**Percentage Rubella susceptible (non-immune).** number rubella susceptible test results / number of rubella tests performed x 100

6.1 Limitations

This data must be interpreted with caution due to a number of caveats. For example, several factors may affect the number of 'bookings' and the number of results recorded. These include:

- A woman may initially book for maternity care in one unit but transfer to another unit. Her NIMATS data will be transferred across to the second unit, along with her blood results. However, there is therefore the potential that the blood results could be counted twice - in the initial booking unit and again in the second transferred into unit.
- A woman may transfer care from ~~the~~ elsewhere in the United Kingdom (UK) or Republic of Ireland (ROI) and may already have had her booking bloods taken.

The tests would not usually be repeated. However, the results will still be counted in the figures (although rubella testing in the rest of the UK has ceased, women transferring in ~~from the mainland will be~~ are tested for rubella susceptibility).

It should also be noted that a positive screening result for syphilis will reflect all stages of disease, as well as a previous infection that has been successfully treated. Further diagnostic testing and clinical assessment is required to ascertain the stage of infection and whether treatment is required.

For HIV and hepatitis B results, all positive results are counted even if it is for a case previously known to be positive.

The data does not include false positive results (i.e. diagnostic test is negative).

7 PROGRAMME STANDARDS AND PERFORMANCE

Public Health England (PHE) published revised Infectious Diseases in Pregnancy Screening Programme Standards on the 30th March 2016 and the revised Handbook for Laboratories on the 25th July 2016. Within the update some standards were unchanged, apart from clarification around the definition (STD 1), some were revised (STD 4 and 6) and some new standards were added (STD 2, 3, 5, 7).

Table: 3 Northern Ireland performance against National IDPS programme standards April 2016 – March 2017[12] .

Northern Ireland performance against National IDPS programme standards April 2016 – March 2017				
	Standard	**Acceptable level**	**Achievable level**	**Northern Ireland 2016- 2017**
1	**Identifying population and coverage: HIV screening** - to provide assurance that screening is offered to all eligible women and each woman accepting screening has a confirmed screening result. **(Existing standard)**	≥ 95.0%,	≥ 99.0%.	24,860 / 24,866 (99.98%)[134]
2	**Identifying population and coverage: hepatitis B screening** - to provide assurance that screening is offered to all eligible women and each woman accepting screening has a confirmed screening result. **(New standard with revised criteria and definition)**	≥ 95.0%	≥ 99.0%	24,860 / 24,866 (99.98%)
3	**Identifying population and coverage: syphilis screening** - to provide assurance that screening is offered to all eligible women and each woman accepting screening has a confirmed screening result. **(New standard with revised criteria and definition)**	≥ 95.0%,	≥ 99.0%	24,860 / 24,866 (99.98%)
4	**Test: turnaround time (HIV, hepatitis B, syphilis)** - the proportion of antenatal screening samples for HIV, hepatitis B and syphilis where a result is available (confirmed positive or negative) and	≥ 95.0%	≥ 97.0%	**All samples positive and negative:** 23,857 / 24,489

12 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/529070/IDPS_Programme_Standards_2016_to_2017.pdf

134 As discussed in 6.1. Caution is required as across Trusts there may be inconsistency in removal of transfers in data reported.

	reported to maternity services within 8 working days of sample receipt in the screening laboratory in line with the IDPS laboratory handbook.[13] (**Revised standard)**			(97.4%) within 3 days (NIBTS data only) **Positive samples:** HIV - 17/17 (100%) hepatitis B - 25/27 (93%) syphilis - 17/20 (85%)
5	**Time to intervention: timely assessment for screen positive and known positive women** -The proportion of pregnant women attending for specialist assessment within 10 working days of the positive result or known status being reported to maternity services. **(New standard)** *Specialist assessment* is a face-to-face appointment with a member of the multidisciplinary team (for example screening coordinator/specialist midwife/clinical nurse specialist). The assessment as per local protocol will support and inform appropriate triage of women for clinical management by the medical team in pregnancy (for example a HIV physician, hepatologist, gastroenterologist, infectious diseases physician or consultant in genitourinary medicine)	≥ 97.0%	≥ 99.0%	**HIV** -17/17 (100%) **hepatitis B** - 24/27 (89%) **syphilis -** 20/20 (100 %)
6	**Time to intervention: timely assessment of women with**	≥ 70.0%	≥ 90.0%	17/27 (63%)

[13] NIBTS work towards a standard turnaround time of 3 days for non-referred (negative) samples, so were unable to produce data for 8 day turnaround. Incomplete data is available for turnaround time for late booking samples (i.e. taken at gestation >20 weeks) referred directly to RVL that were negative. This turnaround time denominator does not include samples of all late bookers or rejected samples where a repeat has been requested.

	hepatitis B -The proportion of pregnant women who are hepatitis B positive attending for specialist assessment with a hepatologist within 6 weeks of the referral being received by hepatology. (In line with previous local agreement) [14]			
7	**Intervention and treatment: timely administration of the first dose of neonatal hepatitis B +/- immunoglobulin (HBIG)-** The proportion of babies born in the reporting period to women with hepatitis B receiving first dose of vaccination +/- immunoglobulin within 24 hours of birth. **(New standard)**	≥ 97%	≥ 99%	27/27 babies (100%)

8 CONDITION SPECIFIC PERFORMANCE DATA

8.1 HIV performance data

- The number of pregnant women eligible for infectious disease screening who accepted screening for HIV infection, leading to a conclusive result, was 24,860/24,866 (99.98% of all eligible women), therefore exceeding the IDPS programme uptake KPI of ≥ 95%.
- From 1st April 2016 to 31st March 2017, 17 pregnant women tested positive for HIV (0.7 per 1000 women tested).
- 6 women declined testing.
- All 17 women were reviewed by maternity services for onward referral, as required, within the 10 day standard.
- 17/17 (100%) positive HIV tests had a turnaround time of within 8 working days, i.e. the sample received in the laboratory to the result being reported.

8.2 Hepatitis B performance data

- The number of pregnant women eligible for infectious disease screening who accepted screening for hepatitis B infection, leading to a conclusive result, was 24,860/24,866 (99.98% of all eligible women). This exceeded the IDPS programme uptake key performance indicator (KPI) ~~of~~ achievable level of ≥ 99%.

[14] This varies from the definition of the current national standard, which became effective in NI in Oct 2018.

- From 1st April 2016 to 31st March 2017, 27 pregnant women tested positive for hepatitis B (1.1 per 1000 women tested).
- 6 women declined testing.
- 25/27 positive hepatitis B tests had a turnaround time of within 8 working days, i.e. the sample received in the laboratory to the result being reported (maximum turnaround was18 working days).

8.2.1 Regional hepatitis B audit

A regional annual hepatitis B audit was performed to review the timeliness of assessment for women identified as hepatitis B positive (standard 6). The number of women positive for hepatitis B attending for specialist assessment within 6 weeks of the referral being received by hepatology services was audited for the period between 1st April 2016 – 31st March 2017 (in line with the previous local agreement).

8.2.2 Methodology

The ANSCs in each Trust identified hepatitis B positive pregnant women booked for antenatal care within their Trusts in 2016/2017. The following data was collected:

- The date of receiving a positive result.
- Date of 1st review by ANSC / Obstetrician.
- New diagnosis / known diagnosis with high infectivity level.
- Date referral sent to hepatology.
- Date referral received by hepatology.
- Date of 1st appointment offered by hepatology.
- Date of 1st review by hepatology.
- Reasons for delay in the process.

The regional hepatology nurse specialist assisted in the verification of the date referrals were received by hepatology, any appointments that were offered but where the patient did not attend and other potential reasons identified for a delay in the process.

8.2.3 Results

27 women were confirmed as being hepatitis B positive through the IDPS programme in 2016/2017. Of these, 14 were newly diagnosed or women already known to be hepatitis B positive with high infectivity markers detected in the current pregnancy. 13 women were previously diagnosed with currently low infective markers for hepatitis B.

- All 27 (100%) women were referred to hepatology services.
- 24/27 (89%) were seen by maternity services and referred for specialist assessment within 10 working days of the positive result being received by maternity services.
- 22/27 (82%) were offered an appointment to be reviewed within 6 weeks of the referral being received by hepatology.

- 17/27 (63%) were seen by hepatology services within 6 weeks of the referral being received.

Overall - in relation to time to be seen:

- From receipt of referral in hepatology, this ranged from 25 days (where a previously known case was reviewed 25 days before the referral was received) to 108 days (15.4 weeks), with a median of 41 days (5.9 weeks).
- From receipt of the result in maternity services, this ranged from 31 days (where a previously known case was reviewed 31 days before result was received) to 112 days (16 weeks) with a median of 54 days (7.7 weeks).

8.2.4 Reasons for delays in the review process:

- **Patient-related factors (in descending frequency)**
  - unable to attend appointments
  - not attending appointments
  - cancelled appointments
  - pre-mature delivery prior to appointment.

- **System-related factors (in descending frequency)**
  - delay in positive result being received by maternity services
  - delay in patients being reviewed by maternity services initially after receipt of positive result.
  - delay in time between referrals being sent and referrals being received by hepatology (referrals sent via internal mail causing a delay in receipt of the referral)
  - referral graded as routine.

8.2.5 Recommendations

- All referrals to hepatology should be emailed securely and copied to the hepatology nurse specialist so that they can ensure that an appropriate appointment has been made for the woman.
- A standardised approach to monitoring women identified as positive for hepatitis B should be adopted by the region, so that women falling outside the expected timeframe for review will be easily and quickly identified.
- More detailed review may be required at a local level to identify potential problems for patients when accessing regional services.

8.3 Vaccination of babies

The PHA Health Protection Service routinely monitors vaccine coverage of the neonatal hepatitis B vaccination programme for infants born to hepatitis B positive mothers. By one year of age an infant should have received three doses of monovalent hepatitis B vaccine (at birth, one and two months of age) and four doses by two years of age (three doses plus fourth dose at 12 months).
Coverage data shows that for the 2016/2017 reporting period:

- Of the 27 babies born to hepatitis B positive mothers who booked and were screened in 2016/2017, 100% received a first dose of monovalent hepatitis B vaccine within 24 hours of birth and 100% of babies born to HBeAg positive mothers received hepatitis B Immunoglobulin HBIG at birth.
- 25/25 (100%) of babies born (birth cohort 2016/2017), 100% received three doses of hepatitis B vaccination by one year of age.
- 27/31 (87.1%) of infants born in 2015/16 had received their 4th dose by two years of age.

8.4 Syphilis performance data

- The proportion of pregnant women eligible for infectious disease screening who accepted screening for syphilis infection, leading to a conclusive result, was 24,860/24,866 (99.98%) exceeding the IDPS programme coverage KPI of ≥ 95%.

- 20 women tested positive for syphilis, which equates to 0.8 per 1000 women tested in 2016/2017.

- All 20 (100%) of these positive syphilis cases were reviewed by maternity services for onward referral within 10 working days of the positive result being received by maternity services.

- 17 out of the 20 positive syphilis results had a test turnaround time of within 8 working days of the test being received by the laboratories (maximum turnaround was13 working days).

8.5 Rubella performance data

- The proportion of pregnant women eligible for infectious disease screening who accepted screening for rubella susceptibility, leading to a conclusive result, was 24,860/24,866 (99.98%) exceeding the IDPS programme uptake KPI of ≥ 95% acceptable level and reaching the 99% achievable level.

- In 2016/2017 the proportion of women testing susceptible to rubella was 19.3% (4,799/24,860 women tested).

8.5.1 Rubella audit

It is advised that women testing as susceptible to rubella are offered MMR vaccination postnatally before discharge from hospital. A regional audit was therefore conducted to determine how many women actually received the MMR vaccination.

8.5.2 Methodology

Antenatal screening coordinators in each Trust were asked to provide information on women testing susceptible to rubella during the period April 2016 to March 2017. They were asked to provide the following data:

- The number of women who delivered during this period who tested as susceptible to rubella (i.e. susceptible to rubella at booking).
- The number of women who were given the MMR vaccination prior to discharge from hospital postnatally.
- The reasons why MMR was not given.

8.5.3 Results

- Of 3,519 women susceptible to rubella who delivered during 2016/2017, it was reported that 2,820 (80%) received the MMR vaccination prior to discharge from hospital postnatally.
- There were several potential maternal, neonatal and other related factors documented as to why MMR had not been given prior to discharge. These included deferral for vaccine to be given by GP, a history of 2 vaccines being given previously or previous immunity, maternal or neonatal illness, contraindication – such as anaphylaxis, decline and no availability of the vaccine/staff to prescribe.

9 TRENDS

9.1 Trends in Rubella susceptibility

Over time, the number and proportion of women testing as susceptible to rubella has increased, in particular during 2016/2017. This increase is attributable to the introduction of a new testing assay in April 2016 and also other factors such as demographic change influencing population susceptibility. However, this is unlikely to explain the extent of the increase from 2015/2016 to 2016/2017.

A previous scoping review by the PHA examined factors influencing rubella susceptibility in pregnant women. Legacy Eastern Board data between 2002/2003 and 2013/2014 showed that women born between1985 -1994 were more likely to have a rubella antibody level of <10 iu/ml, than women born before 1985. There was also evidence that women were more likely to be susceptible in their first pregnancy than a second / subsequent pregnancy. The apparent increase in rubella susceptibility since 2016 is perceived as being attributable to the above referenced change in assay type. There is ongoing international debate about rubella susceptibility testing and interpretation. Evidence suggests that introduction of vaccination programmes; changes in rubella epidemiology and development of new testing technologies have complicated interpretation of rubella susceptibility.

Table 4
Rubella susceptibility in pregnancy: trends in Northern Ireland 2010 – 2017 (source- PHA health protection team)

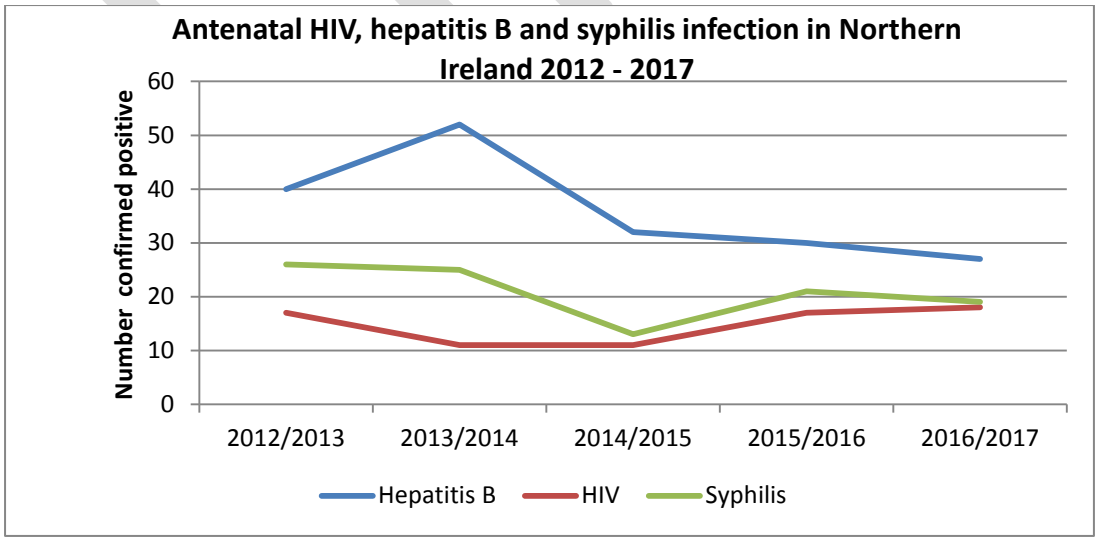
	Number of women tested during pregnancy	Number rubella susceptible	Proportion rubella susceptible	Test	Cut off for susceptibility
2010	26,120	749	2.9	EIA	>10
2011/12	26,153	1067	4.1	EIA	>10
2012/13	25368	1555	6.1	EIA	>10
2013/2014	25,621	1629	6.4	EIA	>10
2014/2015	25,487	1706	6.7	EIA	>10
2015/2016	25,156	1937	7.7	EIA	>10
2016/2017	24,860	4799	19.3	CLIA	>10

EIA- electro/ enzyme immunoassay
CLIA- chemiluminescent immunoassay

9.2 Trends in antenatal HIV, hepatitis B and syphilis infections.

Figure 1 shows the trends in antenatal HIV, hepatitis B and syphilis infections over the last 5 years. It highlights an overall downward trend for hepatitis B and syphilis, and a slightly upward trend for HIV.

Figure 1
Trends in antenatal HIV, hepatitis B and syphilis infection in Northern Ireland 2012 - 2017 (source –health protection team PHA)



10 SUMMARY AND FUTURE DEVELOPMENTS

In Northern Ireland, pregnant women are offered screening for HIV, hepatitis B, syphilis infection and rubella susceptibility early in pregnancy, or as soon as possible after accessing maternity care. Pathways are in place for women with positive screening results to reduce the risk of MTCT of HIV, hepatitis B and syphilis. Women who are susceptible to rubella are identified and offered postnatal MMR vaccination to protect future pregnancies.

This report provides evidence of a high level of programme performance in relation to most of the national standards at regional level for 2016/2017, whilst some areas for improvement have also been highlighted.

The programme is achieving the required standard for the offer, uptake and testing among pregnant women and in the test turnaround times for the results of these tests. Whilst the vast majority of women testing positive for these infections are reviewed by specialist teams in a timely manner, and within the acceptable national standards, work will continue on improving timeliness of assessment and intervention, particularly for women who are hepatitis B positive.

In order to improve the quality of reported data in the future, work will continue with laboratory services, NIMATS support officers and Trusts to reduce double counting and to enable test turnaround times to be more accurately reflected in laboratories. In order to assist with this, the late booking form will also be reviewed to enable more accurate coding of these samples.

11 ABBREVIATIONS

Abbreviations	Meaning
IDPS	Infectious Diseases in Pregnancy Screening Programme
HIV	Human Immunodeficiency Virus
NICE	National Institute for Clinical Excellence
MTCT	Mother to child transmission
MMR	Measles, Mumps and Rubella
CLIA	Chemiluminescent Immunoassay
PHA	Public Health Agency
HBeAg	Hepatitis B e antigen
HBIG	Hepatitis B Immunoglobulin
DNA	Did not attend
WHO	World Health Organisation
MDT	Multidisciplinary team
ART	Antiretroviral therapy
BHSCT	Belfast Health and Social Care Trust
CRS	Congenital Rubella Syndrome
NIBTS	Northern Ireland Blood Transfusion Service
RVL	Regional Virology Laboratory
ANSC	Antenatal screening co-ordinator
NIMATS	Northern Ireland Maternity System
AIS	Antenatal infection screening
BSO	Business Services Organisation
HSCT	Health and Social Care Trust
H&C	Health and Care
LIMS	Laboratory Information Management System
PHE	Public Health England
STD	Standard
KPI	Key Performance Indicator
EIA	Electro/ enzyme immunoassay

HSC Public Health Agency

item 10

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Surveillance of Antimicrobial Use and Resistance in Northern Ireland Annual Report 2018
Reference	PHA/04/02/19
Prepared by	Chris Nugent, Dr Lynsey Patterson and Dr Muhammad Sartaj
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☐ For **Noting** ☒

1 Purpose

This is the second annual report in Northern Ireland describing trends for key organisms, including important gram-negative bacteraemias, antibiotic resistance and antimicrobial consumption. The report describes epidemiological trends for the years 2009-2017.

The report is being presented to the PHA Board for noting prior to publication in the public domain.

2 Background Information

Under PHA's Corporate Plan Objective 4, "All health and wellbeing services should be safe and high quality", there is a target in the 2018/19 Business Plan to "raise awareness and knowledge about AMR". This report forms part of that work.

The PHA is required to produce this report as a deliverable under the Regional Healthcare Associated Infections and Antimicrobial Stewardship Improvement Board.

The information produced in this report is based on information derived from data submitted by Health and Social Care Trust microbiology and pharmacy staff.

3 Key Issues

Antibiotics have been one of the most important life-saving medical developments of the last century. However, they are not effective against all types of bacteria (so-

called intrinsic resistance). In addition, some bacteria can develop tolerance to certain antibiotics or develop ways to break them down (so-called extrinsic resistance). In either case, if these go on to cause an infection it can be much more difficult to treat resistant bacteria. If the use of antibiotics remains unchecked, common infections will become more dangerous, and surgical procedures where antibiotics are used will become more difficult to perform safely. Antimicrobial-resistant infections already cause illness and death in patients, and also disrupt care in hospitals. Reducing the use of antibiotics where they are not necessary will help keep antibiotics working in the future.

The first section of the Report describes trends in antibiotic resistance in Northern Ireland and the second section describes the trends in antibiotic consumption in Northern Ireland.

Some of the key findings of the Report are as follows:

- *E. coli* bloodstream infection cases have increased from **980** in 2009 to **1703** in 2017
- *K. pneumoniae* bloodstream infection cases have increased from **143** in 2009 to **256** in 2017
- *E.coli* resistance to Piperacillin-tazobactam has increased from **8.8%** in 2009 to **17.7%** in 2017
- *K. pneumoniae* resistance to Piperacillin-tazobactam has increased from **8.6%** in 2009 to **24.2%** in 2017
- Antibiotic prescribing in primary care is **85.4%** (84% in-hours, 1.4% out of hours) and in secondary care is **14.6%**
- There has been a slight decrease in total antibiotic use from **31.37** DDD/1000 inhabitants per day in 2014 to **29.87** in 2017.

4 Next Steps

Following this meeting the Report will be published on the PHA website.

Going forward, the Public Health Agency will:

- Continue to monitor the progress of the national ambition to reduce healthcare associated Gram-negative bacteraemias and assess the impact on the burden of AMR in terms of the numbers of resistant infections
- Further improve our understanding of the epidemiology and incidence of antibiotic resistant infections with a view to improving their management and prevent onward transmission
- Standardise the approach to investigation and treatment of suspected urinary tract infection in care homes in Northern Ireland
- Lead and coordinate efforts in undergraduate and postgraduate training, continuing professional development, and staff training related to Antimicrobial Stewardship, Antimicrobial Resistance and Infection Prevention and Control

- Continue to monitor trends in antibiotic prescribing across primary and secondary care and explore opportunities to improve benchmarking and quality improvement.
- Conduct a study to understand the factors affecting primary care antibiotic prescribing
- Continue to develop, pilot and validate tool to assess appropriateness of antibiotic prescriptions in acute hospitals and facilitate data collection and analysis of data in
- Plan and implement cascade training workshops for school-teachers about the e-Bug resources
- Work closely with innovation lab to complete a systematic review of interventions for reducing antibiotic prescribing in primary care and development of an intervention
- Work closely with stakeholders to focus and further improve dental prescribing across Northern Ireland

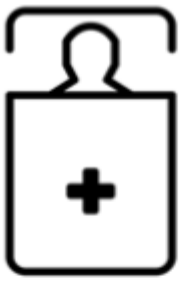
Surveillance of Antimicrobial Use and Resistance in Northern Ireland, Annual Report

2018

HSC Public Health Agency

Contents

Executive summary



E.coli
Bloodstream infection has increased from **980** in 2009 to **1703** in 2017

K. pneumoniae
Bloodstream infection increased from **143** in 2009 to **256** in 2017

E.coli resistance to Piperacillin-tazobactam
8.8% in 2009
17.7% in 2017

K. pneumoniae resistance to Piperacillin-tazobactam
8.6% in 2009
24.2% in 2017

Antibiotic Prescribing:
Primary care: **85.4%** (84% in-hours, 1.4% out-of-hours)
Secondary care: **14.6%**

Slight decrease in total antibiotic use from **31.37** DDD/1000 inhabitants per day in 2014 to **29.87** in 2017

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Acknowledgements

The information produced in this report is based on information derived from data submitted by Health and Social Care Trust microbiology and pharmacy staff, and we thank them for the time and effort involved in producing these data.

We also thank David Farren, Derek Fairley and Sara Hedderwick for their input into the original design of this report.

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Background

Antibiotics have been one of the most important life-saving medical developments of the last century. However, they are not effective against all types of bacteria (so-called intrinsic resistance). In addition, some bacteria can develop tolerance to certain antibiotics or develop ways to break them down (so-called extrinsic resistance). In either case, if these go on to cause an infection it can be much more difficult to treat resistant bacteria. If the use of antibiotics remains unchecked, common infections will become more dangerous, and surgical procedures where antibiotics are used will become more difficult to perform safely. Antimicrobial-resistant infections already cause illness and death in patients, and also disrupt care in hospitals. Reducing the use of antibiotics where they are not necessary will help keep antibiotics working in the future. In recognition of this, the NI Department of Health (then the Department of Health, Social Services and Public Safety) published a five year Strategy for Tackling Antimicrobial Resistance (STAR 2012-2017) in 2012[1]. One of the key objectives of STAR was "to establish and maintain systems to monitor antimicrobial usage and surveillance of resistance". This report is a product of the systems that have been established in response to this goal.

The tasks of preventing and reducing antimicrobial resistant infections, and reducing antimicrobial consumption in Northern Ireland are led by the Strategic Antimicrobial Resistance and Healthcare-associated Infection (SAMRHAI) group, which includes representatives responsible for animal and environmental as well as human health. For translating policy and strategy into action for human health, the Public Health Agency leads a multi-agency group, the Healthcare-associated Infection and Antimicrobial Stewardship Improvement Board, which has a number of themed subgroups that are responsible for regional efforts to reduce harm from antimicrobial use and resistance in different settings. This report is issued under the auspices of the Improvement Board and is divided into two major sections. The first describes trends in antibiotic resistance in Northern Ireland. Selected combinations of bacteria and antibiotics in line with those identified as key indicators as part of the UK Antimicrobial Resistance strategy[2] were chosen. In addition, bacteria-antibiotic combinations included in the English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report[3] were also chosen.

The second section describes the trends in antibiotic consumption in Northern Ireland. Antibiotic consumption is the key driver for the emergence of resistance in healthcare. Antibiotics are prescribed across a range of settings including primary care (GP), secondary care (hospitals) and by dentists. In this report, information from primary and secondary

care is provided. More detailed information about different healthcare settings and clinical specialities will be provided in future reports.

The aim of the report is to describe trends in antimicrobial resistance and antibiotic consumption in Northern Ireland. As surveillance data is 'information for action', this report will inform and drive best practice in antimicrobial prescribing.

Method

Antibiotic resistance

Data sources

Testing for bacteria in human specimens and their susceptibility to antibiotics is conducted in the laboratories of the five Health and Social Care Trusts in Northern Ireland. Infections that meet certain criteria, usually the most severe that occur in the blood (bacteraemias), are reported voluntarily to the Public Health Agency's CoSurv Information System directly from each Trust's laboratory. The resistance data included in this report includes selected bacteraemias that were reported to the PHA between 2009 - 2017 (presented by calendar year).

The data for carbapenemase producing organisms (CPO) has been collected as part of a voluntary reporting service. In cases where a microbiology laboratory suspects a CPO, the specimen is submitted to Public Health England's (PHE) Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) reference unit for investigation. Most recently, some health and social care trusts have developed the capacity to perform this function locally. Confirmed isolates include both colonisation and infections.

Definitions

Hospital microbiology laboratories report antimicrobial susceptibility test results "susceptible", "intermediate" or "resistant". For the purpose of this report, antibiotic susceptibility test results reported as "intermediate" or "resistant" were combined and presented as "non-susceptible". For analysis of resistance to more than one antibiotic, multidrug resistance (MDR) was defined as acquired non-susceptibility to at least one agent in three or more antimicrobial classes.

Antibiotic consumption

Data sources

Consumption data for primary and secondary care was obtained using the data submitted to the European Antimicrobial Consumption Surveillance Network (ESAC-Net). The primary care antimicrobial consumption data were extracted from the Electronic Prescribing Database by the Health and Social Care Board. The data includes all Health and Social Care, general practitioner prescribing in practices and out-of-hours centres; all nurse, pharmacy and allied health professional HSC prescribing; and dental prescribing. The secondary care antimicrobial consumption data were extracted by each Trust's JAC Medicines Management System and aggregated for all five Trusts to give Northern Ireland totals. It was not possible to analyse at the level of inpatient or outpatient. The data for both settings are available from 2014 - 2017 and are presented by calendar year.

Data from Out-of-Hours settings was extracted from two sources; the JAC Medicines Management System and a private pharmaceutical company responsible for over-labelling of antibiotic packs. Data was only available for the years 2016-2017.

Definitions

The classification of antibiotic used is based on the anatomical therapeutic chemical (ATC) classification system, using the WHO defined daily doses (DDD) for each drug and where grouped, this has been done according to Kucer's "The Use of Antibiotics" (6th edition)[4]. It is important to note that in England, hospitals usually dispense outpatient medications, whereas in Northern Ireland these are usually prescribed by general practitioners at the request of secondary care specialists. A significant proportion of outpatient prescribing is therefore counted under primary care in Northern Ireland as opposed to secondary care in England. There is currently no way of separating these prescriptions from the rest of primary care prescribing in Northern Ireland. In England, outpatient prescribing accounts for 7% of secondary care antimicrobial prescribing [3]. The data for both settings in this report include ATC classification groups J01, A07 and P01, please refer to Appendix 2 for specific inclusions.

Denominator

Mid-year population estimates for 2014-2017 were obtained from the Northern Ireland Statistics and Research Agency (NISRA) and used to express DDD's per 1,000 inhabitants per day. Hospital activity and occupancy statistics were obtained from data published by the Department of Health.

Results

Antibiotic resistance

E. coli bacteraemia

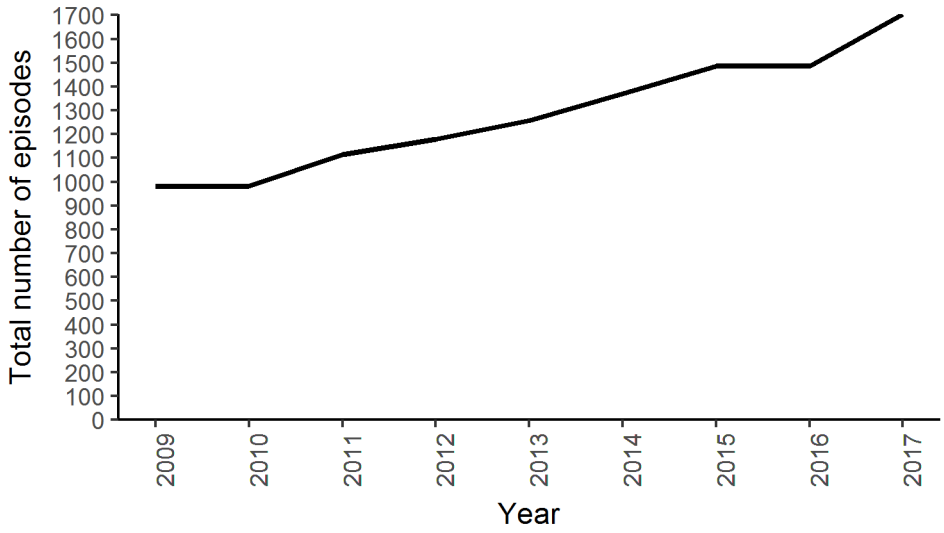


Figure 1: The number of *E. coli* bacteraemias reported to the Public Health Agency, 2009 - 2017

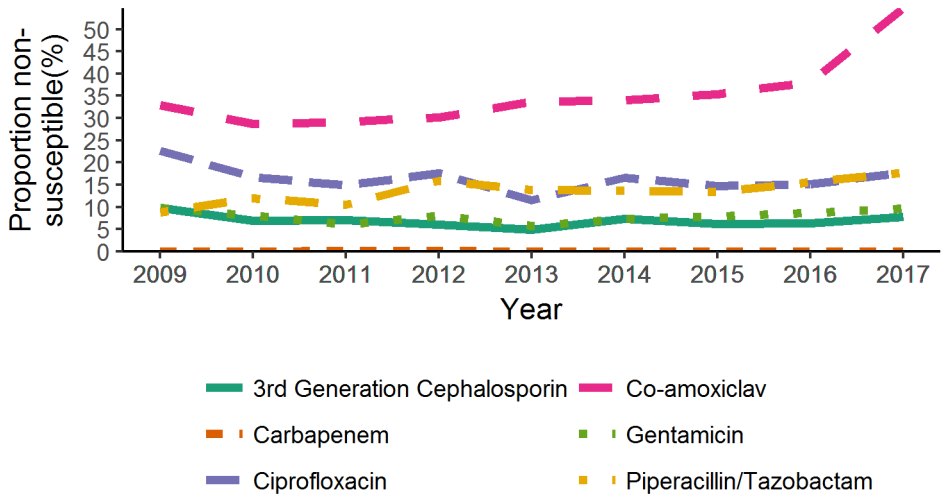


Figure 2: The proportion of *E. coli* bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *E. coli* bacteraemias has increased from 980 in 2009 to 1703 cases in 2017 (Figure 1). The proportion of isolates tested against key antibiotics during 2017 is shown in Appendix 3.

Resistance to piperacillin/tazobactam and co-amoxiclav has increased over the time period (8.8% to 17.7% and 32.9% to 54.7% respectively). The proportion of isolates resistant to gentamicin has remained relatively stable during 2009 - 2017 (9.8% and 9.6%). There were no *E. coli* isolates resistant to carbapenems detected in 2017. Resistance to third generation cephalosporins and ciprofloxacin has decreased (9.8% to 7.7% and 22.6% to 17.7% respectively (Figure 2)).

Despite the reduction in the proportion of resisant isolates reported for the chosen antibioitics, it should be noted that in absolute terms the number of resistant isolates have increased. For example, while the proportion of isolates resistant to ciprofloxacin decreased during 2009 - 2017 (22.6% to 17.7%), the number of infections increased (182 to 271 episodes). The number of isolates resistant to three or more antibiotic classes also increased (34 to 70 episodes).

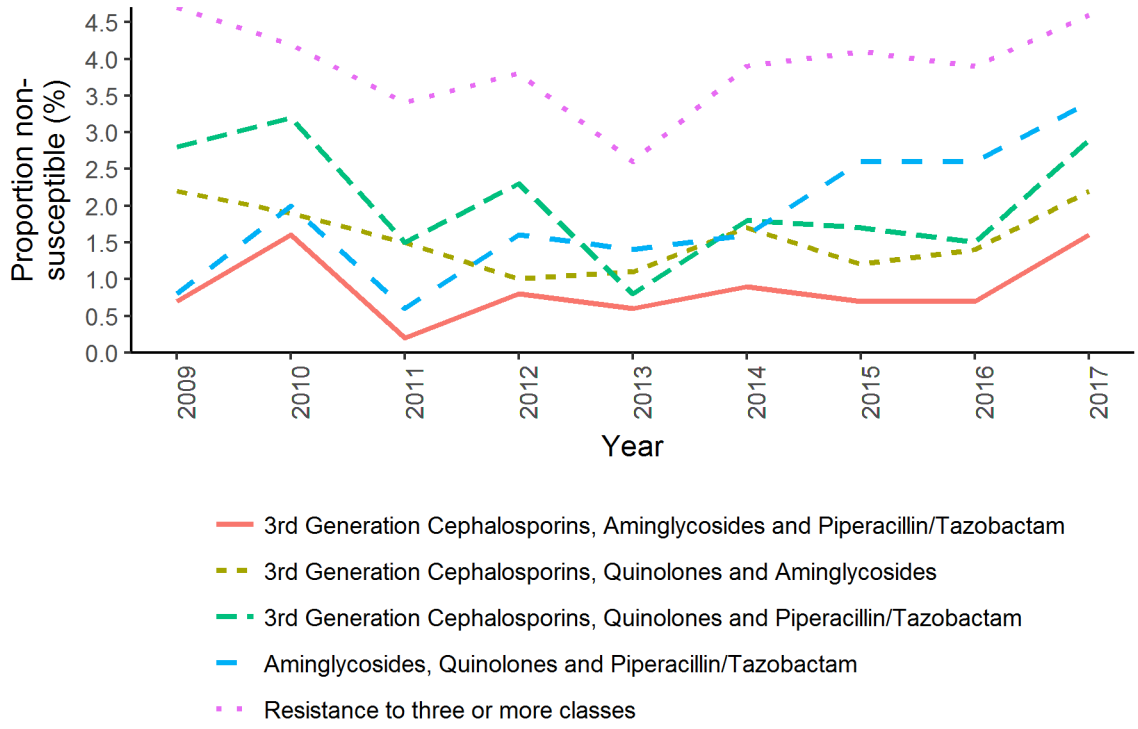


Figure 3: The proportion of *E. coli* bacteraemias reported to the Public Health Agency with multi-drug resistance, 2009 - 2017

The proportion of *E. coli* bacteraemias showing multi-resistance remained stable between 2009 and 2017 and varied in the range of 1-4%. Resistance to at least three or more antibiotic classes has fluctuated around 4%. Within the combination of antibiotic classes, the highest proportion of resistance was seen for combinations of aminoglycosides, quinolones and piperacillin/tazobactam and the lowest for third-generation cephalosporins, aminoglycosides and piperacillin/tazobactam (Figure 3).

K. pneumoniae bacteraemia

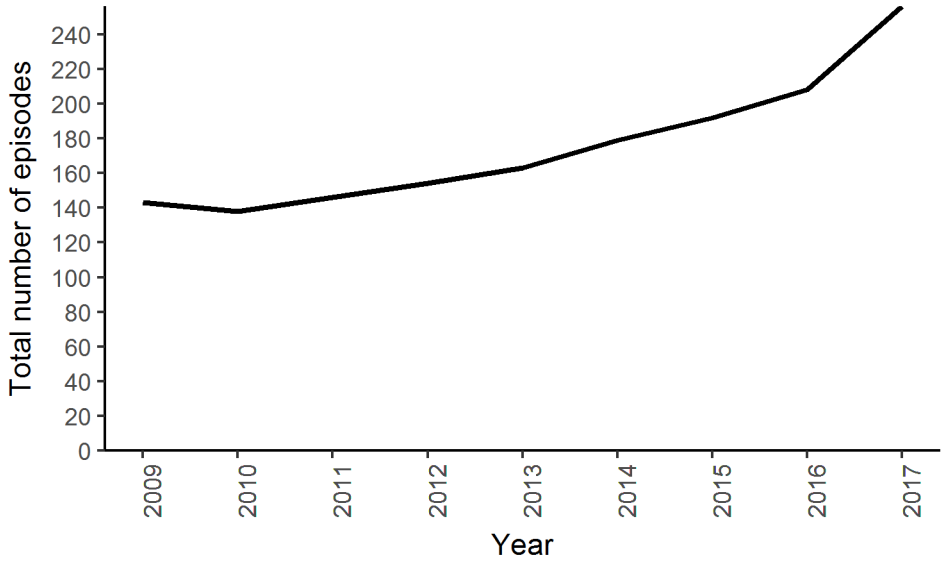


Figure 4: The number of *K. pneumoniae* bacteraemias reported to the Public Health Agency, 2009 - 2017

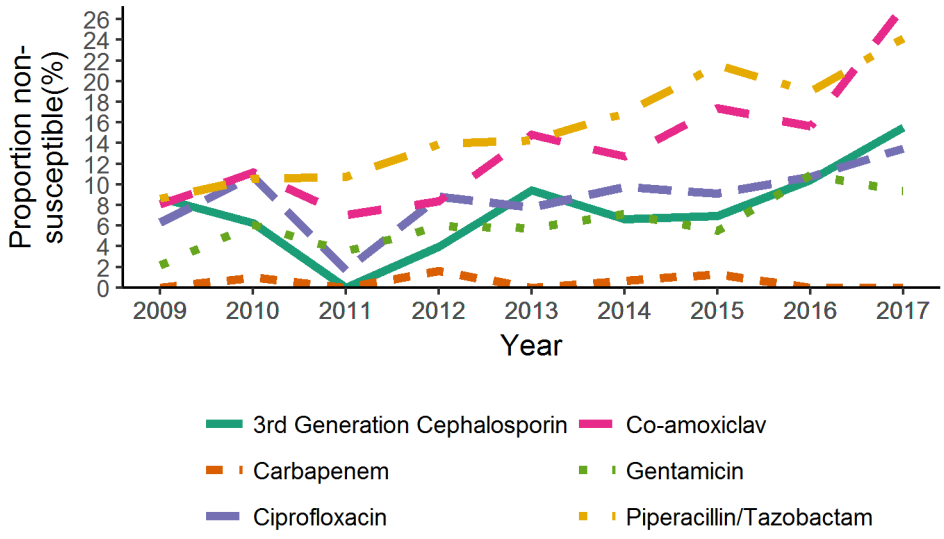


Figure 5: The proportion of *K. pneumoniae* bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *K. pneumoniae* bacteraemias has increased from 143 cases in 2009 to 256 cases in 2017 (Figure 4). The proportion of isolates tested against key antibiotics during

2017 is shown in Appendix 3.

There has been an increase in the proportion of *K. pneumoniae* bacteraemias resistant to selected antibiotics over the 5 year period: ciprofloxacin (6.3% to 13.5%); gentamicin (2.2% to 9.4%); co-amoxiclav (8.1% to 27.2%); piperacillin/tazobactam (8.6% to 24.2%) and cephalosporins (8.7% to 15.5%). There were no isolates resistant to carbapenems detected over the period; Figure 5).

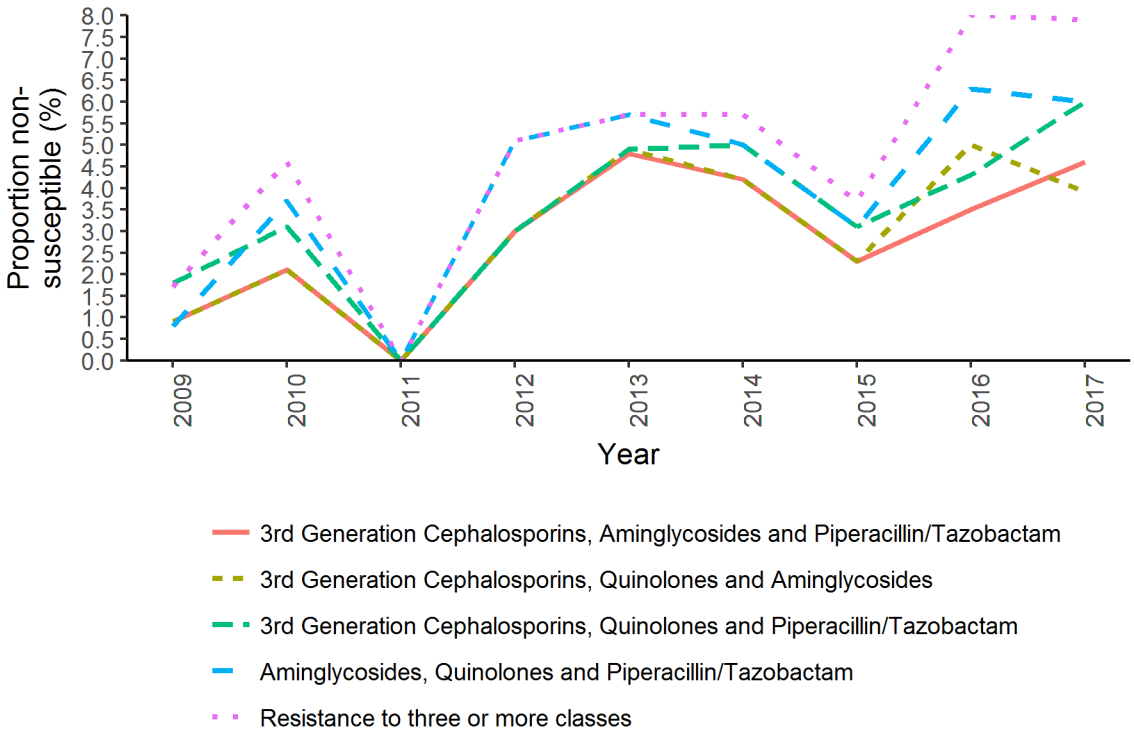


Figure 6: The proportion of *K.pneumoniae* bacteraemias reported to the Public Health Agency with multi-drug resistance, 2009 - 2017

The proportion of *K. pneumoniae* bacteraemias showing multi-resistance has increased slightly between 2009 and 2017 across all antibiotic combinations. Multi-resistance varied between 0 - 8%.The proportion of *K. pneumoniae* bacteraemias exhibiting resistance to three or more classes has increased over time. Within the named combinations of antibiotic classes, the highest proportions were seen for combinations of aminoglycosides, quinolones and piperacillin/tazobactam and the lowest for third generation cephalosporins, aminoglycosides and piperacillin/tazobactam (Figure 6).

Unlike *E. coli* both the proportion and absolute numbers of *K. pneumoniae* bacteraemias have increased. For example, the proportion of *K. pneumoniae* resistant to ciprofloxacin

increased by 7% during 2009 - 2017 (6.3% to 13.5%), the number of infections trebled (8 to 30 episodes). The number of isolates resistant to three or more classes also increased (2 to 17 episodes).

K. oxytoca bacteraemia

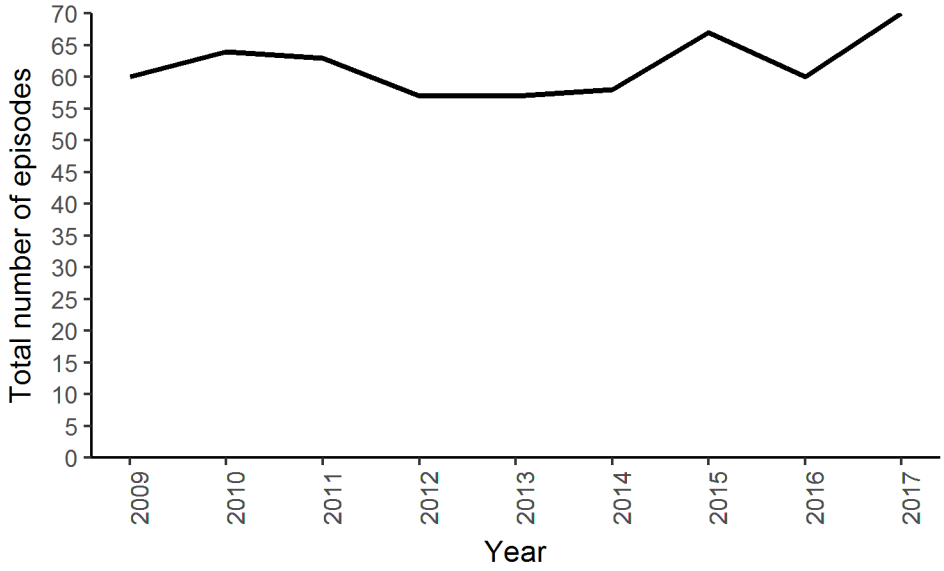


Figure 7: The number of *K. oxytoca* bacteraemias reported to the Public Health Agency, 2009 - 2017

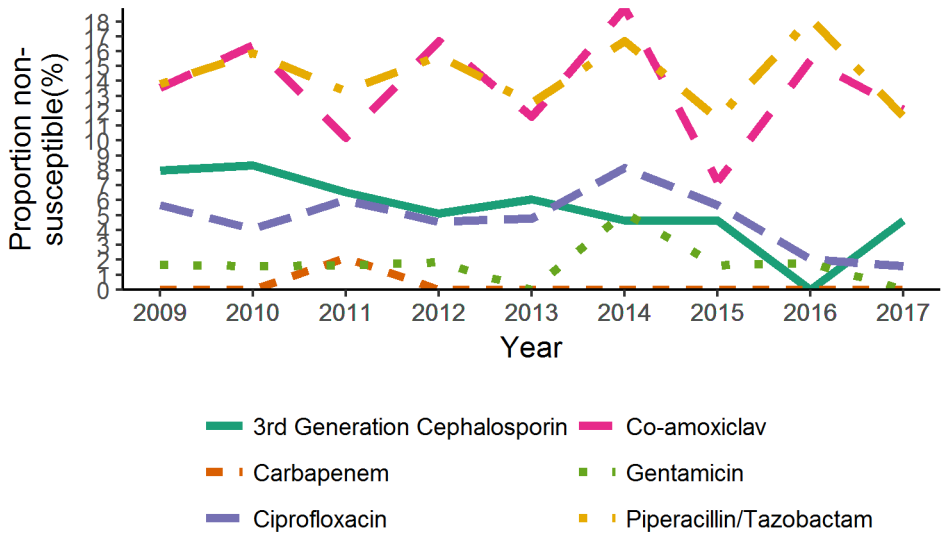


Figure 8: The proportion of *K. oxytoca* bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *K. oxytoca* bacteraemias has increased from 60 cases in 2009 to 70 cases in 2017 (Figure 7). The proportion of isolates tested against key antibiotics during 2017 is

shown in Appendix 3.

There has been a decrease in the proportion of *K. oxytoca* bacteraemias resistant to selected antibiotics over the 5 year period: ciprofloxacin (5.7% to 1.6%); gentamicin (1.7% to 0%); co-amoxiclav (13.6% to 12.1%) and piperacillin/tazobactam (13.8% to 11.6%) and cephalosporins (8% to 4.7%). There was no resistance to carbapenems detected over the period 2009 - 2017; Figure 8).

Pseudomonas species bacteraemia

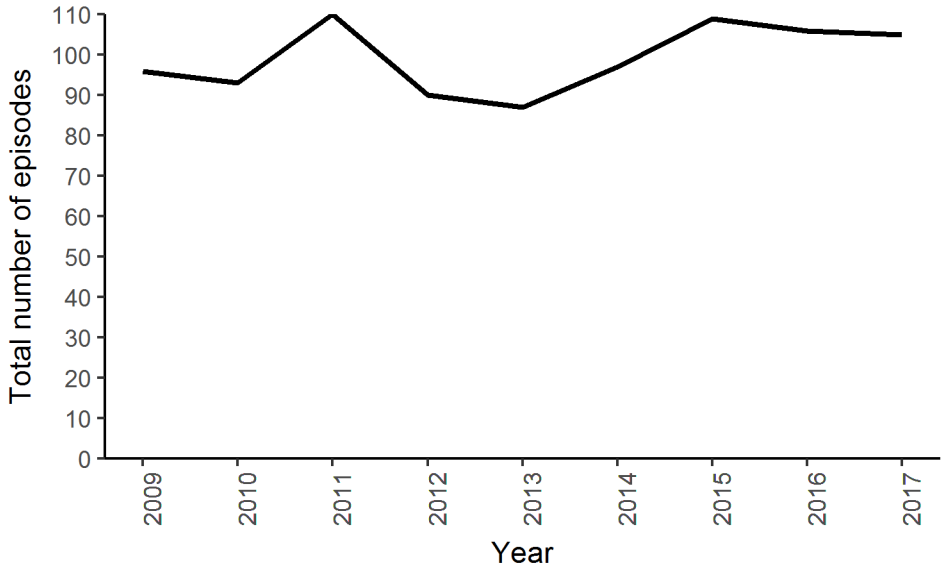


Figure 9: The number of Pseudomonas species bacteraemias reported to the Public Health Agency, 2009 - 2017

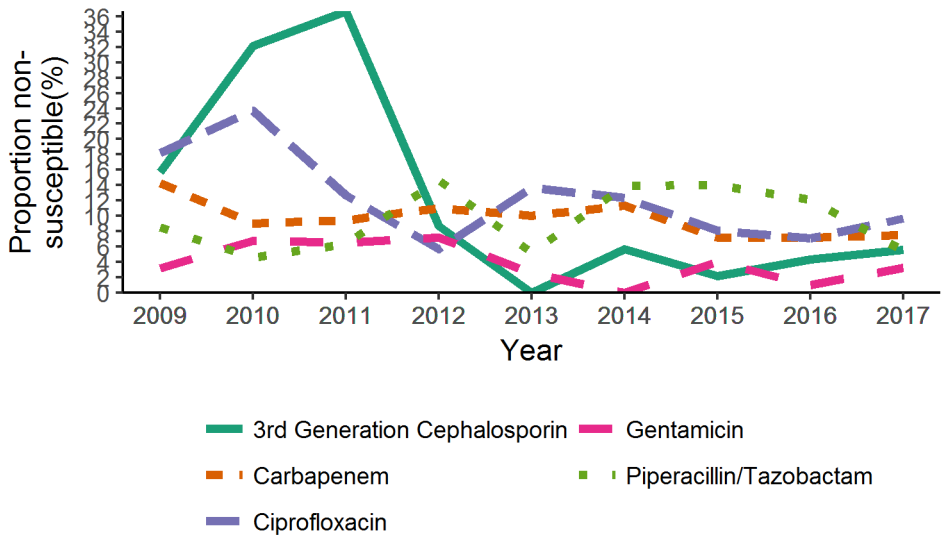


Figure 10: The proportion of Pseudomonas species bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *Pseudomonas species* bloodstream infections has remained relatively stable with 109 cases in 2009 and 105 cases in 2017 (Figure 9). The proportion of isolates

tested against key antibiotics during 2017 is shown in Appendix 3.

There was a slight increase in the proportion of *Pseudomonas species* bacteraemias resistant to piperacillin/tazobactam between 2009 to 2016 (8.5% to 12.1%) with a decrease noted in 2017 (5.5%). Resistance among selected antibiotics has decreased: ciprofloxacin (18.2% to 9.7%); third generation cephalosporins (15.7% to 5.6%) and; carbapenems (14.3% to 7.5%). Resistance to gentamicin has fluctuated across the period but is similar in 2017 and 2009 (3.2%); (Figure 10).

S. aureus bacteraemia

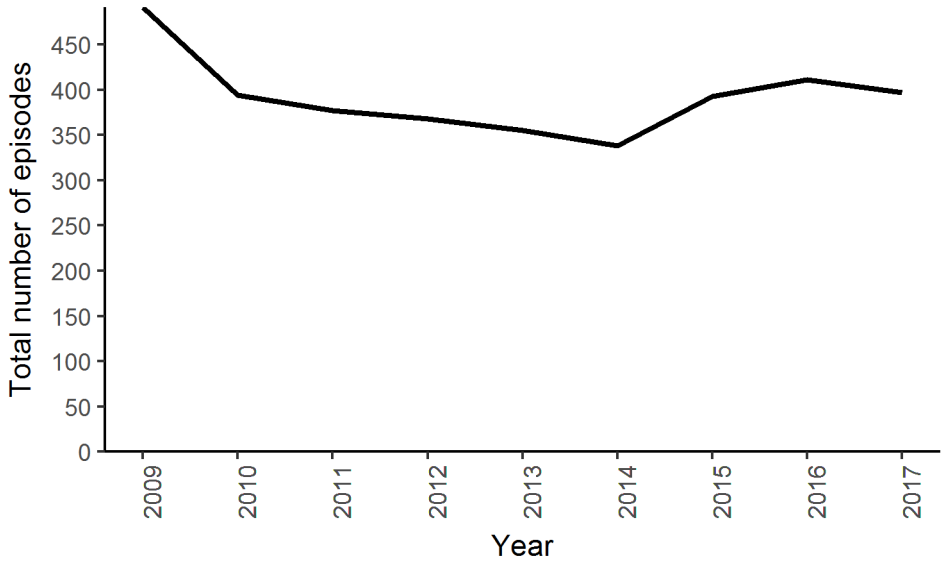


Figure 11: The number of *S. aureus* bacteraemias reported to the Public Health Agency, 2009 - 2017

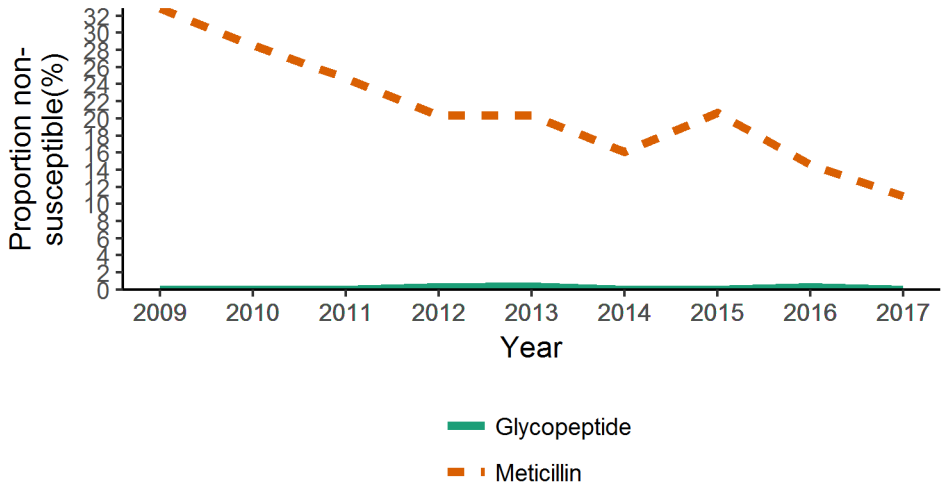


Figure 12: The proportion of *S. aureus* bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *S. aureus* bacteraemias had been decreasing between 2009 and 2014 but began to increase from 338 in 2014 to 411 cases in 2016 before again decreasing in 2017

(397 cases); (Figure 11). The proportion of isolates tested against key antibiotics during 2017 is shown in Appendix 3. The proportion of *S. aureus* that are resistant to meticillin (MRSA) has been decreasing over the last 5 years, with a low of 10.9% in 2017. The proportion of *S. aureus* that are resistant to glycopeptides (eg. Vancomycin or Teicoplanin) has remained low (Figure 12).

Enterococcus species bacteraemia

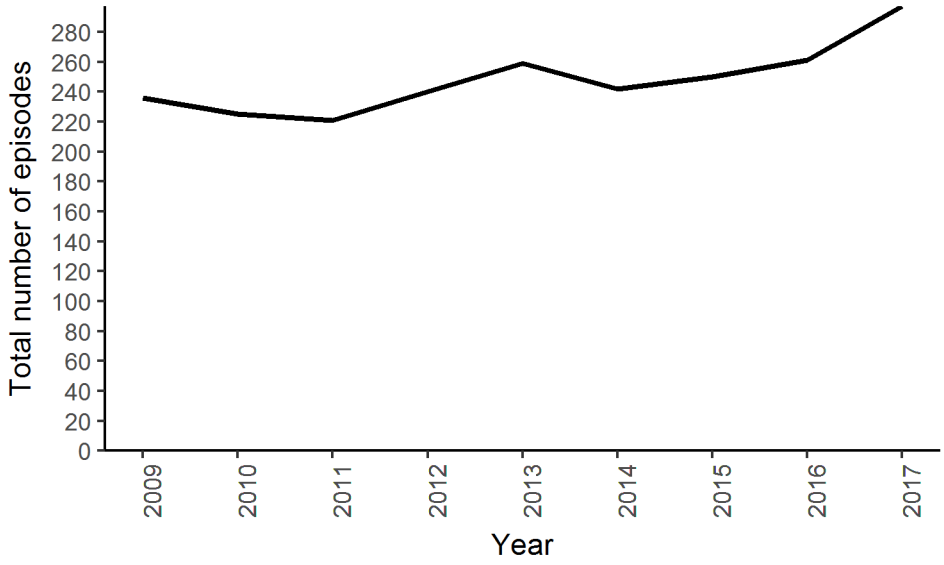


Figure 13: The number of Enterococcus species bacteraemias reported to the Public Health Agency, 2009 - 2017

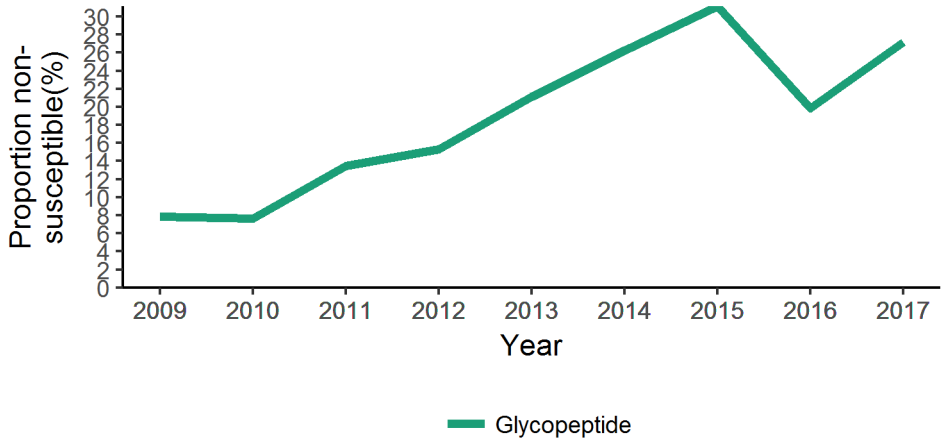


Figure 14: The proportion of Enterococcus species bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *Enterococcus species* bacteraemias has generally increased between 2009 and 2017 with a steady year on year increase during the period 2015 to 2017 (250; 261

and 297 cases respectively; Figure 13). Resistance to glycopeptides has been increasing over the period, with a decreased noted only in 2016. In 2017, 92.9% were tested against glycopeptides- 27.2% were resistant (Figure 14).

S. pneumoniae bacteraemia

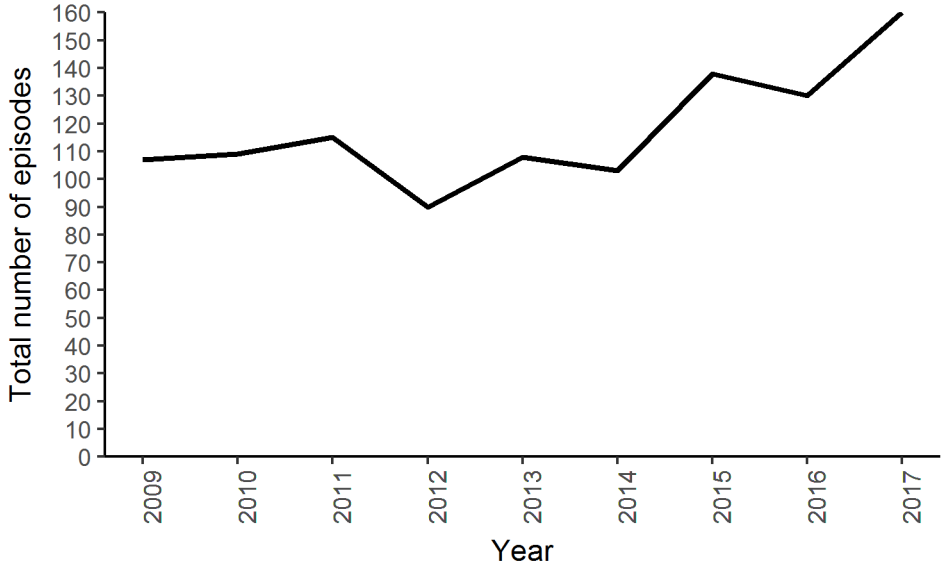


Figure 15: The number of *S. pneumoniae* bacteraemias reported to the Public Health Agency, 2009 - 2017

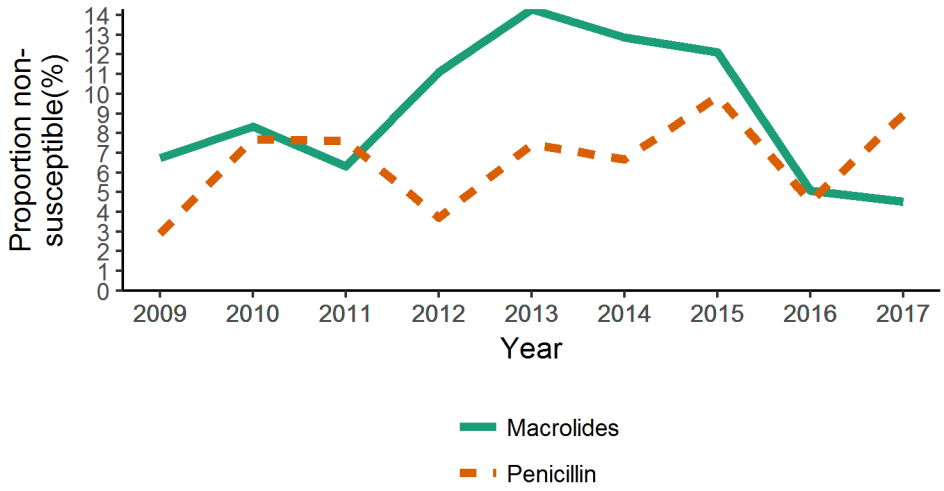


Figure 16: The proportion of *S. pneumoniae* bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

There has been a general increase in the number of *S. pneumoniae* bacteraemias during the time period, with slight decreases reported from 2011-2012 (115 cases to 90 cases),

2013-2014 (108 cases to 103cases) and 2015 to 2016 (138 cases to 130 cases). Between 2016 and 2017 the number of cases increased to 160; the highest recorded during the period (Figure 15). The proportion of isolates tested against key antibiotics during 2017 is shown in Appendix 3. While the proportion of *S. pneumoniae* resistant to macrolides increased between 2009-2013, resistance has been decreasing from 2009 (6.7% to 4.5% 2017. Resistance to penicillin has increased (2.9% to 8.9% during the same period; Figure 16).

Acinetobacter species bacteraemia

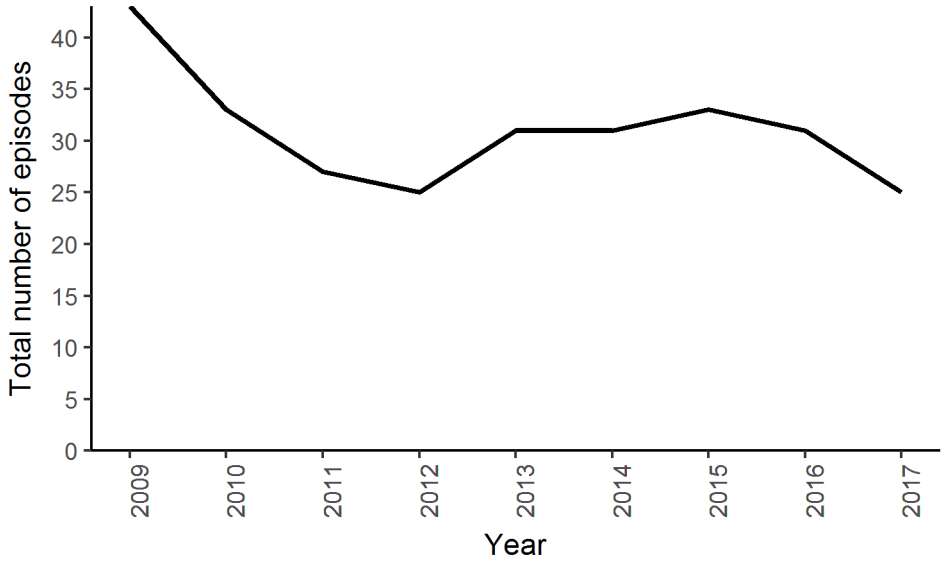


Figure 17: The number of Acinetobacter species bacteraemias reported to the Public Health Agency, 2009 - 2017

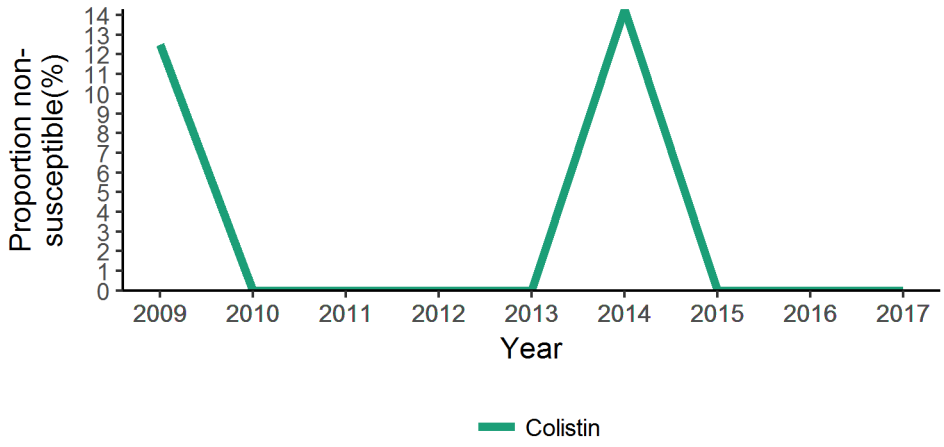


Figure 18: The proportion of Acinetobacter species bacteraemias resistant to selected antibiotics in NI, 2009 - 2017

The number of *Acinetobacter species* bacteraemias decreased from 33 cases in 2015 to 25 cases in 2017 (Figure 17). During 2017, 4 isolates were tested against colistin.

Resistance to colistin among *Acinetobacter species* has remained at zero (Figure 18).

Carbapenamse Producing Organisms

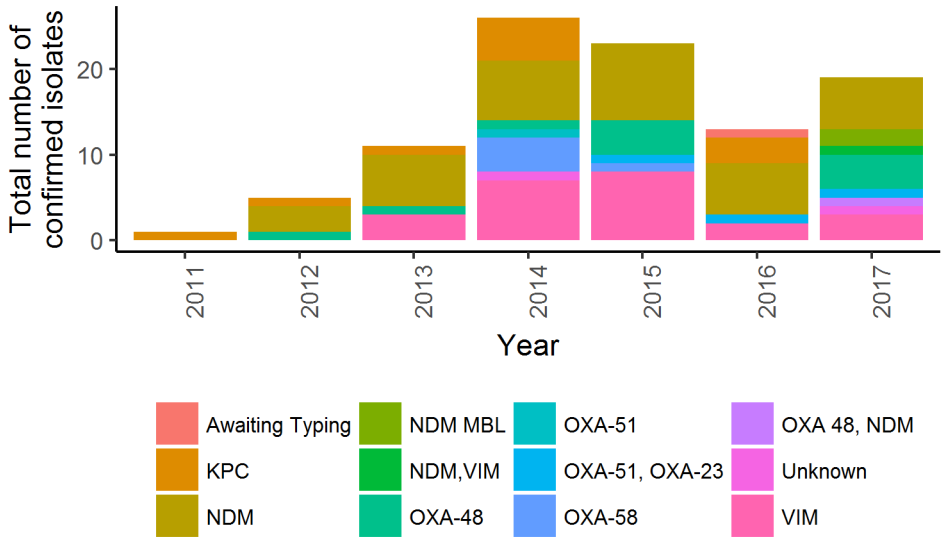


Figure 19: Carbapenamase activity among CPO confirmed isolates sent to Public Health England's AMRHAI Reference unit, 2011 - 2017

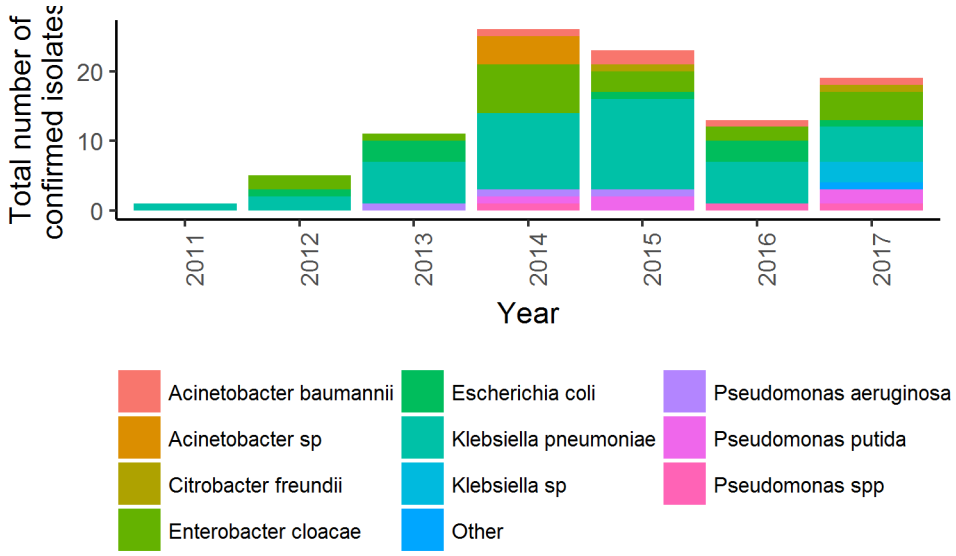


Figure 20: Organisms with confirmed carbapenamase production among isolates sent to Public Health England's AMRHAI Reference unit, 2011 - 2017

The number of CPO's voluntarily reported to the PHA increased from 1 in 2011 to 26 in 2014 but decreased between 2015-2016 (23 to 13) before increasing to 19 episodes

during 2017 (Figure 19). The most common reported resistance mechanism is New Delhi Metallo-Beta-lactamase (NDM) (37 episodes during 2011-2017; Figure 19). The most commonly reported CPO over the time period was *K. pneumoniae* (Figure 20).

Antibiotic resistance in *Neisseria gonorrhoeae*

Gonorrhoea has been identified as at risk of becoming an untreatable disease due to the emergence of antimicrobial resistance to successive standard treatments. This has necessitated changes to recommended antibiotic prescribing. In the UK, current recommended treatment guidelines include ceftriaxone with azithromycin, along with routine test of cure[5]. Third-generation cephalosporins are the last remaining effective antibiotics but reports of treatment failures and increasing minimum inhibitory concentrations (MIC) levels have raised concerns that they will no longer be a suitable treatment option[6]. Since 2015, NI has participated in the European Gonococcal Antimicrobial Surveillance Programme(Euro-GASP)[7] through the Royal Victoria Hospital, Belfast. This GUM clinic captured 61% of all gonorrhoea diagnoses made during 2017.

In 2017, gonorrhoea diagnoses accounted for 12% (679/5,728) of all new STI diagnoses made in NI GUM clinics. During the study period, 30 isolates were cultured and sent to Public Health England for inclusion in EuroGASP. Of these, *N. gonorrhoeae* was successfully retrieved from 20 isolates (67%).

From 2015 to 2017, 69 isolates were tested within the EuroGASP programme and showed similar resistance pattern to the UK overall with 10% resistant to azithromycin and 0% resistant to ceftriaxone.

The full report for this surveillance programme will be published on the PHA website.

Antibiotic consumption

Rates of antibiotic consumption by healthcare setting

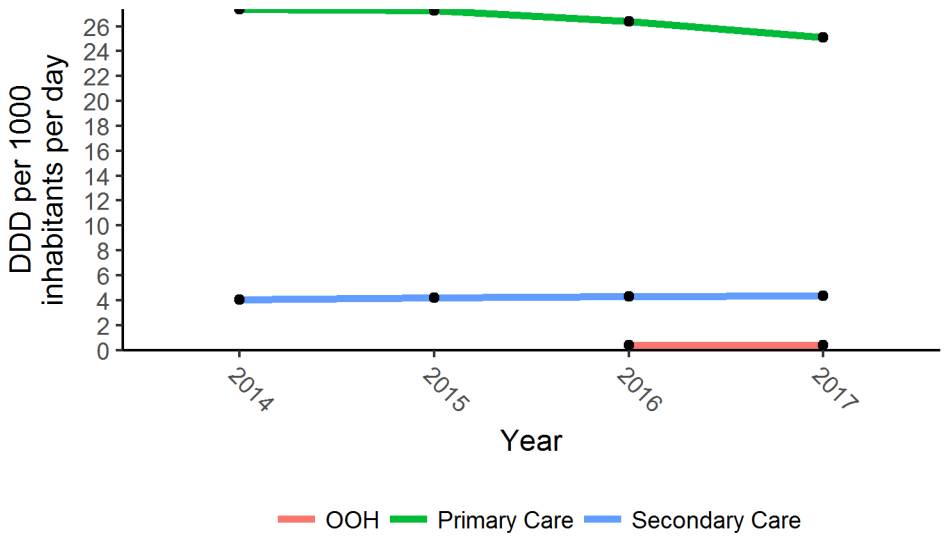


Figure 21: Total antibiotic consumption, expressed as DDD per 1000 inhabitants per day, NI, 2014-2017

In 2017, the total consumption of antibiotics in primary (including out-of-hours) and secondary care was 29.87 per 1000 inhabitants per day (31.37, 31.47 and 31.08 per 1000 inhabitants per day in 2014, 2015 and 2016 respectively).

The majority of antibiotic prescribing took place in primary care (84% during 2017; Figure 21). In primary care, rates were stable between 2014 and 2015, decreasing slightly in 2016 and 2017. In 2017 the overall rate of prescribing in primary care was 25.09 per 1000 inhabitants per day. There has been little change in the overall rate of antibiotic prescribing in secondary care (4.38 per 1000 inhabitants per day) during 2017 from 4.29 during 2016. Prescribing data for out-of-hours centres (OOH) was available for 2016 and 2017 during which the rate remained stable at 0.4 per 1000 inhabitants per day; Figure 21).

Rates of antibiotic consumption in Secondary care

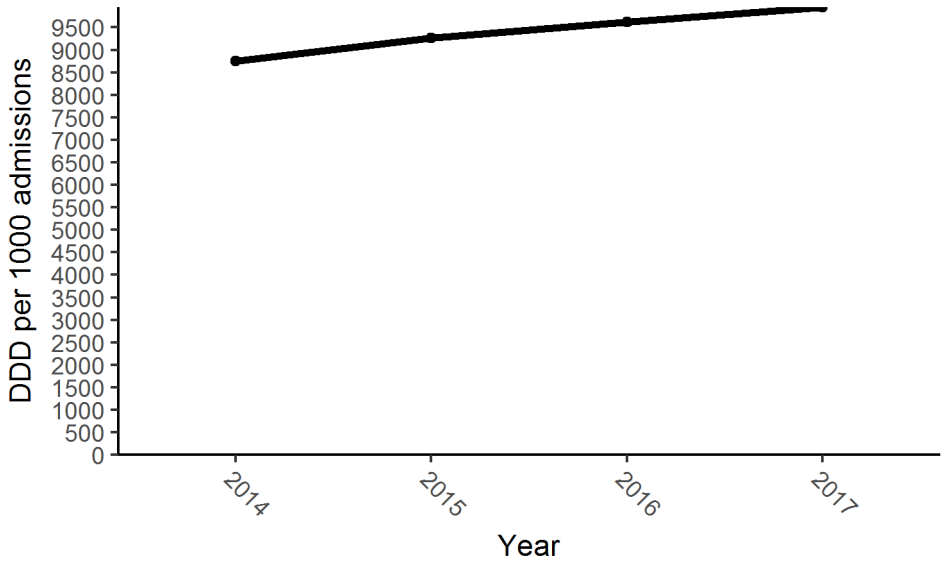


Figure 22: Total antibiotic consumption, expressed as DDD per 1000 admissions, NI, 2014-2017

There has been a gradual year on year increase in the rate of antibiotic consumption expressed as DDD per 1000 admissions: (8758 in 2014 to 9944 DDD per 1000 admissions in 2017 (Figure 22).

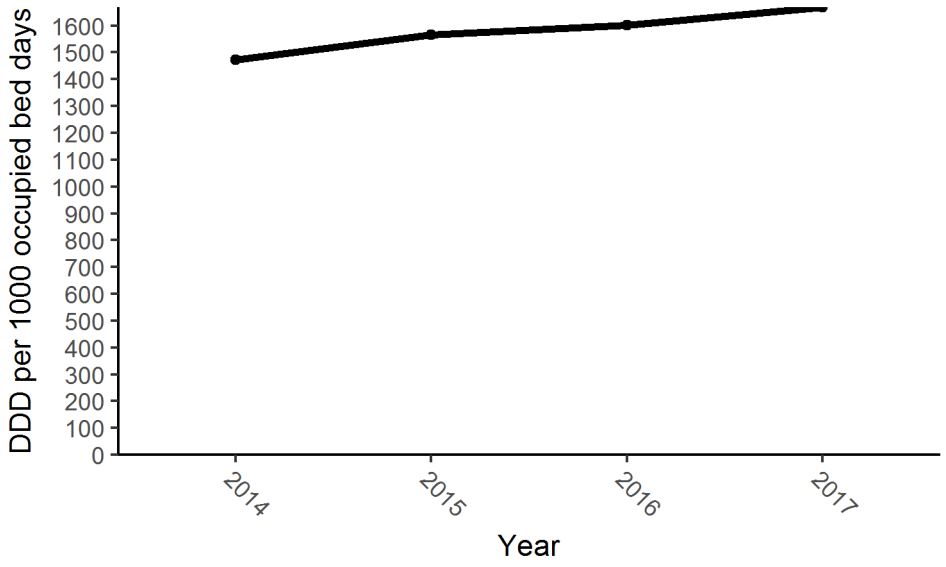


Figure 23: Total antibiotic consumption, expressed as DDD per 1000 occupied bed days, NI, 2014-2017

Like the admissions data, the rate of antibiotic consumption per 1000 occupied bed days has been gradually increasing year on year: 1473 in 2014 to 1668 DDD per 1000 occupied beddays in 2017 (Figure 23).

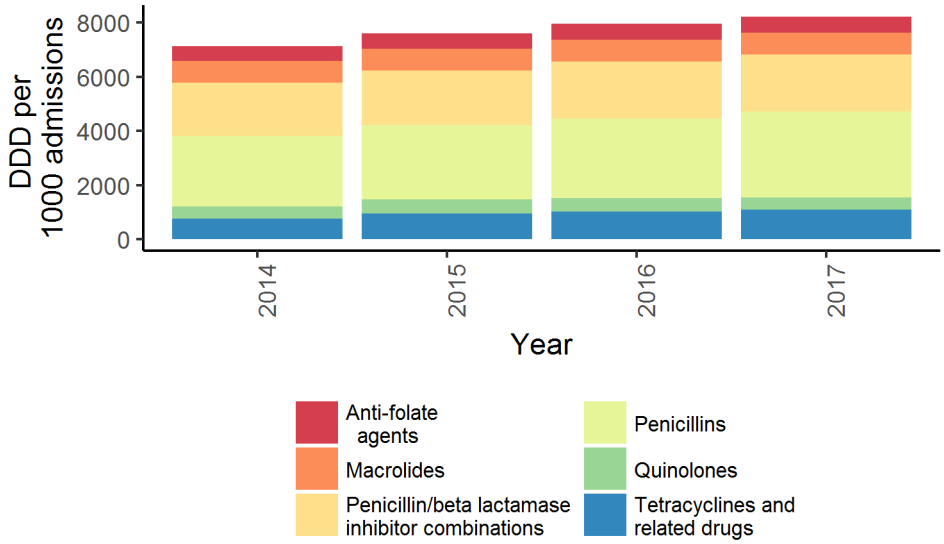
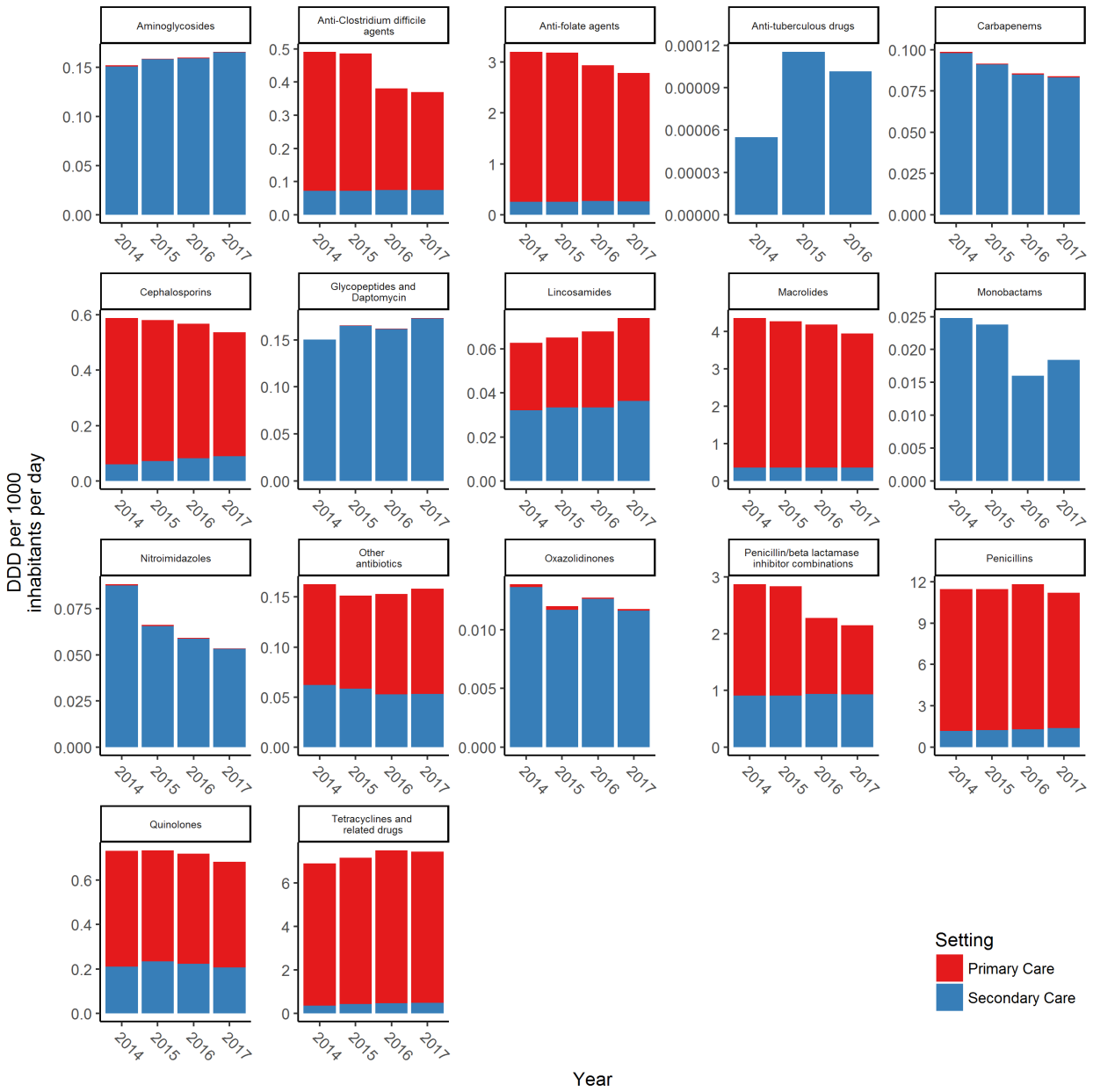


Figure 24: Total antibiotic consumption by key agents in secondary care, expressed as DDD per 1000 admissions, NI, 2014-2017

This figure shows the top 6 key agents prescribed in secondary care. During 2017, the highest rates for antibiotic consumption were penicillins (3145 DDD per 1000 admissions), Penicillin/beta lactamase inhibitor combinations (2115 DDD per 1000 admissions) and tetracyclines and related drugs (1090 DDD per 1000 admissions; Figure 24).

Antibiotic consumption by key agents



Note: differing scales on y-axis

During 2017, the most frequently used antibiotics in both primary and secondary care in NI were Penicillins (38.5% and 31.6% respectively), tetracyclines and related drugs (27.3% and 11% respectively) and macrolides (14.1% and 8.1% respectively). Overall, the rate of antibiotic prescribing has remained relatively stable across all groups (**??**).

Antibiotic consumption by class and individual antibiotics

Penicillins

Table 1: Total rate of Penicillins DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Penicillins	7708992	1840500	11.48
2015	Penicillins	7755516	1851600	11.48
2016	Penicillins	8030224	1862100	11.81
2017	Penicillins	7654114	1870800	11.21

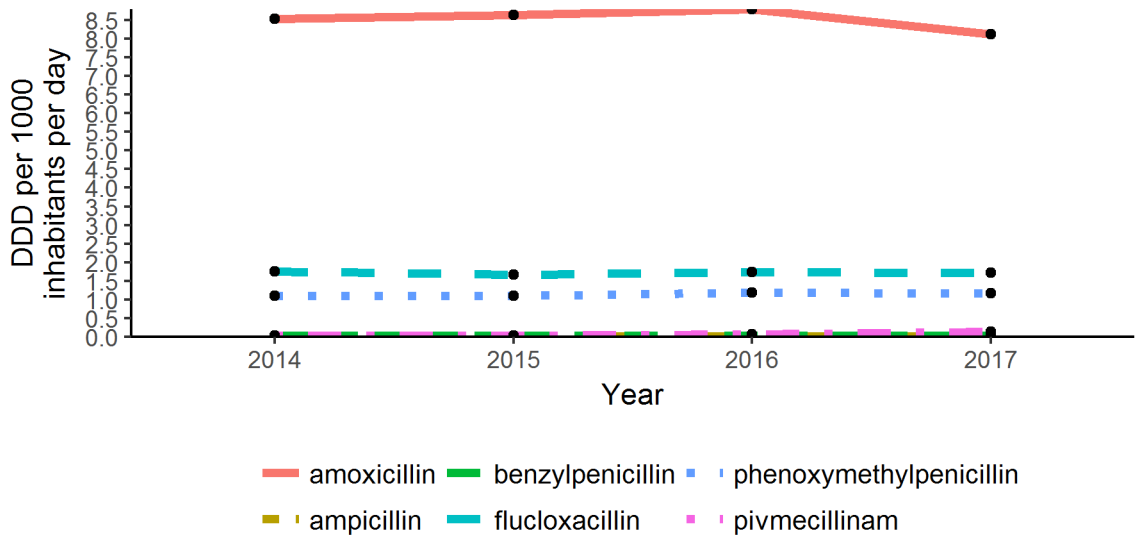


Figure 25: Consumption of most commonly used penicillins expressed per 1000 inhabitants per day, NI, 2014 - 2017

The figure represents the top six antimicrobial agents used in the Penicillins class. Penicillins accounted for 37.5% of antibiotic consumption in 2017. The rate of penicillin consumption has slightly decreased to a rate of 11.21 per 1000 inhabitants per day during 2017. The highest rate was for amoxicillin (8.13 DDD per 1000 inhabitants per day in 2017; Figure 25).

Cephalosporins

Table 2: Total rate of Cephalosporins DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Cephalosporins	394892	1840500	0.59
2015	Cephalosporins	392427	1851600	0.58
2016	Cephalosporins	386024	1862100	0.57
2017	Cephalosporins	366426	1870800	0.54

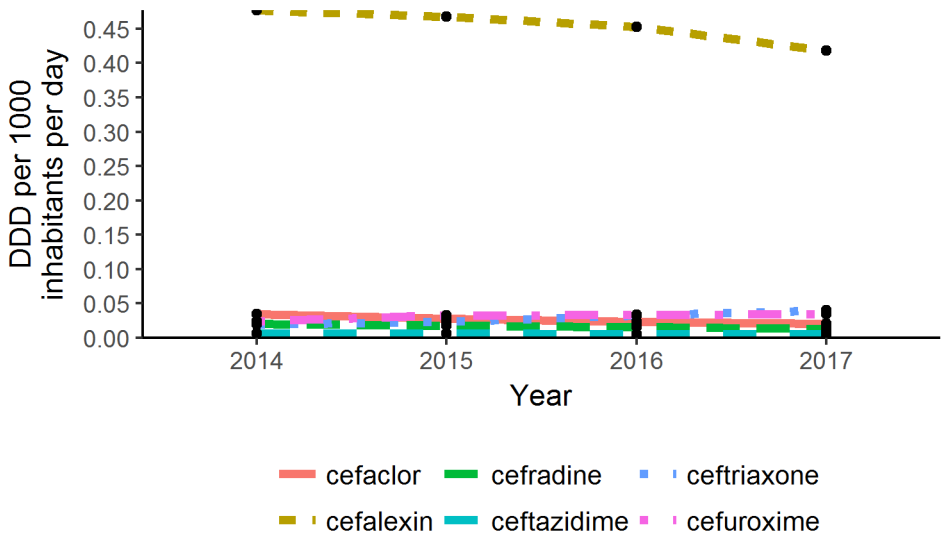


Figure 26: Consumption of most commonly used cephalosporins expressed per 1000 inhabitants per day, NI, 2014 - 2017

The figure represents the top six agents used in the Cephalosporins class. The rate of cephalosporin consumption has remained relatively stable with a rate of 0.54 DDD per 1000 inhabitants per day during 2017. The highest rate was for cefalexin, the rate of which has decreased over time (0.42 DDD per 1000 inhabitants per day during 2017; Figure 26).

Tetracyclines and related drugs

Table 3: Total rate of tetracyclines and related drugs consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Tetracyclines and related drugs	4637310	1840500	6.90
2015	Tetracyclines and related drugs	4840373	1851600	7.16
2016	Tetracyclines and related drugs	5088909	1862100	7.49
2017	Tetracyclines and related drugs	5084036	1870800	7.45

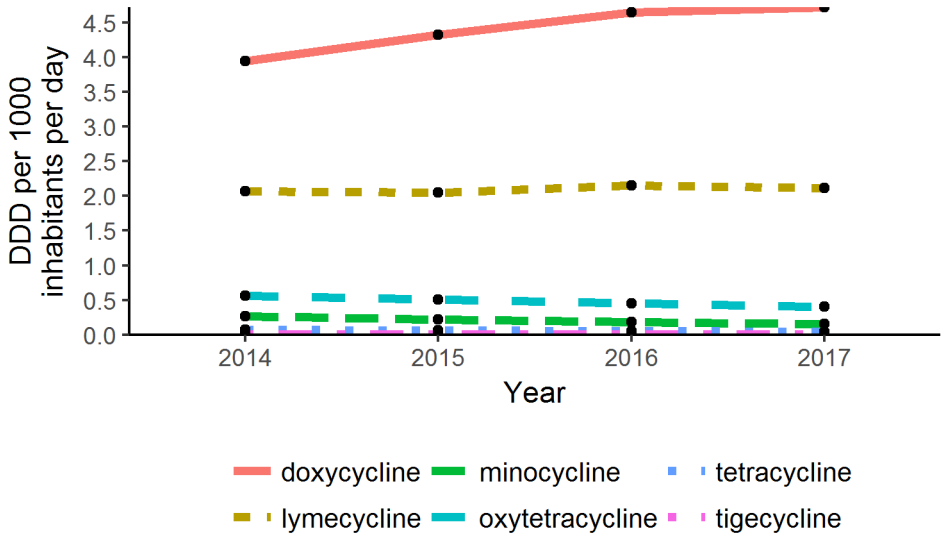


Figure 27: Consumption of most commonly used tetracyclines and related drugs[2] expressed per 1000 inhabitants per day, NI, 2014 - 2017

The figure represents the top six agents used in the tetracyclines and related drugs class. Tetracyclines and related drugs accounted for 24.9% of all antibiotic consumption in 2017. The rate of tetracyclines and related drugs consumption has generally increased during 2014 - 2017 with a rate of 7.45 DDD per 1000 inhabitants per day during 2017. The highest rate was for doxycycline, the rate of which has increased over time (3.94 to 4.72 DDD per 1000 inhabitants per day from 2014 to 2017; Figure 27).

[2]While demeclocycline and lymecycline are not primarily used for their antimicrobial effects they have been included as they can still be considered drivers of resistance.

Quinolones

Table 4: Total rate of Quinolones consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Quinolones	491422	1840500	0.73
2015	Quinolones	495643	1851600	0.73
2016	Quinolones	488675	1862100	0.72
2017	Quinolones	465618	1870800	0.68

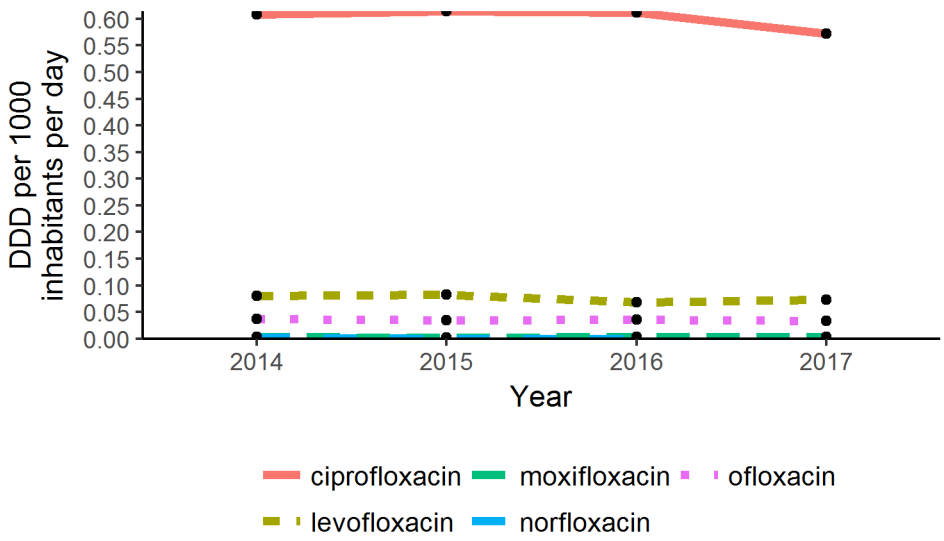


Figure 28: Consumption of most commonly used quinolones expressed per 1000 inhabitants per day, NI, 2014 - 2017

The rate of Quinolones consumption remained stable during 2014 - 2016, decreasing slightly to a rate of 0.68 DDD per 1000 inhabitants per day during 2017. The highest rate was for ciprofloxacin which has also been stable between 2014-2016 but decreased to 0.57 DDD per 1000 inhabitants per day in 2017; Figure 28).

Macrolides

Table 5: Total rate of Macrolides consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Macrolides	2927767	1840500	4.36
2015	Macrolides	2887666	1851600	4.27
2016	Macrolides	2844342	1862100	4.18
2017	Macrolides	2696486	1870800	3.95

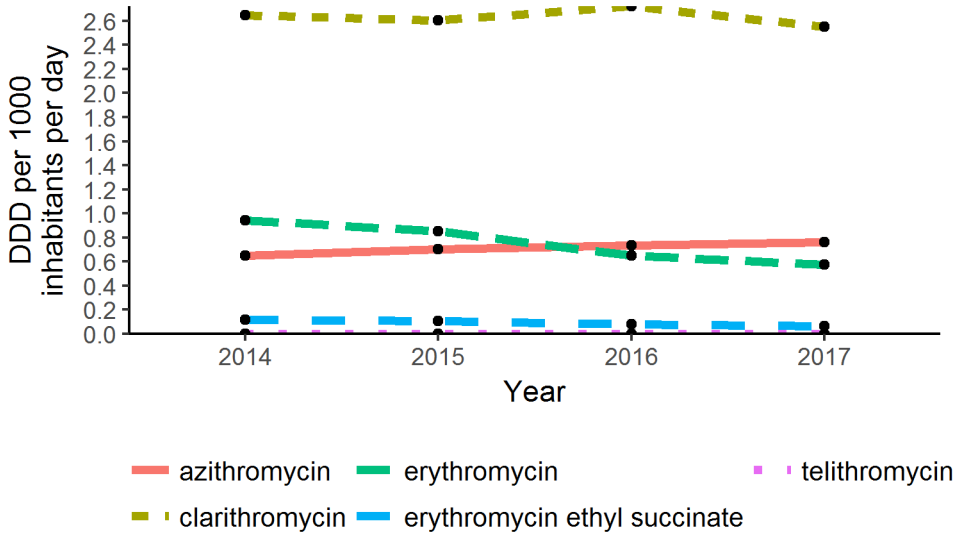


Figure 29: Consumption of most commonly used macrolides expressed per 1000 inhabitants per day, NI, 2014 - 2017

Macrolides accounted for 13.2% of all antibiotic consumption in 2017. The rate of Macrolides consumption has generally remained stable across the period, with a slight decline noted in 2017 (3.95 DDD per 1000 inhabitants per day). The highest rate was for clarithromycin which has been stable between 2014-2016 but decreased slightly to 2.55 DDD per 1000 inhabitants per day in 2017; (Figure 29).

Carbapenems

Table 6: Total rate of Carbapenems consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Carbapenems	66280	1840500	0.10
2015	Carbapenems	61872	1851600	0.09
2016	Carbapenems	58135	1862100	0.09
2017	Carbapenems	57294	1870800	0.08

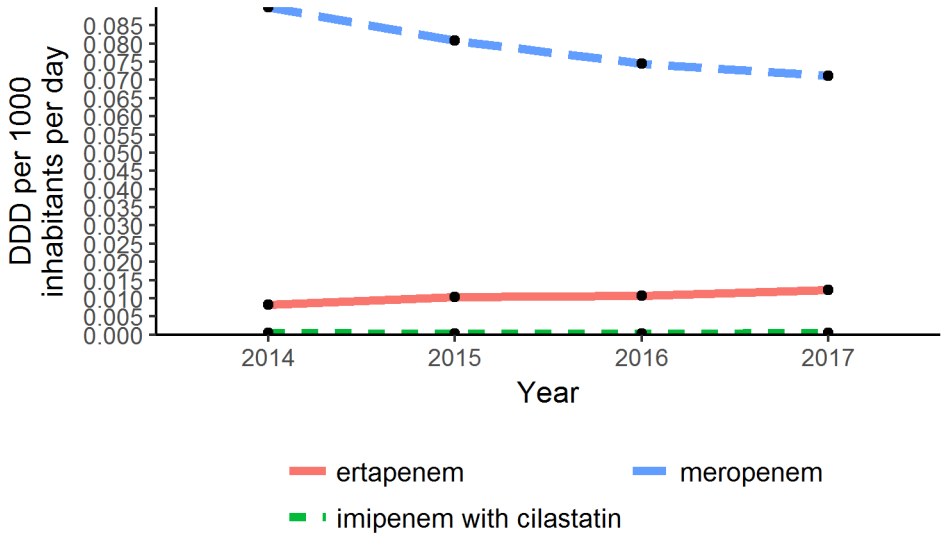


Figure 30: Consumption of most commonly used carbapenems expressed per 1000 inhabitants per day, NI, 2014 - 2017

The rate of Carbapenems consumption has remained stable during 2014 - 2017 with a rate of 0.08 DDD per 1000 inhabitants per day in 2017. The highest rate was for meropenem which has decreased slightly over time (0.09 in 2014 to 0.07 DDD per 1000 inhabitants per day in 2017; Figure 30).

Penicillin/beta lactamase inhibitor combinations

Table 7: Total rate of Penicillin/beta lactamase inhibitor combinations consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Penicillin/beta lactamase inhibitor combinations	1929077	1840500	2.87
2015	Penicillin/beta lactamase inhibitor combinations	1915479	1851600	2.83
2016	Penicillin/beta lactamase inhibitor combinations	1546893	1862100	2.28
2017	Penicillin/beta lactamase inhibitor combinations	1469779	1870800	2.15

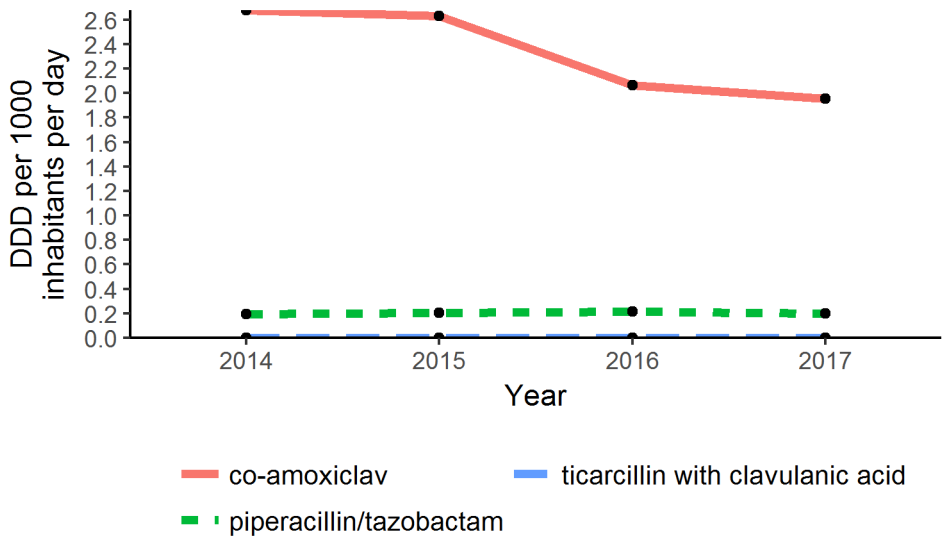


Figure 31: Consumption of most commonly used Penicillin/beta lactamase inhibitor combinations expressed per 1000 inhabitants per day, NI, 2014 - 2017

The rate of Penicillin/beta lactamase inhibitor combinations consumption has decreased during 2014 - 2017 with a rate of 2.15 DDD per 1000 inhabitants per day in 2017. The highest rate was for co-amoxiclav which has decreased over time (2.68 to 1.95 DDD per 1000 inhabitants per day from 2014 to 2017). The use of piperacillin/tazobactam has been stable over time (0.2 DDD per 1000 inhabitants per day in 2017; Figure 31).

Glycopeptides and daptomycin

Table 8: Total rate of glycopeptides and daptomycin consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Glycopeptides and Daptomycin	101105	1840500	0.15
2015	Glycopeptides and Daptomycin	111767	1851600	0.17
2016	Glycopeptides and Daptomycin	110060	1862100	0.16
2017	Glycopeptides and Daptomycin	118262	1870800	0.17

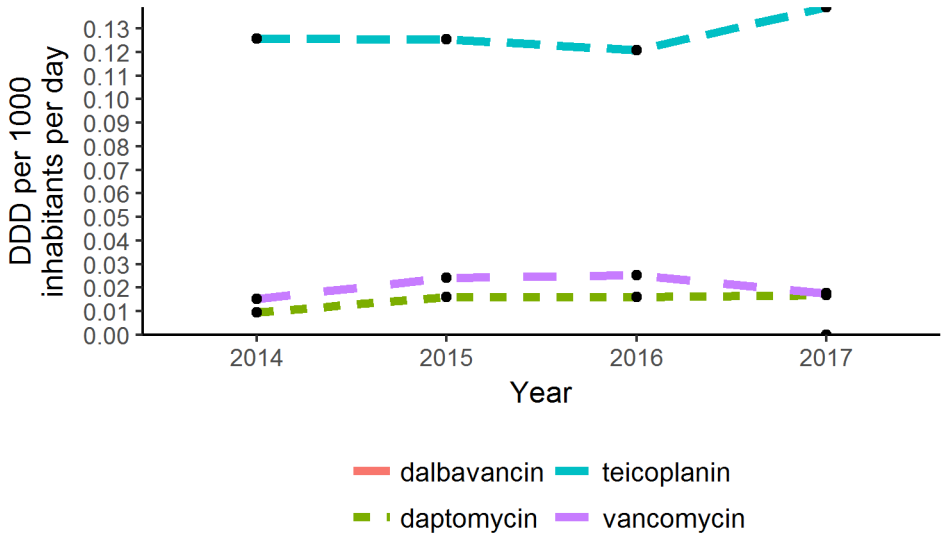


Figure 32: Consumption of most commonly used glycopeptides and daptomycin expressed per 1000 inhabitants per day, NI, 2014 - 2017

The rate of glycopeptide and daptomycin consumption has remained stable during 2014 - 2017 with a rate of 0.17 DDD per 1000 inhabitants per day in 2017. The highest rate was for teicoplanin which has been generally stable over time (0.14 DDD per 1000 inhabitants per day in 2017; Figure 32).

Anti-folate agents

Table 9: Total rate of Anti-folate agents consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Anti-folate agents	2148805	1840500	3.20
2015	Anti-folate agents	2153624	1851600	3.19
2016	Anti-folate agents	1995188	1862100	2.94
2017	Anti-folate agents	1903605	1870800	2.79

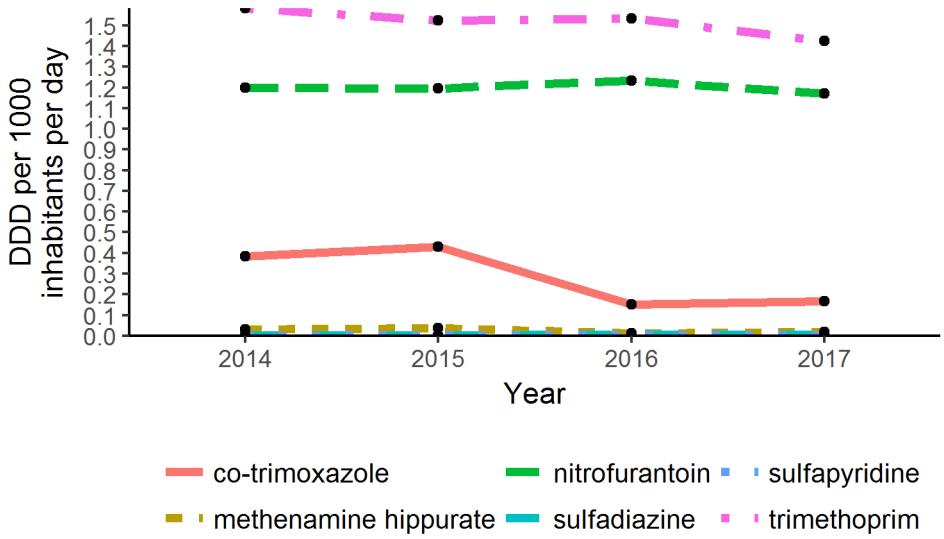


Figure 33: Consumption of most commonly used anti-folate agents expressed per 1000 inhabitants per day, NI, 2014 - 2017

Anti-folate agents accounted for 9.3% of all antibiotic consumption in 2017. The rate of Anti-folate agents consumption has remained stable during 2014 - 2016 but decreased slightly to a rate of 2.79 DDD per 1000 inhabitants per day in 2017. The highest rate was for trimethoprim which has decreased slightly over time (1.58 to 1.43 DDD per 1000 inhabitants per day from 2014 to 2017; Figure 33).

Antibiotic consumption of key agents by healthcare setting

Trimethoprim

Table 10: Total rate of trimethoprim consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Antibiotic	DDD	Population	rate
2014	trimethoprim	1062533	1840500	1.58
2015	trimethoprim	1029756	1851600	1.52
2016	trimethoprim	1041346	1862100	1.53
2017	trimethoprim	973778	1870800	1.43

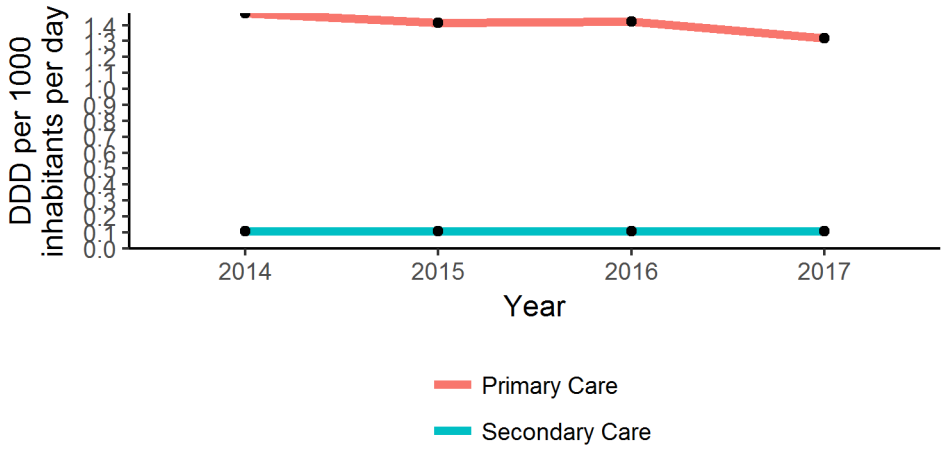


Figure 34: Consumption of trimethoprim by prescriber location expressed per 1000 inhabitants per day, NI, 2014 - 2017

Overall, the rate of trimethoprim consumption has decreased slightly during 2014 - 2017 with a rate of 1.43 DDD per 1000 inhabitants per day during 2017. This trend is influenced by generally stable rates of trimethopim consumption in primary care during 2014 - 2017 (1.47 to 1.32 DDD per 1000 inhabitants per day) with no change in secondary care during 2014-2017 (0.11 to 0.11 DDD per 1000 inhabitants per day; Figure 34).

Nitrofurantoin

Table 11: Total rate of nitrofurantoin consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Antibiotic	DDD	Population	rate
2014	nitrofurantoin	804657	1840500	1.20
2015	nitrofurantoin	808025	1851600	1.20
2016	nitrofurantoin	838472	1862100	1.23
2017	nitrofurantoin	799471	1870800	1.17

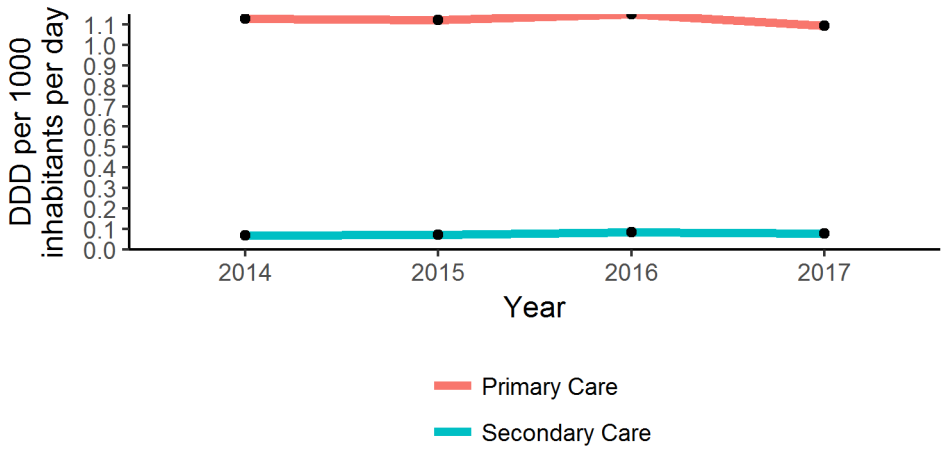


Figure 35: Consumption of nitrofurantoin by prescriber location expressed per 1000 inhabitants per day, NI, 2014 - 2017

Overall, the rate of nitrofurantoin consumption remained stable during 2014 - 2016, decreasing slightly to a rate of 1.17 DDD per 1000 inhabitants per day in 2017. Rates in primary care have remained generally stable- with a slight decrease in 2017- while rates in secondary care have not changed during 2014 - 2017 (1.13 to 1.09 DDD per 1000 inhabitants per day in primary care and 0.07 to 0.08 DDD per 1000 inhabitants per day in secondary care; Figure 35).

Aminoglycosides

Table 12: Total rate of Aminoglycosides consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Class	DDD	Population	rate
2014	Aminoglycosides	102169	1840500	0.15
2015	Aminoglycosides	107463	1851600	0.16
2016	Aminoglycosides	108889	1862100	0.16
2017	Aminoglycosides	113280	1870800	0.17

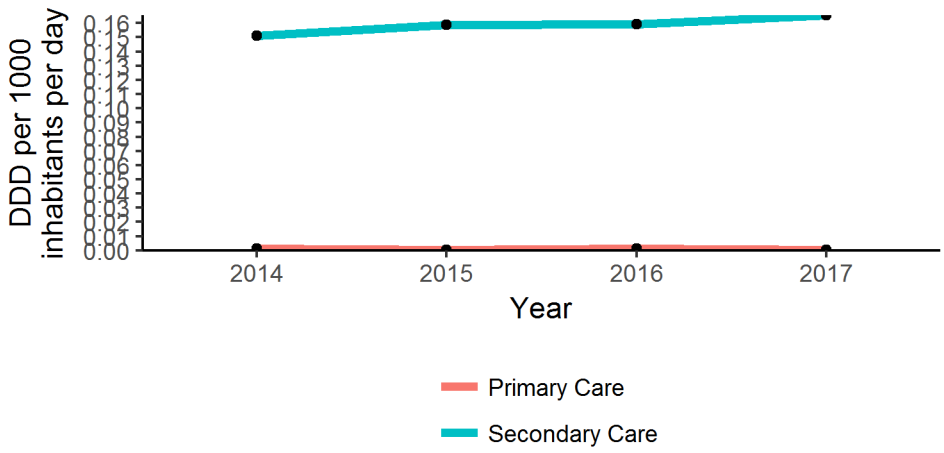


Figure 36: Consumption of aminoglycosides by prescriber location expressed per 1000 inhabitants per day, NI, 2014 - 2017

Overall, the rate of Aminoglycosides consumption has remained stable during 2014 - 2017 with a rate of 0.17 DDD per 1000 inhabitants per day in 2017. This trend is influenced by stable rates in primary care during 2014 - 2017 (0 DDD per 1000 inhabitants per day during 2017) and a slight increase in secondary care (0.15 to 0.17 DDD per 1000 inhabitants per day; Figure 36).

Glycopeptides and daptomycin

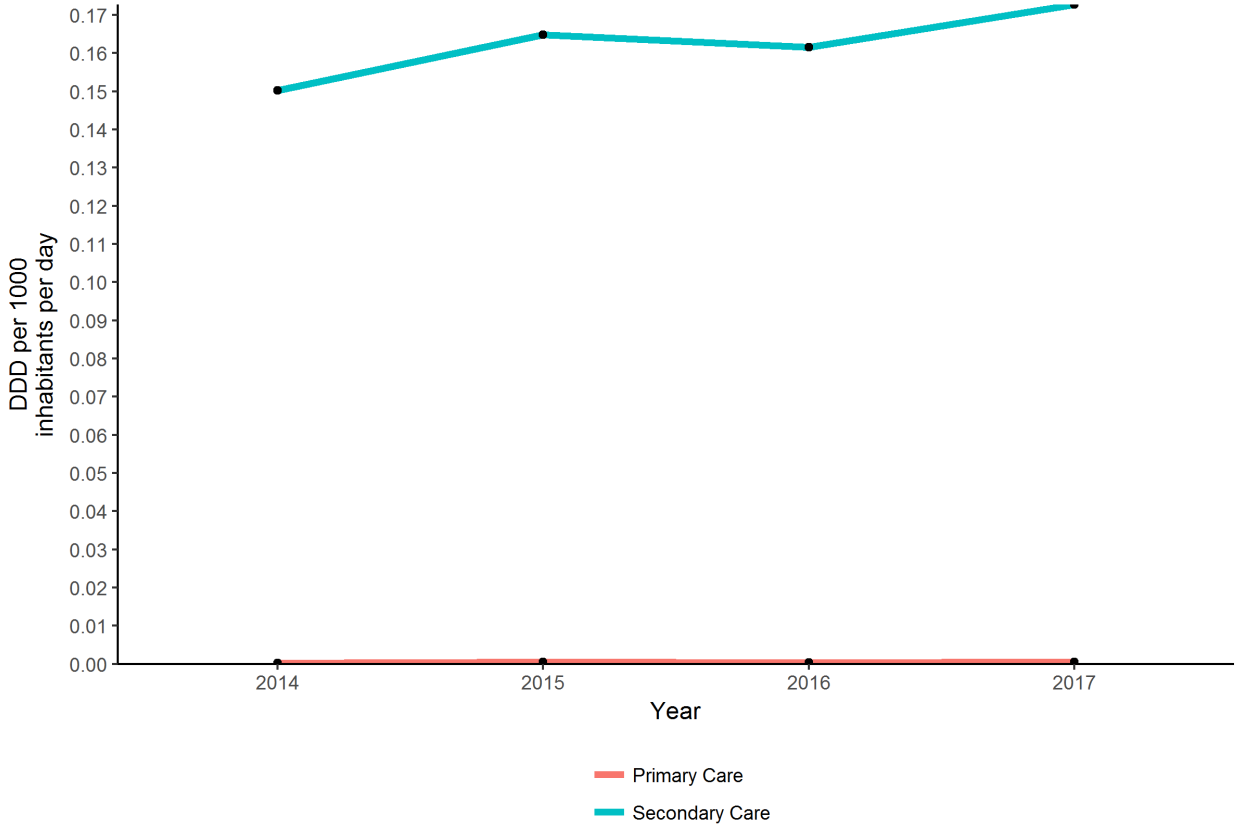


Figure 37: Consumption of glycopeptide and daptomycin by prescriber location expressed per 1000 inhabitants per day, NI, 2014 - 2017

The consumption rates of glycopeptides and daptomycin have been stable in primary care during 2014 - 2017 (0 DDD per 1000 inhabitants per day during 2017) with a slight increase in secondary care to (0.17 DDD per 1000 inhabitants per day in 2017. *Please note that DDDs in primary care are not absolute zero*; Figure 37).

Colistin

Table 13: Total rate of colistin consumption expressed as DDD per 1000 inhabitants per day, NI, 2014-2017.

Year	Antibiotic	DDD	Population	rate
2014	colistin	60158	1840500	0.09
2015	colistin	55889	1851600	0.08
2016	colistin	61758	1862100	0.09
2017	colistin	66645	1870800	0.10

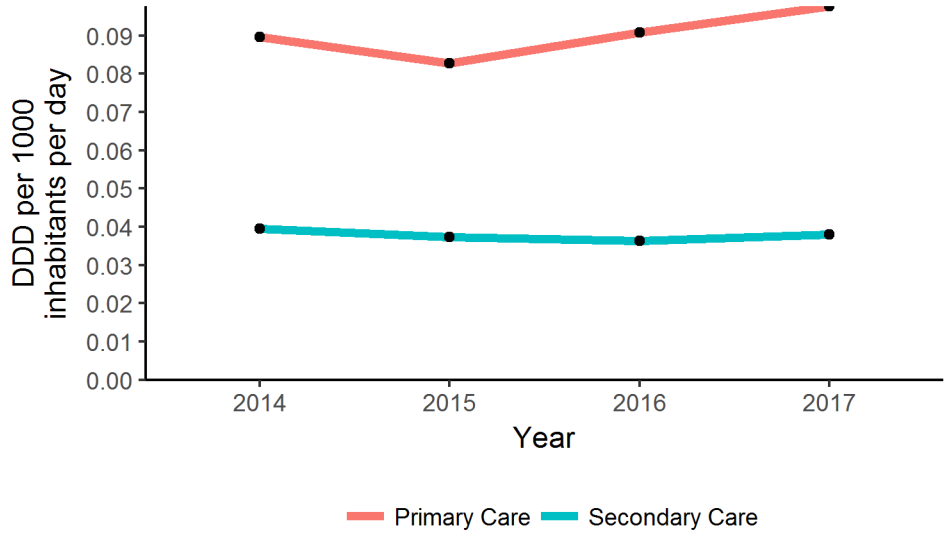


Figure 38: Consumption of colistin by prescriber location expressed per 1000 inhabitants per day, NI, 2014 - 2017

Overall, the rate of colistin consumption has remained stable during 2014 - 2017 with a rate of 0.1 DDD per 1000 inhabitants per day in 2017. This trend is influenced by stable rates in primary care during 2014 - 2017 (0.09 in 2014 to 0.1 DDD per 1000 inhabitants per day during 2017) and in secondary care (0.04DDD per 1000 inhabitants per day during 2017; Figure 38).

Antibiotic guardians

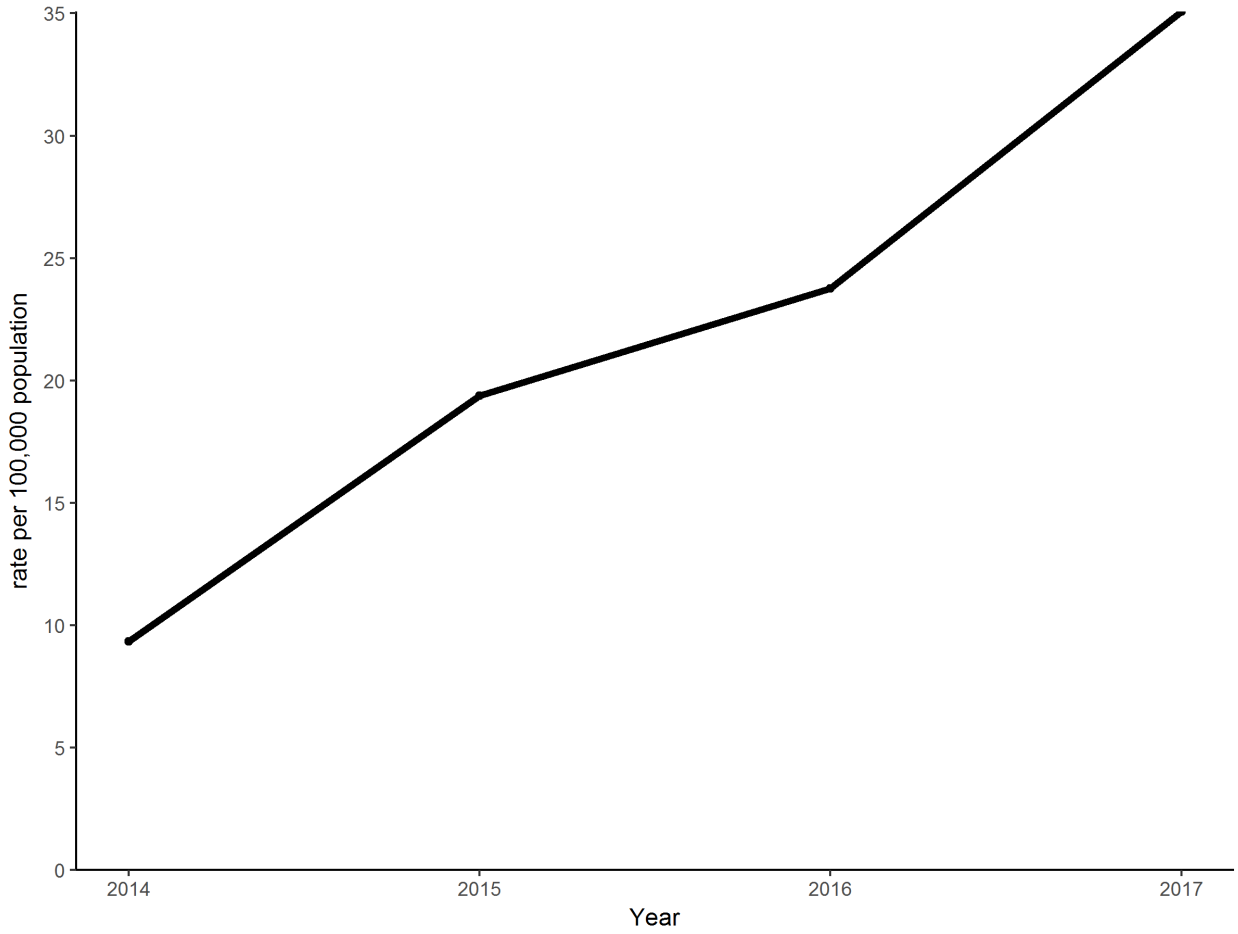


Figure 39: Cumulative rate of antibiotic guardians per 100,000 population, NI, 2014 - 2017

There has been a year on year increase in the cumulative rate of antibiotic guardians in Northern Ireland. During 2017, there were 656 individuals registered (35 individuals per 100,000 population; Figure 39).

Discussion

This is the second report of antimicrobial resistance and antimicrobial consumption in Northern Ireland. As with the prevous report, we have aimed to keep the content generally comparable with the ESPAUR report for England[3]. In future reports, we aim to be able to access, analyse and report more detailed information about antimicrobial use and resistance in specific healthcare settings.

Antimicrobial resistance

The focus for the antimicrobial resistance section was the organism-antibiotic combinations that were identified as part of the UK AMR strategy[2]. The data for this report has been extracted from the regional laboratory system. As of 2017 *Staphylococcus aureus*, and gram negative bloodstream infections (*E.coli*, *K. pneumoniae* and *Pseudomonas sp.*) are subject to mandatory surveillance.

The information presented in this report demonstrates increasing incidence and increasing resistance of many bloodstream infections, particularly *E. coli*, *K. pneumoniae* and glycopeptide-resistant enterococci.

E. coli and *K. pneumoniae* bloodstream infections have been targeted as part of the UK governments ambition to reduce healthcare-associated gram-negative bloodstream infections by 50% by 2020. In order to reduce the number of these infections, local teams will need timely information about the characteristics of the patients who are affected, the risk factors that contributed to the infection and which healthcare settings were responsible. In recognition of this, mandatory surveillance of gram-negative bloodstream infections was introduced in April 2018. These new data will be an important source of business intelligence for Health and Social Care Trusts as they aim to improve the quality and safety of the care that they provide. The success of this new programme will require Trusts to take steps to implement new data collection arrangements quickly for the benefit of their patients.

Antimicrobial resistance in most of the selected organisms has remained relatively stable since 2009, with increases noted in both *E. coli* and *K. pneumoniae* resistance to co-amoxiclav and Glycopeptide resistant enterococci. The number of Carbapenem Producing Organisms (CPOs) preported to the PHA have increased in 2017 after declining from 2014-2016, however this likely reflects the voluntary nature of reporting (case ascertainment) as

well as local developments in the ability to test for CPO. Comparable data for England is available in their 2018 ESPAUR report. While the proportion of isolates that are resistant to key antibiotics has not changed very much over time, the absolute number of resistant infections has increased because of the overall rising number of infections. As antimicrobial resistance is a transmissible global problem, PHA will continue to collaborate with Public Health England and the Scottish, Welsh and Irish public health organisations, to contribute to the European Antimicrobial Resistance Surveillance Network (EARS-Net) and the World Health Organisation's Global Antimicrobial Resistance Surveillance System (GLASS). This will ensure standardised information on antimicrobial resistance is available to inform comparisons and drive improvement.

Antibiotic consumption

Total antibiotic consumption in Northern Ireland has slightly declined in 2017 to 29.87 DDD per 1,000 inhabitants after remaining largely unchanged for the previous three years. Little overall change was noted in secondary care witha slight decrease in primary care in 2016 and 2017. Despite this, the rate of antimicrobial consumption in secondary care per admission or per occupied bed day has continued to steadily increase, perhaps suggesting that the case-mix of hospital inpatients has become more severe over time. This relative stasis is in contrast with the situation in England, where antibiotic consumption has continued to fall, and was measured at 21.1 DDD per 1,000 inhabitants per day in 2017. By this measure, Northern Ireland's total antibiotic consumption is 41% higher than that of England.

Penicillins, tetracyclines and macrolides were the most commonly prescribed antibiotics in both settings. There has been little change in penicillins or tetracyclines in either setting but macrolide consumption in primary care has slightly declined over time. The use of carbapenems, and meropenem in particular have also declined over time in Northern Ireland, which is an encouraging trend. Use of co-amoxiclav also fell further in 2017, and trimethoprim use fell slightly. In general, however, comparison with antimicrobial use in England continues to highlight substantially higher use in Northern Ireland. Piperacillin/tazobactam consumption remained unchanged in 2017 at 0.20 DDD per 1,000 inhabitants per day, which is more than three times the declining rate in England (0.065 DDD per 1,000 inhabitants per day). It should be noted however, the 2017 decrease in piperacillin/tazobactam use in England is partly due to an international supply shortage with an increase in the use of alternative antibiotics as a result. In 2018/19, piperacillin/tazobactam will be the focus of a reduction target as part of the UK ambition to recuce inappropriate prescribing. The rate of cephalosporin use was steady at 0.57 DDD per 1,000 inhabitants per day, which is twice the English rate of 0.33 DDD per 1,000 inhabitants per day. The use of tetracyclines, particularly doxycycline, continued to increase in Northern Ireland to 7.49 DDD per 1,000 inhabitants per day, which was much higher than the English rate of 4.7 DDD per 1,000 inhabitants per day. The use of quinolones and macrolides has remained unchanged over the last 3 years in Northern Ireland, during which time macrolide use has decreased in England, but quinolone use has slightly increased.

Colistin is an antibiotic of last resort that is used for multidrug-resistant infections and also as an inhaled therapy for people with cystic fibrosis. Colistin consumption in Northern Ireland has been steady for the last three years, but rates are higher than in England (0.13

DDD per 1,000 inhabitants per day in 2017 in NI and 0.078 DDD per 1,000 inhabitants per day in 2017 in England).

The amount of antimicrobial use in Northern Ireland remains markedly higher than England. Understanding the reasons for the difference is a complex task. Most antibiotics were prescribed in the primary care setting. In order to understand and address the factors that lead to antibiotic consumption, we need information about the characteristics of the people who are prescribed them. During 2018 the PHA collaborated with the Health and Social Care Board, the Innovation Lab at the Department of Finance and other primary care stakeholders to fill this information gap, producing a report of their findings. In the secondary care setting, investigating the reasons for differences is vastly more difficult because antimicrobial consumption is measured at ward level, not at patient level, and therefore there is no routine source of information that links antibiotic use to individual patient details. Health and Social Care Northern Ireland has committed to developing a new electronic health care record ("Encompass"), which will ultimately include electronic prescribing, which will provide a rich source of information about the factors influencing antimicrobial consumption. However, over-use of antibiotics is already causing harm to patients, and we cannot afford to wait years before addressing the challenges of inappropriate antimicrobial prescribing. Reducing antimicrobial consumption safely is the complex challenge that faces all of us. One way of engaging clinicians (as well as other professionals and the public) in this challenge, is to encourage them to sign up to an Antibiotic Guardian pledge. There were more new Antibiotic Guardians in 2017 (n= 216) than in the previous three years, an encouraging sign.

Public communication

The O'Neill report recommended a major global information campaign to raise awareness about the future harms likely to occur if antibiotic use was not reduced. PHA has developed a communications plan to communicate with people in Northern Ireland about the potential harms related to inappropriate antibiotic use. This will involve running engagement events, social media and news releases at key points. Highlights include:

- Ongoing significant press and social media activity is planned and implemented specifically around World Antibiotic Awareness Week. These included an animation to inform the public on the threat of AMR, and the actions they can take to keep antibiotics working; videos of professionals including medics, pharmacists and scientists explaining the threat of AMR; and a series of antibiotic mythbusters. The issue was highlighted on news bulletins on several local radio stations.
- 100 primary and post-primary teachers in Northern Ireland have attended an e-Bug training workshop. This is a free NICE endorsed educational resource for classrooms that helps teachers educate their pupils on microbes, their spread, treatment and prevention of infection.
- As part of WAAW activities for 2019 PHA, in partnership with Stranmillis University College, will train approximately 90 primary school teachers on e-Bug.
- A significant mass media campaign to inform and engage the public on how to keep antibiotics working is currently being developed and will be launched in 2019.

Changing prescribing behaviour

Safely reducing antimicrobial use is a complex challenge that will require an understanding of the capacity, opportunity and motivation of prescribers to decide when not to prescribe antibiotics. Initiatives to reduce antimicrobial consumption in 2018 have included:

- Publication in March 2018 of the results of a survey with GPs about the factors that influence their antibiotic prescribing decisions and with stakeholders about their current understanding of the problem and ideas for solutions.
- TARGET toolkit workshops for GPs were delivered throughout Northern Ireland during the year.
- Collaborative work on a systematic review of behavioural science interventions for antimicrobial stewardship continues between the Innovation Lab and PHA.
- Evaluation of a pilot point-of-care CRP testing for respiratory infections in primary care was undertaken, with results due in the coming months.

Future Actions

- Continue to monitor the progress of the national ambition to reduce healthcare-associated Gram-negative bacteraemias and assess the impact on the burden of AMR in terms of the numbers of resistant infections
- Further improve our understanding of the epidemiology and incidence of antibiotic-resistant infections with a view to improving their management and prevent onward transmission
- Standardise the approach to investigation and treatment of suspected urinary tract infection in care homes in Northern Ireland
- To lead and coordinate efforts in undergraduate and postgraduate training, continuing professional development, and staff training related to Antimicrobial Stewardship, Antimicrobial Resistance and Infection Prevention and Control
- Continue to monitor trends in antibiotic prescribing across primary and secondary care and explore opportunities to improve benchmarking and quality improvement.
- Conduct a study to understand the factors affecting primary care antibiotic prescribing
- Continue to develop, pilot and validate tool to assess appropriateness of antibiotic prescriptions in acute hospitals and facilitate data collection and analysis of data in
- Plan and implement cascade training workshops for school-teachers about the e-Bug resources
- To work closely with innovation lab to complete a systematic review of interventions for reducing antibiotic prescribing in primary care and development of an intervention
- To work closely with stakeholders to focus and further improve dental prescribing across Northern Ireland

Appendix 1: AMR surveillance categories

Table 14: Antibiotic names (trade and generic) and assigned surveillance group for the antimicrobial resistance data

Antibiotic surveillance group	Individual antibiotic name
3rd Generation Cephalosporin	cefotaxime
3rd Generation Cephalosporin	claforan
3rd Generation Cephalosporin	ceftazidime
3rd Generation Cephalosporin	fortum
3rd Generation Cephalosporin	cefpodoxime
3rd Generation Cephalosporin	ceftizoxime
3rd Generation Cephalosporin	ceftriaxone
Carbapenem	meronem
Carbapenem	meropenem
Carbapenem	imipenem
Carbapenem	ertapenem
Ciprofloxacin	ciprofloxacin
Ciprofloxacin	low level ciprofloxacin
Ciprofloxacin	ciproxin
Co-amoxiclav	co-amoxiclav
Co-amoxiclav	amoxicillin/clavulanate
Co-amoxiclav	augmentin
Colistin	colistin
Colistin	colomycin
Gentamicin	gentamicin
Gentamicin	lugacin
Gentamicin	cidomycin
Gentamicin	genticin
Gentamicin	garamycin
Gentamicin	high_level gentamicin
Glycopeptide	vancocin
Glycopeptide	vancomycin
Glycopeptide	teicoplanin
Macrolides	clarithromycin

Antibiotic surveillance group	Individual antibiotic name
Macrolides	erythromycin
Macrolides	azithromycin
Macrolides	erythrocin
Macrolides	erythromid
Methicillin	cefoxitin
Methicillin	flucloxacillin
Methicillin	floxapen
Methicillin	oxacillin
Methicillin	meticillin
Methicillin	celbenin
Methicillin	cloxacillin
Methicillin	orbenin
Penicillin	apsin
Penicillin	benzylpenicillin
Penicillin	phenoxymethylpenicillin
Penicillin	penicillin
Penicillin	penidural
Piperacillin/Tazobactam	tazocin
Piperacillin/Tazobactam	piperacillin/tazobactam

Appendix 2: AMC data categories

Table 15: Antibiotic names, ATC codes and assigned surveillance group for the antimicrobial consumption data

Antibiotic surveillance group	Individual antibiotic name	ATC codes
Aminoglycosides	tobramycin	J01GB01
Aminoglycosides	gentamicin	J01GB03
Aminoglycosides	neomycin	J01GB05
Aminoglycosides	amikacin	J01GB06
Anti-Clostridium difficile agents	vancomycin	A07AA09
Anti-Clostridium difficile agents	fidaxomicin	A07AA12
Anti-Clostridium difficile agents	metronidazole	G01AF01
Anti-Clostridium difficile agents	metronidazole	P01AB01
Anti-folate agents	trimethoprim	J01EA01
Anti-folate agents	sulfapyridine	J01EB04
Anti-folate agents	sulfadiazine	J01EC02
Anti-folate agents	sulphamethoxypyridazine	J01ED05
Anti-folate agents	co-trimoxazole	J01EE01
Anti-folate agents	nitrofurantoin	J01XE01
Anti-folate agents	methenamine	J01XX05
Anti-tuberculous drugs	streptomycin	J01GA01
Carbapenems	meropenem	J01DH02
Carbapenems	ertapenem	J01DH03
Carbapenems	imipenem with cilastatin	J01DH51
Cephalosporins	cefalexin	J01DB01
Cephalosporins	cefazolin	J01DB04
Cephalosporins	cefadroxil	J01DB05
Cephalosporins	cefradine	J01DB09
Cephalosporins	cefoxitin	J01DC01
Cephalosporins	cefuroxime	J01DC02
Cephalosporins	cefaclor	J01DC04
Cephalosporins	cefotaxime	J01DD01
Cephalosporins	ceftazidime	J01DD02
Cephalosporins	ceftriaxone	J01DD04

Antibiotic surveillance group	Individual antibiotic name	ATC codes
Cephalosporins	cefixime	J01DD08
Cephalosporins	cefpodoxime	J01DD13
Cephalosporins	ceftazidime_with_avibactam	J01DD52
Cephalosporins	ceftaroline	J01DI02
Glycopeptides and Daptomycin	vancomycin	J01XA01
Glycopeptides and Daptomycin	teicoplanin	J01XA02
Glycopeptides and Daptomycin	dalbavancin	J01XA04
Glycopeptides and Daptomycin	daptomycin	J01XX09
Lincosamides	clindamycin	J01FF01
Macrolides	erythromycin	J01FA01
Macrolides	clarithromycin	J01FA09
Macrolides	azithromycin	J01FA10
Macrolides	telithromycin	J01FA15
Monobactams	aztreonam	J01DF01
Nitroimidazoles	metronidazole	J01XD01
Nitroimidazoles	tinidazole	P01AB02
Other antibiotics	chloramphenicol	J01BA01
Other antibiotics	quinupristin	J01FG02
Other antibiotics	colistin	J01XB01
Other antibiotics	fucidic_acid	J01XC01
Other antibiotics	fosfomycin	J01XX01
Oxazolidinones	linezolid	J01XX08
Oxazolidinones	tedizolid	J01XX11
Penicillins	ampicillin	J01CA01
Penicillins	amoxicillin	J01CA04
Penicillins	pivmecillinam	J01CA08
Penicillins	temocillin	J01CA17
Penicillins	co-fluampicil	J01CA51
Penicillins	benzylpenicillin	J01CE01
Penicillins	phenoxymethylpenicillin	J01CE02
Penicillins	benzathine-benzylpenicillin	J01CE08
Penicillins	procaine	J01CE09
Penicillins	flucloxacillin	J01CF05
Penicillins	co-fluampicil	J01CR50

Antibiotic surveillance group	Individual antibiotic name	ATC codes
Penicillins with beta lactamase inhibitors	co-amoxiclav	J01CR02
Penicillins with beta lactamase inhibitors	ticarcillin with clavulanic_acid	J01CR03
Penicillins with beta lactamase inhibitors	piperacillin/tazobactam	J01CR05
Quinolones	ofloxacin	J01MA01
Quinolones	ciprofloxacin	J01MA02
Quinolones	norfloxacin	J01MA06
Quinolones	levofloxacin	J01MA12
Quinolones	moxifloxacin	J01MA14
Tetracyclines and related drugs	doxycycline	J01AA02
Tetracyclines and related drugs	lymecycline	J01AA04
Tetracyclines and related drugs	oxytetracycline	J01AA06
Tetracyclines and related drugs	tetracycline	J01AA07
Tetracyclines and related drugs	minocycline	J01AA08
Tetracyclines and related drugs	tigecycline	J01AA12

Appendix 3: Testing data

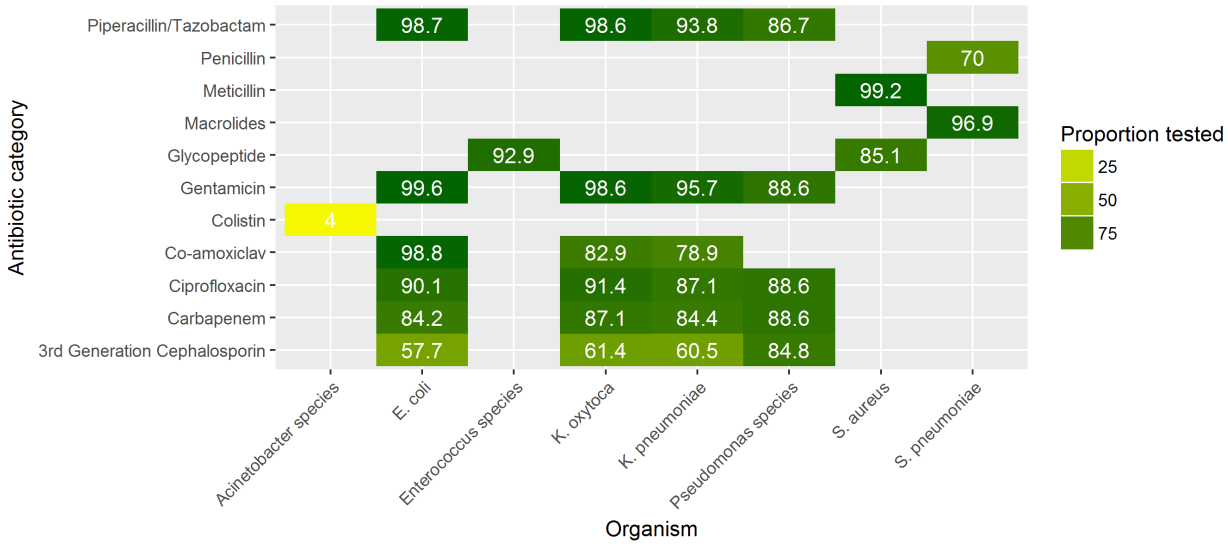


Figure 40: The proportion of key bacteraemias where selected antibiotic susceptibility results were reported to the PHA

Appendix 4: Drug/bug combinations monitored

Bacteria	Antibiotics
Escherichia coli	Third-generation cephalosporins, carbapenems, co-amoxiclav, ciprofloxacin, gentamicin, piperacillin/tazobactam
Klebsiella pneumoniae	Third-generation cephalosporins, carbapenems, co-amoxiclav, ciprofloxacin, gentamicin, piperacillin/tazobactam
Pseudomonas species	Third-generation cephalosporins, carbapenems, ciprofloxacin, gentamicin, piperacillin/tazobactam
Staphylococcus aureus	Glycopeptide, meticillin
Enterococcus species	Glycopeptide
Streptococcus pneumoniae	Macrolides, penicillin
Acinetobacter species	Colistin

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6 Spiteri G, Cole M, Unemo M *et al.* The European Gonococcal Antimicrobial Surveillance Programme (Euro-GASP)–a sentinel approach in the European Union (EU)/European Economic Area (EEA). *Sexually transmitted infections* 2013;**89 Suppl 4**:iv16–8. doi:10.1136/sextrans-2013-051117

7 European Centre for Disease Prevention and Control. European Gonococcal Antimicrobial Surveillance Programme (Euro-GASP). https://ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/euro-gasp

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item 11

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Surveillance of Healthcare Associated Infections in Northern Ireland Annual Report 2017
Reference	PHA/05/02/19
Prepared by	Dr Lynsey Patterson, Dr Muhammad Sartaj and Rachel Spiers
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☐ For **Noting** ☒

1 Purpose

This is the first annual report in Northern Ireland describing trends of C. difficile, S. aureus and Gram-negative bacteraemias. The report describes epidemiological trends for the year 2017.

The report is being presented to the PHA Board for noting prior to publication in the public domain.

2 Background Information

Under PHA's Corporate Plan Objective 4, "All health and wellbeing services should be safe and high quality", there is a target in the 2018/19 Business Plan that PHA will "improve patient safety and experience by bringing leadership to reducing healthcare-associated infections". This report forms part of that work.

The information produced in this report is based on information derived from data submitted by Health and Social Care Trust Infection Control, laboratory and Information staff.

3 Key Issues

The Public Health Agency's Health Protection Surveillance Team is mandated by the Department of Health to undertake surveillance of healthcare-associated infections (HCAI).

The surveillance of HCAIs has a number of goals:

1. **Detection** of changes in the temporal, geographic and age distribution of new and known diseases, or changes in the pattern of diseases and their risk factors

2. **Analysis** which can determine the exposure, prevalence, burden, morbidity, mortality, carriage and long term trends of HCAI

3. **Timely action** to protect the public's health

4. Building **information** on the temporal, geographic and population distribution and epidemiology of new, poorly-understood and well-understood diseases for information public health decision-making, health service planning, risk management, research and infection control programmes

5. **Informing** the public about the risk of communicable diseases

6. **Contributing** to European and International efforts to protect health

The aim of the report is to describe the epidemiology and trends in selected healthcare associated infections in Northern Ireland (specifically S. aureus, C. difficile, E. coli, Klebsiella species, and P. aeruginosa)

Some of the key findings of the Report are as follows:

- For Northern Ireland in 2017, the rate of *C. difficile i*n inpatients increased by **3%** to **0.21** cases per 1000 occupied bed days compared to 2016
- The **overall** rate of *S. aureus* bloodstream infections decreased in 2017 by **3%** to **0.26** cases per 1000 occupied bed days compared to 2016
- The **overall** rate of Gram-negative bloodstream infections increased in 2017 by **18%** to **1.18** cases per 1000 population compared to 2016
- During 2017, 13 Pseudomonas **colonisations** from 9 infants were reported from neonatal units across Northern Ireland. No infections were reported.

4 Next Steps

Following this meeting the Report will be published on the PHA website.

Going forward, proposed objectives to reduce healthcare-associated infections in include:

- Establishing an Education subgroup on the HCAI and AMS Improvement Board to coordinate efforts in undergraduate, postgraduate and staff training related to Infection Prevention and Control
- Developing new reports for the monitoring Gram-negative bacteraemia to allow HSC Trusts to monitor their progress towards DOH targets
- Launching a new public-facing website to facilitate the publication of HCAI rates against a number of indicators
- Rolling out the new HCAI data collection and reporting tool, Hi-Surv, to all HSC Trusts in Northern Ireland

- Leading by the IPC Lead Nurse Forum, provide infection prevention and control support and education to healthcare professionals in Primary Care

Surveillance of Healthcare Associated Infections in Northern Ireland

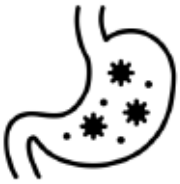
Annual Report

2017

HSC Public Health Agency

Contents

Executive summary



Created by mungjang kim from Noun Project

For Northern Ireland in 2017, the rate of *C. difficile* in inpatients increased by 3% to 0.21 cases per 1000 occupied bed days compared to 2016.

The **overall** rate of *S. aureus* bloodstream infections decreased in 2017 by 3% to 0.26 cases per 1000 occupied bed days compared to 2016

- The MRSA rate decreased by 25% to 0.03
- The MSSA rate increased by 1% to 0.23

Created by Made by Made from Noun Project

Created by Viral Iaisalovers from Noun Project

The **overall** rate of Gram-negative bloodstream infections* increased in 2017 by 18% to 1.18 cases per 1000 population compared to 2016

- The *E.coli* rate increased by 18% to 0.945
- The *Klebsiella* species rate increased by 26% to 0.18
- The *Pseudomonas aeruginosa* rate increased by 4% to 0.05

During 2017, 13 *Pseudomonas* **colonisations** from 9 infants were reported from neonatal units across Northern Ireland. No infections were reported.

Created by Gan Khoon Lay from Noun Project

*Data sourced from voluntary laboratory reporting (CoSurv)

Authors

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Muhammad Sartaj, MBBS, MPH, DHSCM, FFPH

Acknowledgements

The information produced in this report is based on information derived from data submitted by Health and Social Care Trust Infection Control, laboratory and Information staff, and we thank them for the time and effort involved in producing these data.

We also thank Eileen Corey for her assistance and support in the development of this report.

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Laboratory: Created by Made by Made from The Noun Project
Bacteria: Created by Viral faisalovers from The Noun Project
Nurse Holding Newborn: Created by Gan Khoon Lay from The Noun Project

Date generated: 07/11/2018

Background

The Public Health Agency's Health Protection Surveillance Team is mandated by the Department of Health to undertake surveillance of healthcare-associated infections (HCAI). The surveillance of HCAIs has a number of goals:

1. **Detection** of changes in the temporal, geographic and age distribution of new and known diseases, or changes in the pattern of diseases and their risk factors
2. **Analysis** which can determine the exposure, prevalence, burden, morbidity, mortality, carriage and long term trends of HCAI
3. **Timely action** to protect the public's health
4. Building **information** on the temporal, geographic and population distribution and epidemiology of new, poorly-understood and well-understood diseases for information public health decision-making, health service planning, risk management, research and infection control programmes
5. **Informing** the public about the risk of communicable diseases
6. **Contributing** to European and International efforts to protect health

Mandatory surveillance for Meticillin-sensitive and Meticillin-resistant *Staphylococcus aureus* (MSSA and MRSA, respectively) bloodstream infection was introduced in April 2001. *Staphylococcus aureus* (*S. aureus*) is a round shaped bacterium which commonly colonises the nose, respiratory tract, gut mucosa and the skin usually without causing any problems. It can also cause disease, particularly if there is an opportunity for the bacteria to enter the body, for example through broken skin or a medical procedure (including operations and intravenous lines). If these bacteria enter the body, illnesses which range from mild to life threatening may develop. These can include skin and wound infections, abscesses, endocarditis, pneumonia and bacteraemia (blood stream infection). Most strains of *S. aureus* are sensitive to the more commonly used antibiotics, and infections can be effectively treated. Some *S. aureus* bacteria are more resistant to the antibiotic meticillin. These are more difficult to treat and are termed meticillin resistant *S. aureus* (MRSA).

Mandatory surveillance of *Clostridium difficile* infection (CDI) in hospitals Northern Ireland was introduced in January 2005, with enhanced surveillance of **community-onset** CDI following in 2011. *C. difficile* is a bacterium that can infect the bowel and cause diarrhoea. The infection most commonly affects people who have recently been treated with antibiotics,

and can spread by spores found within faeces. Infections can occur where many people take antibiotics and are in close contact with each other, such as hospitals and care homes.

Gram-negative bacteria (specifically in blood) continue to be an emerging threat to health worldwide and are therefore a priority.

In July 2014, the then-UK Prime Minister commissioned the economist Jim O'Neill to analyse the problem of antimicrobial resistance and propose concrete actions to tackle it. The final report [1] was published in May 2016. The UK Government produced a response to this report in September 2016 which stated a number of objectives. One key objective was:

We will reduce healthcare associated Gram-negative bloodstream infections in England by 50% by 2020.

In April 2017, this was endorsed by the Chief Medical Officer indicating a commitment to reduce Gram-negative bloodstream infections in Northern Ireland (HSS(MD) 6/2017) [2].

In response, the PHA introduced mandatory surveillance for Gram-negative bloodstream infection (to include *E. coli*, *Klebsiella* species and *P. aeruginosa*) in April 2018. New programmes were required as there were no sources currently available to PHA that would supply the required data. These data will feature in future reports.

The enhanced surveillance programme of *Pseudomonas* colonisations in neonatal units commenced in January 2013 following a recommendation [3] arising after outbreaks in neonatal units.*Pseudomonas* is an important cause of healthcare-associated infection, particularly in patients who are very ill or immunocompromised. Individuals may be colonised on the skin surface, nose and throat, usually without problems. Infections of the bloodstream are, however, particularly serious.

The aim of the report is to describe the epidemiology and trends in selected healthcare associated infections in Northern Ireland (specifically *S. aureus, C. difficile, E. coli, Klebsiella* species, and *P. aeruginosa*)

Method

Healthcare associated infections

Testing for bacteria in human biological specimens is conducted in laboratories in five Health and Social Care Trusts in Northern Ireland. Data were extracted from each of the data sources below and analysed using R version 1.0.143.

The data included in this report includes selected organisms that were reported to the PHA during 2010 - 2017 (presented by calendar year).

Data sources

S. aureus and *C. difficile* infection

All toxin positive *C. difficile* inpatient cases and all *S. aureus* cases with specimen dates between 01/01/2017 and 31/12/2017 were extracted from the HCAI Data Collection Web System.

Currently in Northern Ireland, all cases of *C. difficile* and *S. aureus* are reported to the PHA by HSC Trusts to be included as part of enhanced surveillance arrangements under the following definitions:

C. difficile

Any of the following in patients aged 2 years and above:
1. Diarrhoeal stools (Bristol Stool types 5-7) where the specimen is *C. difficile* toxin positive
2. Toxic megacolon or ileostomy where the specimen is *C. difficile* toxin positive
3. Pseudomembranous colitis revealed by lower gastro-intestinal endoscopy or Computed Tomography
4. Colonic histopathology characteristic of *C. difficile* infection (with or without diarrhoea or toxin detection) on a specimen obtained during endoscopy or colectomy
5. Faecal specimens collected post-mortem where the specimen is C. difficile toxin positive or tissue specimens collected post-mortem where pseudomembranous colitis is revealed or colonic histopathology is characteristic of C. difficile infection
6. In contrast to other collections, *C. difficile* infections identified post-mortem are included
7. Current guidelines recommend a combination of two tests (first; toxin gene detection by NAAT or GDH EIA, second; a sensitive toxin EIA test) for the diagnosis of CDI.

If a positive isolate is cultured from the same patient more than 28 days apart they are considered as reflecting different episodes.

For the purposes of this report, only inpatient episodes are presented (i.e. the specimen has been taken in an acute setting).

S. aureus

A laboratory confirmed blood culture of *S. aureus* - whether clinically significant or not, whether treated or not, whether acquired in the Trust or not. This includes positive blood cultures taken within 48 hours of admission to hospital. If a positive blood culture is collected from the same patient more than 14 days apart they are considered as reflecting different episodes.

Gram-negative Bacteraemias

Infections that meet certain criteria, usually the most severe that occur in the blood (bacteraemias), are reported voluntarily to the Public Health Agency's CoSurv Information System from each Trust's microbiology and/or virology laboratories. For the calender year 2017, no **enhanced** surveillance arrangements were in place for Gram-negative bacteraemias, so line listings were generated using the regional voluntary laboratory database, CoSurv. Admission dates were added to each case individually by HSC Trusts to facilitate attribution.

***Pseudomonas* colonisations and infections in neonatal units**

Once HSC Trusts receive laboratory confirmation of a *Pseudomonas* colonisation or infection (from a sterile site), an enhanced surveillance form is submitted to PHA. This is stored and maintained within the Northern Ireland *Pseudomonas* Database.

Denominator

Mid-year population estimates for the most recent year (2017) were obtained from the Northern Ireland Statistics and Research Agency (NISRA) and used to express infections per 100,000 population. Hospital occupancy statistics were obtained from the Department of Health published data and are experessed as per 1000 occupied bed days.

Results

C. difficile

The annual regional rate per 1000 occupied bed days for inpatient CDI between 2010 and 2017 is presented below. Since reporting began there have been significant reductions in CDI rates for inpatients. For 2017, the inpatient CDI rate (for those over the age of 2) increased by 2% to **0.21** per 1000 bed days in Northern Ireland compared to 2016. The highest rates were identified in males over the age of 75 (rate 129.59, 22% of all CDIs), followed by females over the age of 75 (Rate 128.86, 32% of all CDIs). The highest rates per 100,0000 population were observed in the Belfast Trust (26.43), followed by Western Trust (23.22).

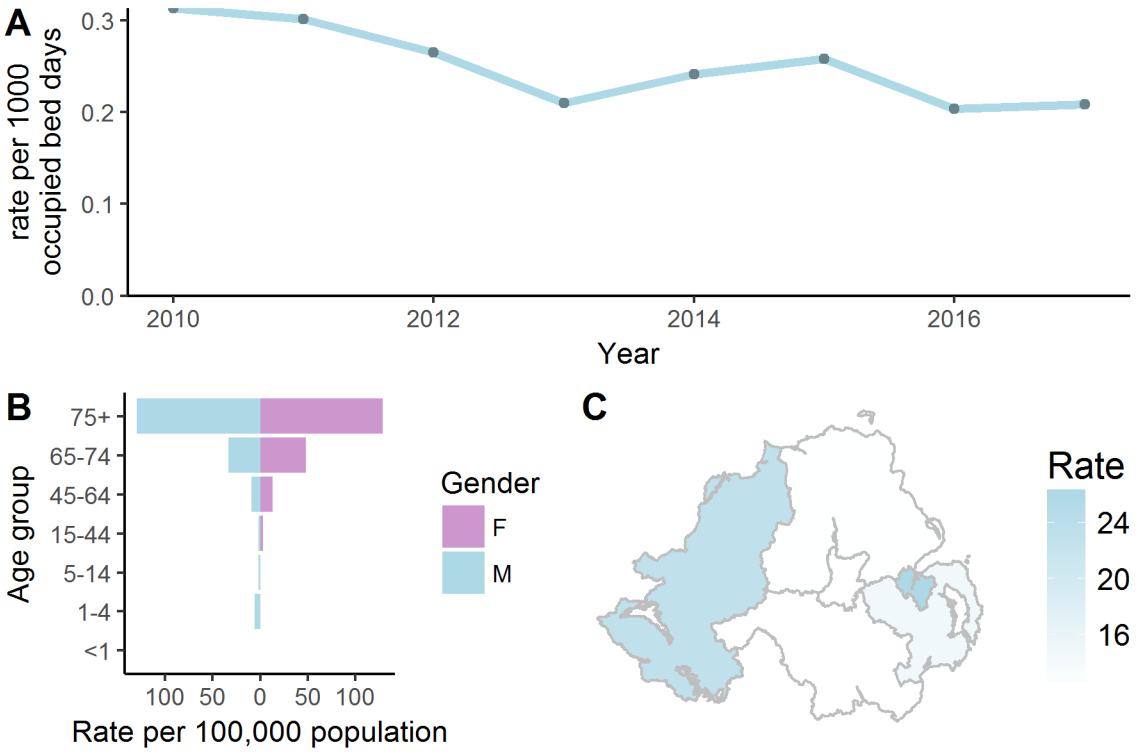

Figure legend

- **Figure A)** Rate of inpatient CDI per 1000 bed days in Northern Ireland, 2010 - 2017
- **Figure B)** Age and gender distribution of inpatient CDI rate (> 2 years of age) per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of CDI Rate per 100,000 population with HSC Trust Boundaries, 2017

Meticillin-resistant *S. aureus* (MRSA)

The annual regional rate per 1000 occupied bed days for MRSA between 2010 and 2017 is presented below. For 2017, the MRSA rate decreased by 25% to **0.03** per 1000 bed days in Northern Ireland (45 cases) compared to 2016 - the lowest rate observed in Northern Ireland since surveillance began. The highest rates were identified in males over the age of 75 (rate 19.80, 24% of all MRSA), followed by females over the age of 75 (rate 15.16, 27% of all MRSA). The highest rates per 100,000 population were observed in the Belfast Trust (6.19), followed by Northern Trust (2.53).

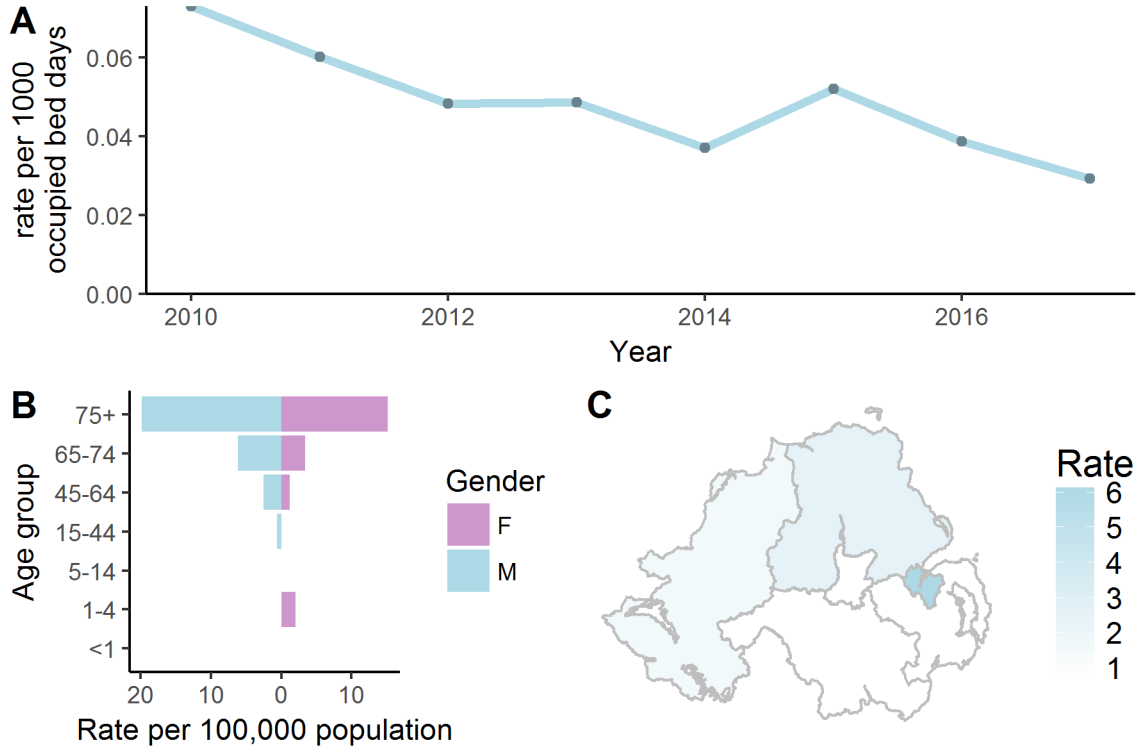

Figure legend

- **Figure A)** Rate of MRSA per 1000 bed days in Northern Ireland, 2010 - 2017
- **Figure B)** Age and gender distribution of MRSA rate per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of MRSA rate per 100,000 population with HSC Trust Boundaries, 2017

Meticillin-sensitive *S. aureus* (MSSA)

The annual regional rate per 1000 occupied bed days for MSSA between 2010 and 2017 is presented below. The rate of MSSA has been gradually increasing since 2010, with a steeper increase between 2014 and 2016. In 2017, the MSSA rate increased slightly again by 0.7% to **0.23** per 1000 bed days in Northern Ireland (354 cases) compared to 2016. The highest rates were identified in males over the age of 75 (rate 116.99, 18% of all MSSA), followed by females over the age of 75 (rate 60.64, 14% of all MSSA). Increased rates were also seen in female patients under the age of 1 with a rate of 60.92 (2% of all MSSA). The highest population rates were observed in the Belfast Trust (40.50 per 100,000), followed by South Eastern Trust (17.56 per 100,000).

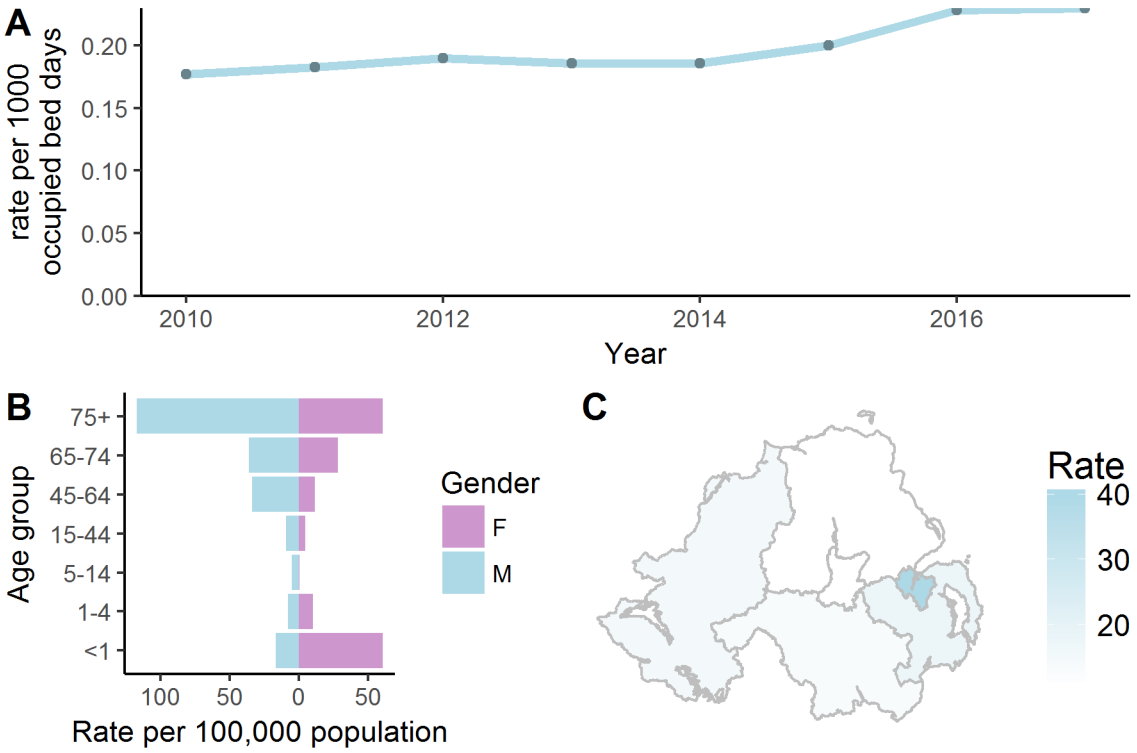

Figure legend

- **Figure A)** Rate of MSSA per 1000 bed days in Northern Ireland, 2010 - 2017
- **Figure B)** Age and gender distribution of MSSA rate per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of MSSA rate per 100,000 population with HSC Trust Boundaries, 2017

Escherichia coli

The annual regional rate per 1000 population for *E. coli* between 2014 and 2017 is presented below. Since 2014, there has been a year on year increase in the rate of these bloodstream infections. For 2017, the *E. coli* rate increased by 18% to **0.95** per 1000 population in Northern Ireland (1705 cases) compared to 2016. In males, highest rates were seen in those over the age of 75 (rate 770.35, 25% of all *E. coli*) and those under 1 year of age (rate 180.40, 1% of all *E. coli*). Similarly, for females, higher rates were observed in those over the age of 75 (rate 552.09, 26%) and in the under 1 year olds (rate 87.03, 0.6% of all *E. coli*). Rates were also higher in the 64-74 age group (rate 164.86, 8% of all *E. coli*). The highest rates per 100,000 population were observed in Belfast Trust (150.45) and Western Trust (86.91).

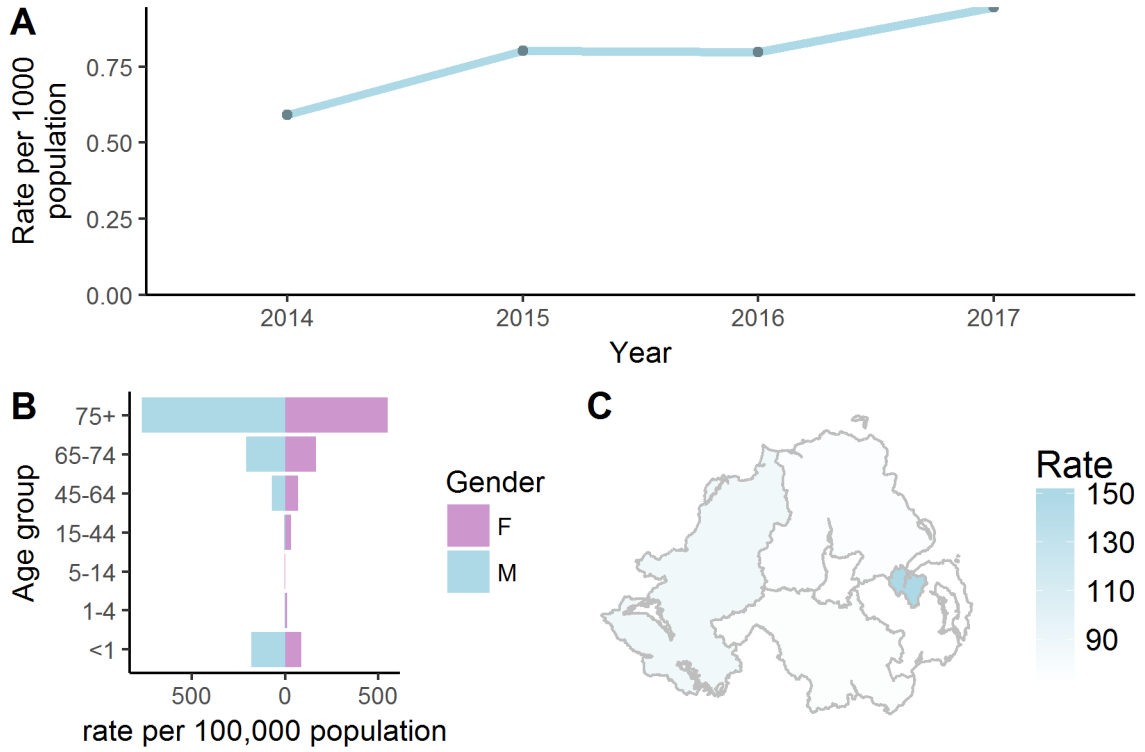

Figure legend

- **Figure A)** Rate of *E. coli* per 1000 population in Northern Ireland, 2014 - 2017
- **Figure B)** Age and gender distribution of *E. coli* rate per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of *E. coli* rate per 100,000 population with HSC Trust Boundaries, 2017

Klebsiella species

The annual regional rate per 1000 population for *Klebsiella* species between 2014 and 2017 is presented below. There has been a gradual year on year increase in the rate of these infections. For 2017, the *Klebsiella* species rate increased by 26% to **0.18** per 1000 population in Northern Ireland (327 cases) compared to 2016. The highest rates were seen in males and females over the age of 75 (rate 179.99 and 60.61 respectively, 45% of all *Klebsiella* species). Rates were also higher in males between the ages of 65 and 74 (rate 50.67, 13% of all *Klebsiella* species). The highest rates per 100,000 population were observed in the Belfast Trust (37.4), followed by South Eastern Trust (16.1).

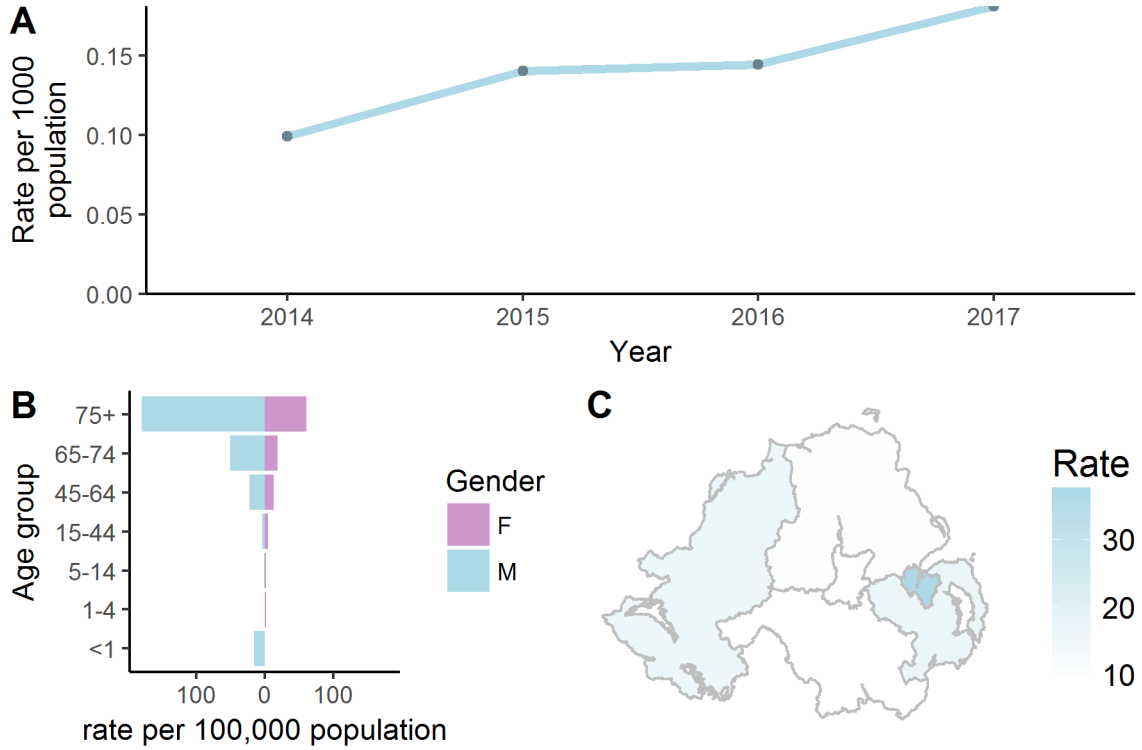

Figure Legend

- **Figure A)** Rate of *Klebsiella* species per 1000 population in Northern Ireland, 2014 - 2017
- **Figure B)** Age and gender distribution of *Klebsiella* species rate per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of *Klebsiella* species rate per 100,000 population with HSC Trust Boundaries, 2017

Pseudomonas aeruginosa

The annual regional rate per 1000 population for *Pseudomonas aeruginosa* bloodtream infections between 2014 and 2017 is presented below. In recent years, the rate has remained relatively stable. For 2017, the *P. aeruginosa* rate slightly increased by 4% to **0.05** per 1000 population in Northern Ireland (93 cases) compared to 2016. The highest rates were observed in males and females over the age of 75 (rate 59.39 and 15.16 respectively, 48% of all *P. aeruginosa* species). Rates were also higher in males between the ages of 65 and 74 (rate 18.54, 16% of all *P. aeruginosa* species). The highest rates per 100,000 population were observed in the Belfast Trust (10.68), followed by Northern Trust (5.90).

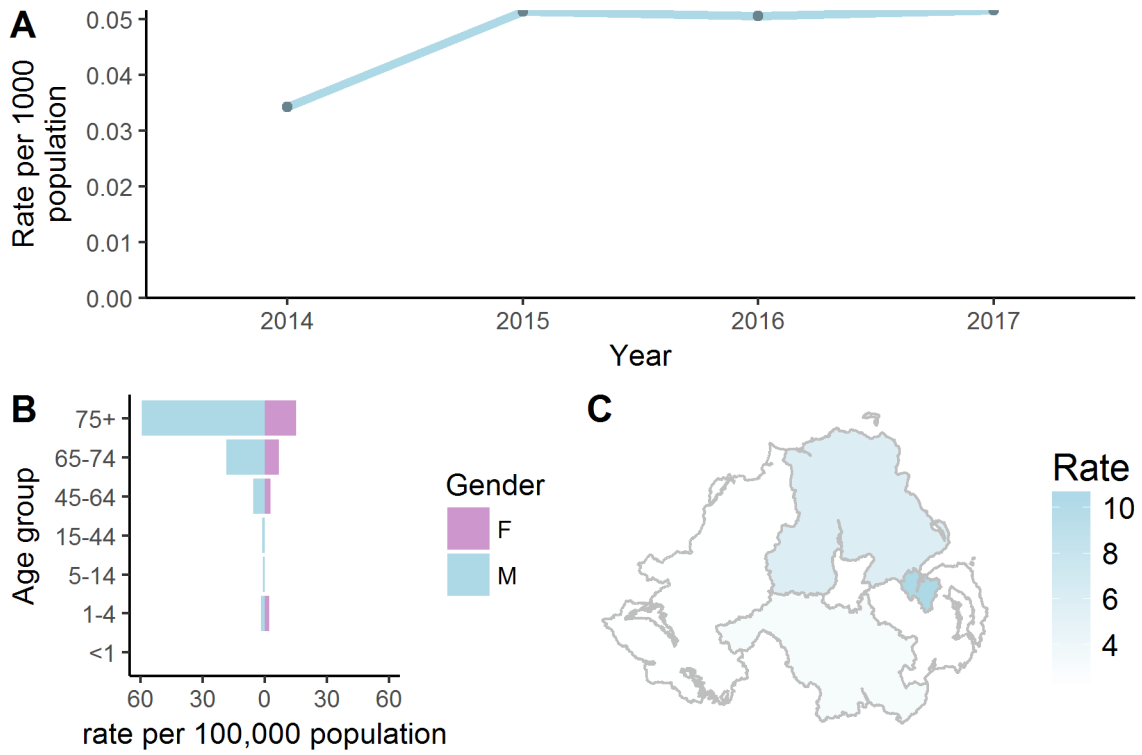

Figure Legend

- **Figure A)** Rate of *P. aeruginosa* per 1000 population in Northern Ireland, 2014 - 2017
- **Figure B)** Age and gender distribution of *P. aeruginosa* rate per 100,000 population in Northern Ireland, 2017
- **Figure C)** Map of *P. aeruginosa* rate per 100,000 population with HSC Trust Boundaries, 2017

Pseudomonas in Neonatal Settings

During 2017, 13 *Pseudomonas* colonisations from 9 neonates were reported to the HCAI team through the *Pseudomonas* Surveillance Programme in Neonatal Units. This is a reduction of 22.5% compared to 2016. The majority of reported positive specimens were of species *P aeruginosa* (92.3%), followed by *P. putida* (7.7%). Multiple isolates of a single strain were not detected between patients. No environmental/water links were reported to the HCAI Team.

The most recent neonatal *Pseudomonas* blood stream infection occured within quarter 4 of 2016.

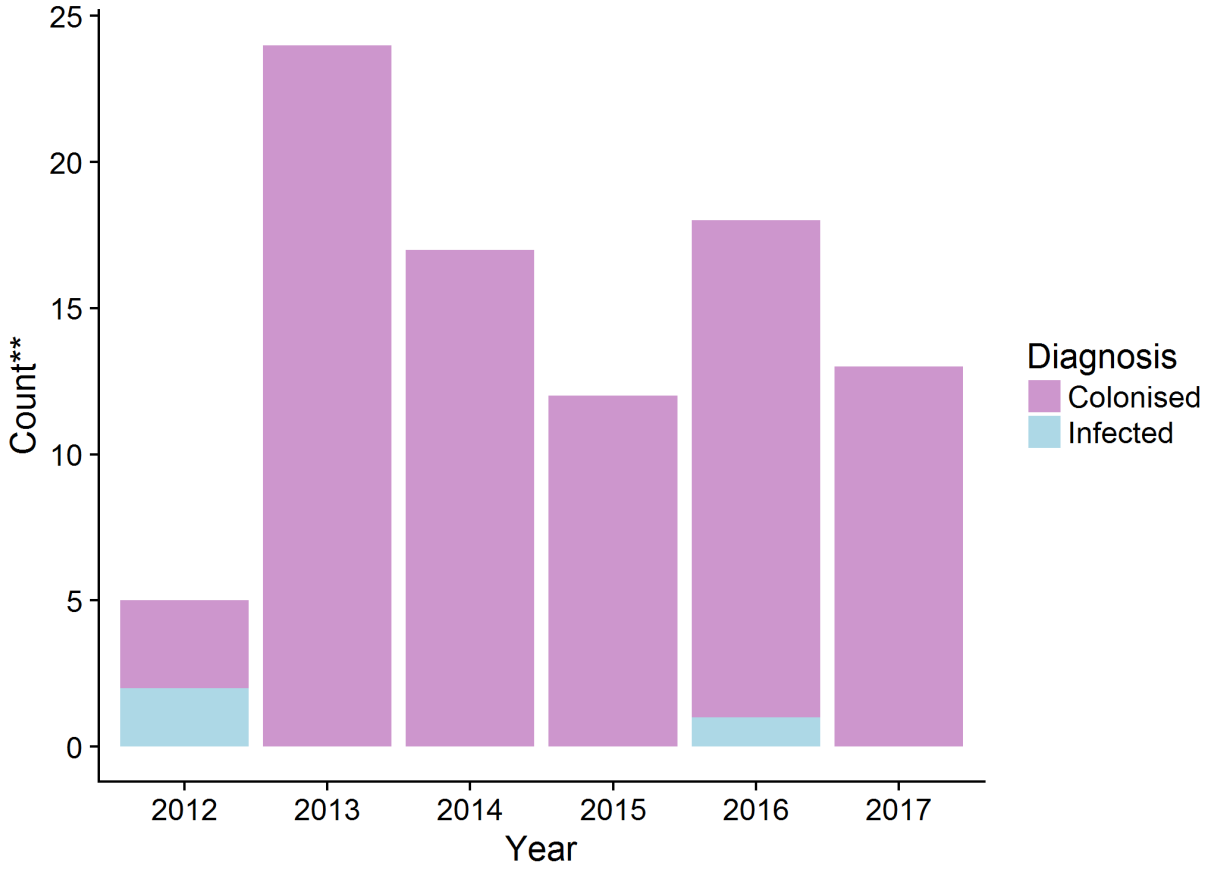

Figure 1. Count of *Pseudomonas* isolates, by diagnosis, 2012-2017.

***Note - illustrates count of isolates only. Patients may have had one colonisation reported.*

Discussion

This is the first annual report of HCAI in Northern Ireland describing trends of *C. difficile*, *S. aureus* and Gram-negative bacteraemias. In general, there have been encouraging reductions in the rates of infection for CDI and MRSA organisms which reflects the hard work of infection control teams in preventing transmission and the prioritisation of timely data through enhanced surveillance. In contrast, the rates of Gram-negative bacteraemias, particularly *E.coli* and *Klebsiella* species have continued to increase.

In response to this, mandatory surveillance will be introduced in 2018. Reductions in rates have been observed since the establishment of enhanced surveillance programmes with a focus on CDI and *S. aureus*. With this in mind, we will continue to review the incidence of Gram-negative bacteraemias as part of the overall ambition to reduce rates by 2020.

The inpatient rate of *C. difficile* infection in those over the age of 2 has been generally been decreasing since 2010 with slight increases observed in 2014 and 2015. This largely reflects trends observed in England[4] where small increases were also observed in the financial years 2013/14 and 2014/15 for hospital-onset cases[4]. While reductions were observed in NI during 2016, 2017 saw a small increase in the rate of CDI inpatients to 0.21 per 1000 bed days (a 2% increase). Age-specific rates of CDI, as expected, are epidemiologically similar to England, with highest rates observed in older populations in both males and females, particularly in those over 75. Altogether, these cases accounted for 55% of total cases, with those aged between 65 and 74 being the next largest group at 22%.

In keeping with the UK-wide trend, we have observed a steep decline in the number of MRSA bacteraemias in NI since 2015 (a 44% reduction)[5]. With regard to age-specific rates of MRSA, NI appears to be epidemiologically similar to the overall UK data [5]. Higher rates are observed in patients over the age of 75, particularly in males. In contrast to UK data, there was a notable absence of cases in the age categories of 5-14 years and in the under 1s.

There has been a gradual year on year increase in the number of MSSA bacteraemias reported to the PHA since 2014, despite a slight decline observed between 2012 and 2014. This is reflective of the trend observed in the UK figures [5]. As in previous years, age-specific rates in those over the age of 65 have continued to be higher. This is epidemiologically similar to the overall age-specific rates observed in UK data [5]. Females under the age of one had a higher rate than males.

This is the first report containing data related to trends of Gram-negative bacteraemias in Northern Ireland. In England, mandatory reporting of *E. coli* bloodstream infections began in 2011. Since then, there has been a general year on year increase of all *E. coli* (both hospital and community onset) in England [4]. This trend is also reflected in NI data, with Northern Ireland seeing increase in the voluntary reporting cases of 59% since 2014. Similarly, the epidemiological trends mirror what is observed in England, with dramatically higher rates observed in both males and females over the age of 75. Increases in the rate in the under 1s were also seen (particularly in males), however, this relates to only 1% of total *E. coli* cases reported. Similar trends in age-specific rates have also been observed for *Klebsiella* species and *P. aeruginosa*, with higher rates observed in the over 75s.

While increases have been observed in these infections, they have now been targeted as part of the UK governments ambition to reduce healthcare-associated cases by 50% by 2020. Continual monitoring of these infections through surveillance will inform progress towards this target.

It is reassuring to note that no bloodstream infections were reported from neonates (those under 1 year of age) through the *Pseudomonas* surveillance programme, as well as the reduction in the number of colonisations of *Pseudomonas* picked up through routine screening in neonatal units. During 2017, the HCAI team did not identify multiple isolates of a single strain, indicating there has been limited patient to patient transmission of colonisations. Similarly, there had been no reports of colonisation as a result of the clinical environment or water.

Developments During 2017

There have been a number of developments during 2017 for the HCAI Team work plan. The new focus on Gram-negative bacteraemias arose from a recommendation in the review on antimicrobial resistance [1]. Prior to 2017, there was no enhanced surveillance programme in place to gather such information relating to these infections.

With potential improvement targets aimed at tackling Gram-negative infections (those occurring on day two or later after admission), there was a need to be able to identify these cases. To do this, existing HCAI data flows needed to be changed in order to accommodate further data collection to include information relating to patient admissions and risk factors. This was also an opportunity to streamline and improve current enhanced surveillance arrangements to create a single data repository for all mandatory infections.

During 2017, we also incorporated basic laboratory-reported information related to Gram-negative bacteraemias into regular reporting streams.

To address the need for collecting more enhanced surveillance information and more organisms, the team began the development of our new online data capture and reporting tool, HI-Surv. The new system allows inpatient and community cases of HCAI to be entered in real time as they occur, giving HSC Trusts access to timely surveillance information in order to inform action. Given the increased complexity of reporting, the HCAI team introduced the first HCAI and Antimicrobial Use and Resistance Surveillance Protocol.

The full enhanced surveillance programme for Gram-negative bacteraemias began in April 2018. Having access to these new data, including identifying potential risk factors, will be an important source of intelligence for HSC Trusts in order to ensure quality and safety in their care.

The introduction of a harmonised HCAI surveillance programme for *C. difficile*, *S. aureus* and Gram-negative bacteraemias will be an important source of business intelligence for HSC Trusts, and will inform action on infection prevention and control programmes in order to improve patient safety and quality of care.

Actions to Reduce Healthcare-associated Infection

During 2017, the PHA hosted a number of events to raise awareness of healthcare-associated infection. In September 2017, we hosted a Regional HCAI and Antimicrobial Stewardship (AMS) Quality Improvement Sharing Event where HSC Trust teams shared their learning through presentations on quality improvement and learning from adverse incidents relating to HCAI and AMS. The HCAI team, along with the wider Health Protection team and Queen's University Belfast, also delivered an event at the W5 Interactive Science Centre as part of Antibiotic Awareness Day in November. This was a great opportunity to communicate with the public around general hand hygiene and the principles of infection prevention and control.

The HCAI and AMS Improvement Board established a number of new subgroups to lead on collaborative projects to prevent healthcare-associated infections, as well as reduce inappropriate antibiotic prescribing.

The Infection Prevention and Control Lead Nurse Forum continued to support Higher Education Institutes (HEIs) to facilitate the integration of good standards of infection

prevention and control practice within patient care delivery across healthcare settings. Material was shared with the HEIs which will be included in the nursing curriculum and used in the teaching of undergraduate nursing students. The forum has also supported further development of the Regional Infection Prevention and Control Manual.

Proposed objectives to reduce healthcare-associated infections in 2018 include:

- Establish an Education subgroup on the HCAI and AMS Improvement Board to coordinate efforts in undergraduate, postgraduate and staff training related to Infection Prevention and Control
- Develop new reports for the monitoring Gram-negative bacteraemia to allow HSC Trusts to monitor their progress towards DOH targets
- Launch a new public-facing website to facilitate the publication of HCAI rates against a number of indicators
- Roll out the new HCAI data collection and reporting tool, Hi-Surv, to all HSC Trusts in NI
- Lead by the IPC Lead Nurse Forum, provide infection prevention and control support and education to healthcare professionals in Primary Care

Limitations

While this report makes reference to general comparisons between NI and UK wide data, care should be taken to avoid direct comparison/benchmarking. There may be difference in case mix, populations sampled and time periods used. Some UK-wide age-specific rates only include data submitted by England and Northern Ireland and exclude Scotland and Wales. Since Gram-negative bacteramias reported through Cosurv could not be attributed to being “hospital onset” or from inpatients, rates were calculated using a population denominator.

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item 12

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Healthcare Associated Infections and Antimicrobial Use in Long-Term Care Facilities (HALT3) 2017 Survey
Reference	PHA/06/02/19
Prepared by	Dr Tony Crockford, Dr Kirsty Kapande, Mark McConaghy and Dr Muhammad Sartaj
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☐ For **Noting** ☒

1 Purpose

This report outlines the findings of a point prevalence survey (PPS) conducted in 2017 to assess the prevalence of healthcare associated infections (HCAI) and antimicrobial use (AMU) in long term care facilities (LTCFs) in Northern Ireland. It is the regional component of a survey which takes place across Europe. In 2017, Wales, Scotland and the Republic of Ireland also took part.

The survey helps to determine the burden of HCAIs and AMU in LTCFs, to measure structure and process indicators of infection prevention and control (IPC) in LTCFs, and helps to inform the priority areas for future work.

The report is being brought to the PHA Board for noting prior to publication in the public domain.

2 Background Information

Under PHA's Corporate Plan Objective 4, "All health and wellbeing services should be safe and high quality", there is a target in the 2018/19 Business Plan that PHA will "improve patient safety and experience by bringing leadership to reducing healthcare-associated infections". This report forms part of that work.

3 Key Issues

The key points from this survey include:

- HALT3 included 2,614 nursing and residential home residents Northern Ireland. 21% of nursing homes and 34% of residential homes took part in the survey

Prevalence of Antimicrobial Use

- The prevalence of antimicrobial use in nursing homes was 10.5% and 9.2% in residential homes.
- 50.4% of all prescriptions were for prophylaxis in nursing homes and 44.4% in residential homes.
- The main target site for prescriptions was urinary tract infections (about 70%).

Prevalence of Healthcare Associated Infections

- The prevalence of HCAIs in residential homes was (6.8%) while nursing homes prevalence was reported as (3.3%). The 2013 results showed similar HCAI prevalence in both facility types
  Urinary tract infections, respiratory tract infections, and skin and soft tissue infections were the most commonly reported HCAI in the surveyed LTCFs.

4 Next Steps

Following this meeting the Report will be published on the PHA website.

Going forward, the priorities are to:

- Explore opportunities for collaboration amongst all GP practices currently providing services to the same LTCF to strengthen and improve the links between LTCF and primary care, particularly with respect to IPC and AMS.
- Continue to work with relevant teams to improve diagnosis of infection and prescribing within LTCFs through primary care.
- Continue to raise awareness of the availability of formal IPC advice through PHA.
- Continue to reduce the HCAI burden by addressing modifiable risk factors through the proper training and the practice of good IPC.
- Develop and Implement interventions to reduce the burden of RTIs.
- Implement interventions to further reduce the burden of UTIs in LTCFs.
- Promote development of pragmatic guidance and protocols on prevention and management of SSTI.
- Further improve support and education within LTCFs around antimicrobial prescribing guidance and IP&C policy and guidelines for the prevention or reduction of infections.
- Promote active review of residents on antimicrobial therapy in LTCFs.
- Undertake five-yearly point prevalence surveys in LTCFs.

Healthcare-Associated Infections and Antimicrobial Use in Long-Term Care Facilities (HALT) 2017 survey

December 2018

HSC Public Health Agency

ACKNOWLEDGEMENTS

This survey could not have been completed successfully without the co-operation and support of the staff of the participating Long Term Care Facilities (LTCFs). Their collaboration is gratefully acknowledged.

The Public Health Agency (PHA) would also like to acknowledge the Regulation and Quality Improvement Authority (RQIA) for assisting with recruitment of LTCFs for participation in the survey.

The authors are particularly grateful to members of the project team who met throughout the survey and provided invaluable suggestions and support; they include: Caroline McGeary (Senior Infection Control Nurse, PHA), Dr Bronagh Clarke (Trainee Doctor), Eileen Morelli (Surveillance Analyst), and Tracey Bone (Surveillance Officer). Special thanks go to colleagues in LTCFs who agreed to take part in the validation study

Finally, we recognise and appreciate the role of the European HALT3 Management Team at the Scientific Institute of Public Health, Brussels, Belgium and the European Centre for Disease Prevention and Control, Stockholm, Sweden.

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EXECUTIVE SUMMARY

NURSING HOME SUMMARY

Nursing Home Characteristics

- 55 (21%) Nursing homes submitted data on 2,321 eligible residents
- The proportion of female residents was 66.3%.
- The proportion of over 85 year old residents was 44.5%
- The proportion of residents with Care Load Indicators:
  - 72.3% were incontinent
  - 64.3% were disorientated
  - 54.2% were either in a wheelchair or bedridden
- The proportion of residents with HCAI Risk Factors
  - 5.2% had a urinary catheter *in situ*
  - 0.3% had a vascular catheter *in situ*
  - 8.8% had a wound (3.8% pressure sores and 5% other wounds)
  - 0.3% had undergone recent surgery

Healthcare Associated Infections

- 77 residents had 78 HCAIs
- The prevalence of HCAI was 3.3% (range 0-15.4%)
- 15 (27.3%) Nursing homes recorded 0 infections
- 43.5% of reported HCAIs were urinary tract infections
- UTI prevalence was 1.5%
- 35% of reported HCAIs were respiratory tract infections
- RTI prevalence was 1.2%
- 20.5% of reported HCAIs were skin and soft tissue infections
- SSTI prevalence was 0.7%

Antimicrobial Prescribing

- A total of 248 antimicrobials were prescribed
- The prevalence of antimicrobial use was 10.5%
- 50.4% of all prescriptions were for prophylaxis.
- 99.6% of prescriptions were antibacterials.
- The main target sites for prescriptions were UTI (68.5%), RTI (21.0%) and SSTI (9.3%).
- 95.2% were prescribed by a GP
- 86.2% were prescribed within the Nursing Home
- 100% were administered orally
- 51.6% of all prescriptions did not have a review / end date
- 97.6% of therapeutic prescriptions had a review / end date recorded
- No prescriptions for prophylaxis had a review / end date recorded
- 29.5% of HCAIs had samples sent for laboratory testing
- 5.1% of HCAIs had laboratory results available
- The most commonly prescribed antimicrobial agents were trimethoprim (22.6%), cefalexin (21.8%) and nitrofurantoin (17.3%).

RESIDENTIAL HOME SUMMARY

Residential Home Characteristics

- 15 (34%) Residential homes submitted data on 293 eligible residents
- The proportion of female residents was 73%.
- The proportion of over 85 year old residents was 46.8%
- The proportion of residents with Care Load Indicators:
  - 35.2% were incontinent
  - 53.6% were disorientated
  - 4.1% were either in a wheelchair or bedridden
- The proportion of residents with HCAI Risk Factors
  - 3.4% had a urinary catheter *in situ*
  - 0 had a vascular catheter *in situ*
  - 6.5% had a wound (5.5% pressure sores and 1% other wounds)
  - 2.7% had undergone recent surgery

Healthcare Associated Infections

- 20 residents had 20 HCAIs
- The prevalence of HCAI was 6.8% (range 0-19%)
- 5 (33.3%) Residential homes recorded 0 infections.
- 55% of HCAIs reported were urinary tract infections
- UTI prevalence was 3.8%
- 25% of HCAIs reported were skin and soft tissue infections
- SSTI prevalence was 1.7%
- 10% of HCAIs reported were respiratory tract infections (10%)
- RTI prevalence was 0.7%

Antimicrobial Prescribing

- A total of 27 antimicrobials were prescribed
- The prevalence of antimicrobial use was 9.2%
- 44.4% of all prescriptions were for prophylaxis.
- 100% of prescriptions were antibacterials.
- The main target sites for prescriptions were UTI (70.3%), SSTI (18.5%) and RTI (11.1%).
- 96.3% were prescribed by a GP
- 88.9% were prescribed within the Residential Home
- 100% were administered orally
- 44.4% of all prescriptions did not have a review / end date
- 80% of therapeutic prescriptions had a review / end date recorded
- 25% of prescriptions for prophylaxis had a review / end date recorded
- 25% of HCAIs had samples sent for laboratory testing
- 5% of HCAIs had laboratory results available
- The most commonly prescribed agents were nitrofurantoin (37.1%), flucloxacillin (14.8%) and cefalexin (11.1%).

PRIORITIES

- Explore opportunities for collaboration amongst all GP practices currently providing services to the same LTCF to strengthen and improve the links between LTCF and primary care, particularly with respect to IPC and AMS.
- Continue to work with relevant teams to improve diagnosis of infection and prescribing within LTCFs through primary care.
- Continue to raise awareness of the availability of formal IPC advice through PHA.
- Continue to reduce the HCAI burden by addressing modifiable risk factors through the proper training and the practice of good IPC.
- Develop and Implement interventions to reduce the burden of RTIs
- Implement interventions to further reduce the burden of UTIs in LTCFs.
- Promote development of pragmatic guidance and protocols on prevention and management of SSTI.
- Further improve support and education within LTCFs around antimicrobial prescribing guidance and IP&C policy and guidelines for the prevention or reduction of infections.
- Promote active review of residents on antimicrobial therapy in LTCFs.
- Undertake five-yearly point prevalence surveys in LTCFs.

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ABBREVIATIONS

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
ATC	Anatomical Therapeutic Chemical classification system (WHO)
CI	Confidence Interval
CDC	Centre for Disease Prevention and Control
ECDC	European Centre for Disease Prevention and Control
EU	European Union
FTE	Full time equivalent
HCAI	Healthcare Associated Infection
HALT	Healthcare Associated Infections and Antimicrobial Use in Long Term Care Facilities
HSC Trust	Health and Social Care Trust
IPC	Infection Prevention and Control
IV	Intravenous
LRTI	Lower Respiratory Tract Infection
LTCF	Long-Term Care Facility
MRSA	Methicillin Resistant *Staphylococcus aureus*
MDRO	Multi Drug-Resistant Organism
NI	Northern Ireland
NIECR	Northern Ireland Electronic Care Record
OR	Odds Ratio
PHA	Public Health Agency (Northern Ireland)
PPS	Point Prevalence Survey
RQIA	Regulation and Quality Improvement Authority
SHEA	Society for Healthcare Epidemiology of America
SSTI	Skin and Soft Tissue Infection
URTI	Upper Respiratory Tract Infection
UTI	Urinary Tract Infection
RTI	Respiratory Tract Infection
WHO	World Health Organisation

DEFINITIONS

Antibiotics are substances used to kill bacteria and are also known as antibacterials.

Antimicrobial is a general term for any compound with a direct action on micro-organisms used for the treatment and/or prevention of infections. In this survey antimicrobials included antibacterials, antifungals and antiprotozoals. Topical antimicrobials, antiviral agents and antiseptics were excluded from this survey. For the purposes of the survey, antimicrobials are classified using the Anatomical Therapeutic Chemical (ATC) classification system.

Antimicrobial Resistance is the ability of micro-organisms to grow in the presence of an antimicrobial that would normally kill them or limit their growth.

Antimicrobial Stewardship promotes the appropriate use of antimicrobials (including antibiotics) to improve patient outcomes, reduce microbial resistance, and decrease the spread of infections caused by multidrug-resistant organisms (MDROs). It includes the selection of the appropriate drug, dose, route of administration and treatment duration.

Asymptomatic bacteriuria is the presence of bacteria in the urine at a level indicating infection but without clinical symptoms.

Healthcare Associated Infections refer to infections that develop whilst resident in a healthcare facility e.g. LTCF or hospital. For the survey, infections were diagnosed from signs and symptoms using decision algorithms based on CDC/SHEA case definitions [1] which are based on the McGeer criteria [2] for the surveillance of infections in LTCFs.

I**mported Infections** refer to active infections diagnosed when patients were resident in another setting or within 2 days of having been transferred to a LTCF.

Nursing homes are residential facilities providing nursing care 24 hours per day.
Prevalence is usually expressed as the percentage of a population found to have e.g. a healthcare associated infection and/or be treated with antimicrobials.

Point prevalence surveys assess the prevalence of an issue at a specific point in time.

Prophylactic treatment or **prophylaxis** refers to an antimicrobial prescribed to prevent the occurrence of an infection.

Residential homes are facilities providing residential care. They are staffed 24 hours a day, providing board and general personal care to the residents. Such premises are provided for those who require ongoing care and supervision in the circumstances where nursing care would normally be inappropriate.

Significance is a statistical term defined as a p value <0.05.

Trust-controlled refers to LTCFs under the control of one of the five Health and Social Care (HSC) Trusts. In Northern Ireland, health services are geographically distributed into HSC Trusts which are funded and owned by the state and are ‘not for profit’.

Uroprophylaxis is a term used for an antimicrobial prescribed to prevent urinary tract infections.

SECTION 1 HALT3 2017

1.1 LTCF: Healthcare Associated Infections and Antimicrobial Use

This report outlines the findings of a point prevalence survey (PPS) conducted in September/October 2017 to assess the prevalence of healthcare associated infections and antimicrobial prescribing practices in long term care facilities (LTCFs). This PPS is a part of HALT-3, a European wide PPS, coordinated by the ECDC. Each of the four UK countries as well as the Republic of Ireland participated. Similar surveys were undertaken in Northern Ireland in 2010 and 2013 [3].

1.2 Background

Healthcare associated infections (HCAI) and increasing rates of antimicrobial resistance are potentially serious health threats. As residents in LTCFs often have complicated underlying medical conditions and are generally from older age groups, they are more susceptible to infection [4]. Good infection prevention and control (IPC) practices and antimicrobial stewardship (AMS) are essential to prevent HCAI and to slow the emergence of antimicrobial resistance (AMR).

1.3 Aims and Objectives

The aims of the survey were to:

- Estimate the prevalence of HCAIs and antimicrobial use in LTCFs.
- Measure structure and process indicators of infection prevention and control (IPC) in LTCFs.

The data will be useful to:

- Quantify the prevalence of HCAIs and antimicrobial use in LTCFs and in the EU/EEA region.
- Identify need for intervention, training and/or additional infection prevention and control (IPC) resources.
- Identify priorities for national and local intervention and raise awareness.

1.4 Methodology

The HALT survey was developed by the ECDC and the Scientific Institute of Public Health, Brussels, Belgium for use in European member states. The survey was conducted using standard forms and a protocol [5] which were adapted for use in Northern Ireland.

The HALT survey in Northern Ireland took place in September / October 2017 and was coordinated by the Public Health Agency (PHA) and overseen by a multi-disciplinary steering group. A letter of invitation was sent from PHA and the Regulation and Quality Improvement Authority (RQIA) to all Nursing homes in Northern Ireland in August 2017. In addition, a number of Trust-controlled Residential homes expressed an interest in participating in the survey. During August 2017, healthcare workers attended one of seven regional training sessions to learn about the survey protocol and methodology.

Seventy LTCFs participated in the survey (55 Nursing homes and 15 Trust-controlled Residential homes). A dedicated helpline was established at the PHA to address any queries that arose during the survey and information leaflets were prepared for residents, their families and staff.

1.4.1 Data Collection

Data was collected on two levels:

Institutional questionnaire [Appendix 1] collected general data (ownership, presence of a qualified nurse), denominator data (total number of available and occupied beds, for residents admitted to hospital, residents with signs/symptoms of infection, receiving antimicrobials, residents with a urinary/vascular catheter, with incontinence, pressure sores, wounds, disorientation or with an impaired mobility) and information on medical care and coordination, infection control structure and antibiotic policy.

Resident questionnaire [Appendix 2] was completed for each resident who was receiving antimicrobials on the day of the survey and / or had an infection on the day of the survey. Information was also collected regarding gender, year of birth, urinary/vascular catheter, incontinence [urinary/faecal], pressure sores, wounds, disorientation and impaired mobility [wheelchair/bedridden].

1.4.2 Data Validation

Northern Ireland also contributed data to a European validation study [6]. This was designed to validate the HALT data collection across Europe. During October 2017, local coordinators from PHA visited three Nursing homes and conducted a parallel survey. As part of the validation process, an external ECDC validator assessed the local validation team. The data, collected simultaneously by both the local team and the validation team, were returned to the European validation study coordinating team for inclusion in a European HALT validation analysis.

1.4.3 Data Analysis

Using data from the resident and institutional questionnaires, the prevalence of healthcare associated infection and antimicrobial use was determined. Prevalence was calculated as a proportion of all eligible residents at the time survey. Prevalence results were calculated for HCAI, antimicrobial use, care load indicators and risk factors for HCAI. The frequency and distribution of HCAIs were also calculated.

The questionnaire data also provided a description of the characteristics of the residents and their LTCFs. This allowed an analysis of the contribution of these characteristics to HCAI and antimicrobial use.

SECTION 2 RESULTS

2.1 CHARACTERISTICS OF PARTICIPATING LTCFs

2.1.1 Participation

All the Nursing homes in Northern Ireland were invited to participate in the survey. In addition, all Residential homes under the control of the Health and Social Care (HSC) Trusts were offered the same opportunity.

In total, 55 private Nursing homes and 15 Trust-controlled Residential homes participated in the survey during September/October 2017.

2.1.3 Response Rate and Location of Facilities

Nursing Homes

According to the RQIA, There were 257 Nursing homes in Northern Ireland in March 2017. Of these, 55 submitted data for the survey, giving a response rate of approximately 21%.

The Nursing homes that submitted data were distributed across all five HSC Trusts. Fourteen (25.5%) were located in the Southern Trust, 13 (23.6%) in Northern Trust, 11 (20%) in South Eastern Trust, 10 (18.2%) in Western Trust and 7 (12.7%) in Belfast Trust [Table 1].

Table 1 Distribution of participating Nursing Homes by HSC Trust

	All Nursing Homes	Participating Nursing Homes
HSC Trust	**Number (%)**	**Number (%)**
Belfast	54 (21.0%)	7 (12.7%)
Northern	62 (24.1%)	13 (23.6%)
South Eastern	53 (20.6%)	11 (20.0%)
Southern	49 (19.1%)	14 (25.5%)
Western	39 (15.2%)	10 (18.2%)

**Facilities with identical postcodes were grouped*

In March 2017, there were a total of 10,869 RQIA-approved Nursing home places. The average number of places per home was 42.3 [Table 2]. The participating Nursing homes had an average of 44.8 places per home. There was no significant difference in the size of all Nursing homes compared with those that submitted data. Participating Nursing homes ranged in size from 19 to 81 beds (median 44) and the proportion of single rooms per 100 beds ranged from 40.9% - 100% (median = 97.5%).

Table 2 Nursing Home Approved Places and Participation

	Number of Approved places	Average Number of Places
All Nursing homes in Northern Ireland (n=257)	10,869	42.3
Nursing homes that submitted data (n=55)	2,466	44.8

To meet the inclusion criteria, residents had to live full-time in the facility, be resident for at least 24 hours and be present at 8 a.m. on the day of the survey. At the time of the survey, the 55 participating Nursing homes indicated that they had a capacity

of 2,446 beds and a total of 89 were unoccupied. Of the 2,357 beds that were in use, 36 residents did not meet the above inclusion criteria making 2,231 eligible for inclusion. The occupancy rate was 96.4%.

Residential Homes

Of the 44 Trust-controlled Residential homes in Northern Ireland, 15 submitted data to the PHA giving an approximate response rate of 34%

The 15 Residential homes were located in three of the five HSC Trusts. Six were in the South Eastern Trust, four in the Southern Trust and five in the Western Trust [Figure 1]. No Residential homes from Belfast and the Northern HSC Trusts participated in the survey.

There were a total of 1101 RQIA-approved Trust-controlled Residential home places. The average number of places per home was 24.7 [Table 3]. The participating Residential homes had an average of 29.7 places per home. Participating Residential homes ranged in size from 16 to 39 beds (median 30) and the proportion of single rooms per 100 beds ranged from 87.5% - 100% (median = 100%).

The 15 participating Residential homes had a total of 446 beds and 146 unoccupied beds. A further 7 residents did not meet the inclusion criteria leaving a total of 293 Residential home residents eligible for the survey. The occupancy rate was 67.3%.

Table 3 Residential Home Approved Places and Participation

	Number of Approved Places	Average Number of Places
All Trust-controlled Residential homes (n=44)	1101	24.7
Participating Residential Homes (n=15)	446	29.7

Facility Staffing Levels

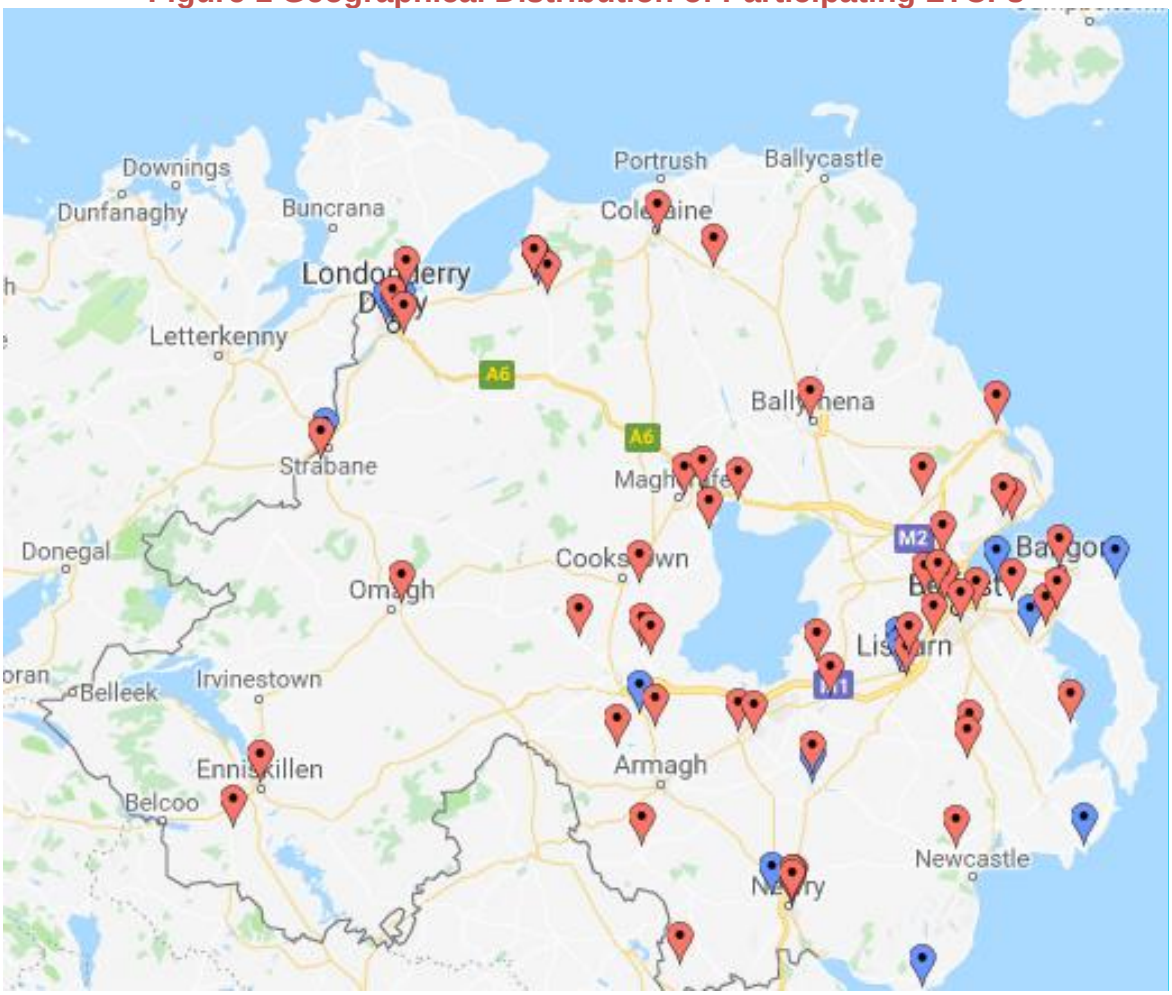
Nursing Homes

Full time equivalent (FTE) staffing levels were also collected. Nursing homes reported an average of 0.2 nurses per resident and 0.6 health care assistants per resident.

Residential Homes

Residential homes had an average nursing staffing of 0.003 per resident and an average healthcare assistant staffing level of 0.8 per resident.

Figure 1 Geographical Distribution of Participating LTCFs



Summary Point: Nursing Homes

- 21% of Nursing homes submitted data to the HALT survey
- 55 Nursing homes submitted data on 2,321 eligible residents

Summary Point: Residential Homes

- 34% of Residential homes submitted data to the HALT survey
- 15 Residential homes submitted data on 293 eligible residents

2.2 LTCF Resident Characteristics

2.2.1 Resident Characteristics

Data was collected on the gender and age of the residents. Residents were grouped according to their age on the day of survey into those over 85 years and those 85 years and under.

Nursing Homes

Of the 2,321 Nursing home residents were 66.3% female (n=1,538), while male residents accounted for 33.7% (n=783). The majority of Nursing home residents (44.5%; n=1033) were older than 85 years. The proportion of those over 85 years varied between Nursing homes and ranged from 0 to 96.4**%** of the population.

Residential Homes

Of the 293 Residential home residents 73.0% (n=214) were female and 27.0% (n=79) were male. The majority of the Residential home population, (46.8%; n=137) were older than 85 years old. The proportion of those over 85 years varied between Residential homes and ranged from 35.3 to 62.5**%** of the population.

Summary Point: Nursing Homes

- The proportion of female residents was 66.3%.
- The proportion of over 85 year old residents was 44.5%

Summary Point: Residential Homes

- The proportion of female residents was 73%.
- The proportion of over 85 year old residents was 46.8%

2.2.2 Care Load Indicators

Three 'care load indicators' were used:

- Incontinence: (both faecal and/or urinary);
- Disorientation (in time and/or in space) and;
- Impaired mobility (wheelchair bound or bedridden).

Nursing Homes

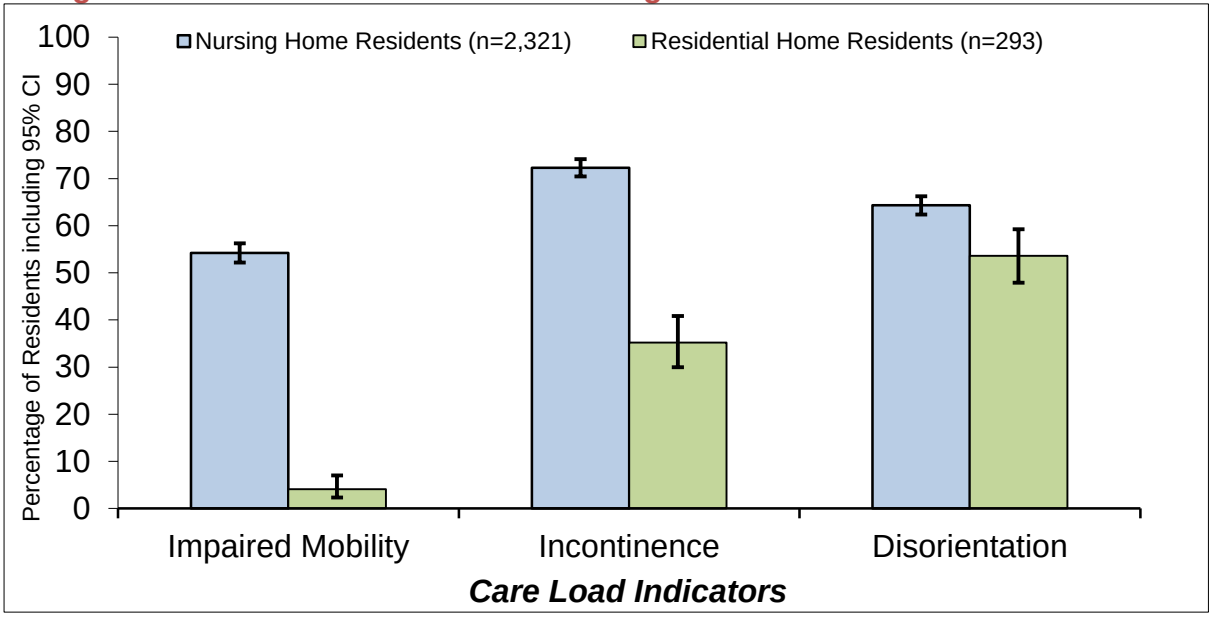
Amongst Nursing home residents, the incontinence rate was 72.3% (n=1,677). Disorientation was present in 64.3% (n=1,493) of Nursing home residents and 54.2% (n=1,258) of Nursing home residents were described as having impaired mobility.

Residential Homes

Amongst Residential home residents, the incontinence rate was 35.2% (n=103). Residents with disorientation accounted for 53.6% (n=157) and only a small proportion, 4.1% (n=12) of residents had impaired mobility.

Figure 2 shows the frequency of care load indicators amongst Nursing home and Residential home residents.

Figure 2 Care Load Indicators in Nursing and Residential Home Residents



Summary Point: Nursing Homes

- The proportion of residents with Care Load Indicators:
  - 72.3% were incontinent
  - 64.3% were disorientated
  - 54.2% had impaired mobility (either in a wheelchair or bedridden)

Summary Point: Residential Homes

- The proportion of residents with Care Load Indicators:
  - 35.2% were incontinent
  - 53.6% were disorientated
  - 4.1% had impaired mobility (either in a wheelchair or bedridden)

2.2.3 Risk Factors

Although any patient is at risk of developing an HCAI, a number of factors have been identified that increase the risk of infection. The survey looked at the presence of three risk factors for HCAI in the participating LTCFs:

1) Those residents with invasive devices *in situ.* The survey focused on two device types, urinary catheters and vascular catheters.

2) Wounds were classified into two types, 'pressure sores' and 'other wounds'. 'Other wounds' included e.g. leg ulcers, traumatic or surgical wounds (if >30days post-surgery with no implant), insertion sites for gastrostomy, or tracheostomy sites (>90 days post-surgery with an implant in place). If the infection matched one of the Surgical Site Infection (SSI) definitions, priority was given to the SSI and another case definition for the same infection was not applied.

3) Recent surgery referred to residents who had undergone surgery in the previous 30 days.

Figure 3 below shows the frequency of risk factors for HCAI amongst Nursing home and Residential home residents.

Nursing Homes

Urinary catheters were present in 5.2% (n=121) of residents while vascular catheters were found in 0.3% (n=6).

A total of 8.8% (n=205) residents were reported as having a wound. The majority of wounds were 'other wounds' (5%; n=116), while pressure sores accounted for 3.8% (n=89) of residents.

0.3% (n=7) of residents had undergone surgery in the 30 prior to the day of the survey.

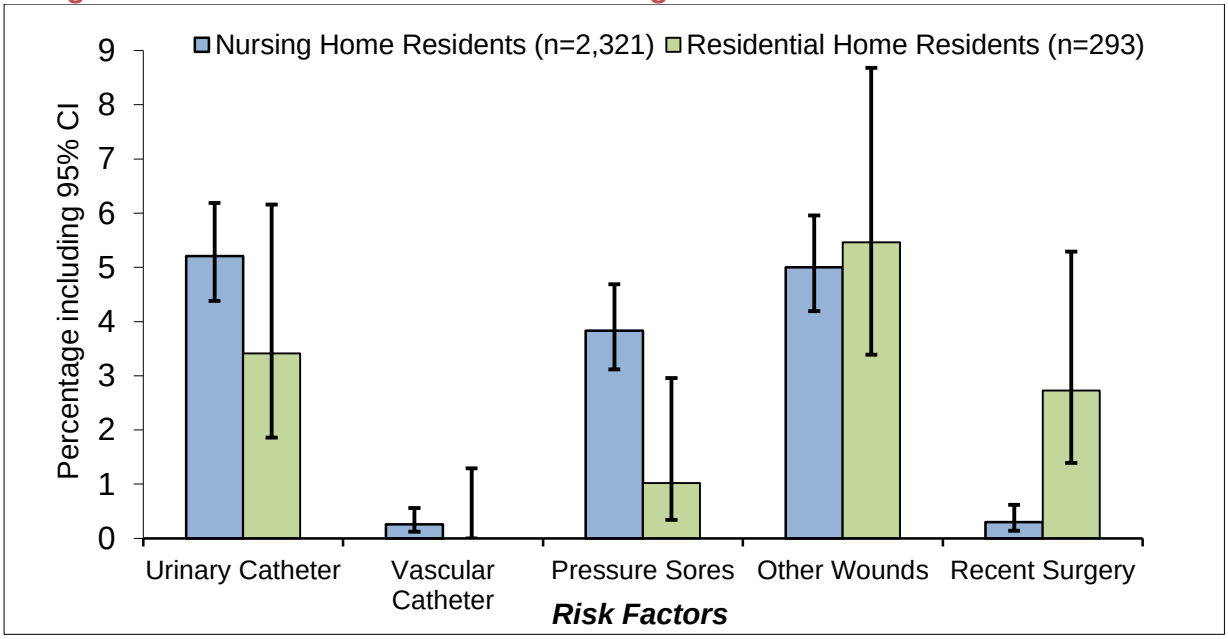
Residential Homes

Urinary catheters were present in 3.4**%** (n=10**)** of residents while there were no (0%) vascular catheters in Residential home residents.

A total of 6.5% (n=19) residents were reported as having had a wound. The majority (5.5%; n=16) had 'other wounds' while 1% (n=3) had pressure sores.

2.7% (n=8) of residents had undergone surgery in the 30 days prior to the day of the survey.

Figure 3 Risk Factors for HCAI in Nursing and Residential Home Residents



Summary Point: Nursing Homes

- The proportion of residents with HCAI Risk Factors
  - 5.2% had a urinary catheter *in situ*
  - 0.3% had a vascular catheter *in situ*
  - 8.8% had a wound (3.8% pressure sores and 5% other wounds)
  - 0.3% had undergone recent surgery

Summary Point: Residential Homes

- The proportion of residents with HCAI Risk Factors
  - 3.4% had a urinary catheter *in situ*
  - 0 had a vascular catheter *in situ*
  - 6.5% had a wound (5.5% pressure sores and 1% other wounds)
  - 2.7% had undergone recent surgery

2.3 Healthcare Associated Infection and Antimicrobial Use

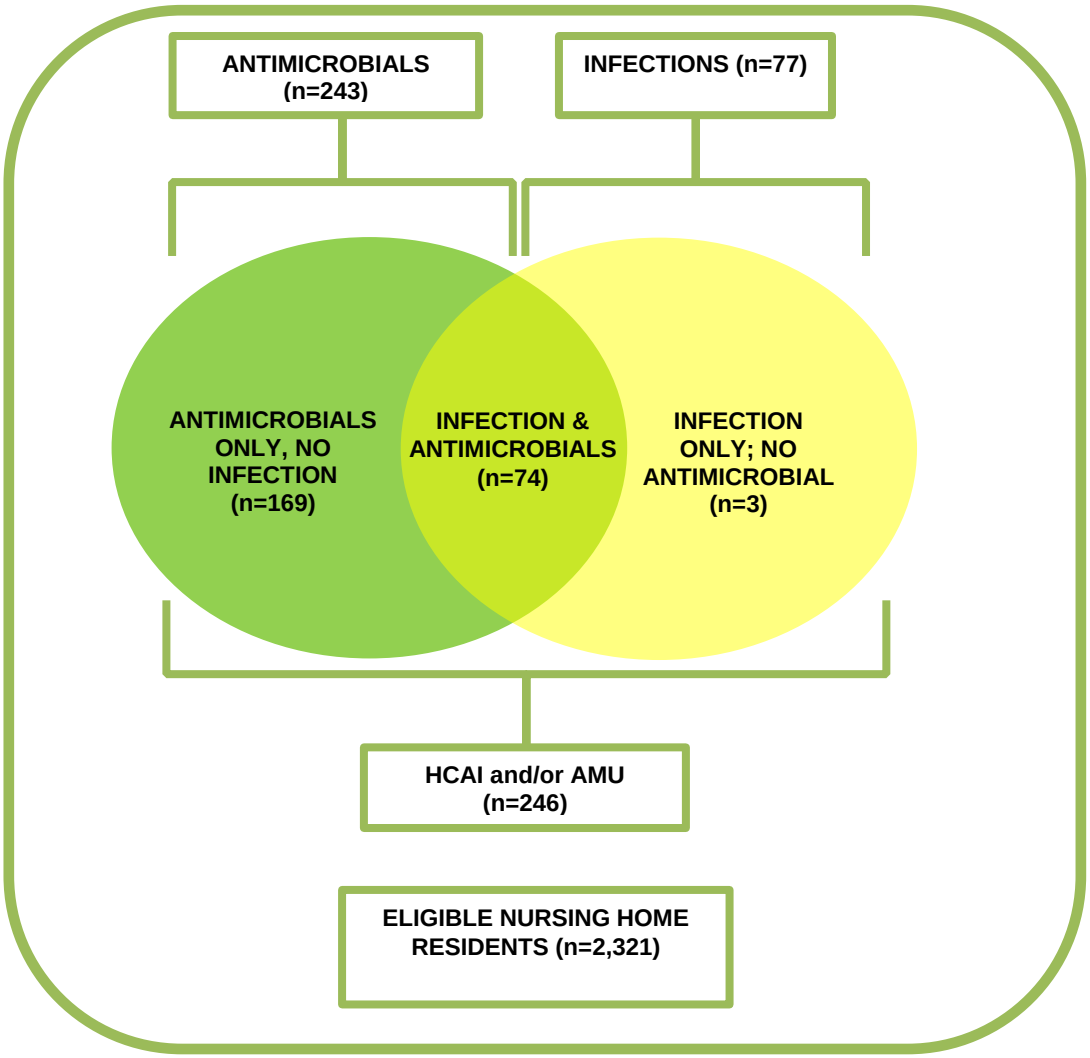
Nursing Homes

Of the 2,321 eligible residents, 246 (10.6%) had signs and symptoms of an infection and/or were receiving an antimicrobial, on the day of the survey [Figure 4]. Three residents (0.13%) had an infection but were not receiving antimicrobials. There were 169 residents (7.3%) in receipt of antimicrobials that did not have signs and symptoms of infection and 74 residents (3.2%) had both an infection and were receiving antimicrobials. The total number of residents taking antimicrobials was 243 (10.5%) and the total number with an infection was 77 (3.3%).

Residential Homes

Of the 293 eligible residents, 34 (11.6%) had signs and symptoms of an infection and/or were receiving an antimicrobial, on the day of the survey. Seven residents (2.4%) had an infection but were not receiving antimicrobials. There were 14 residents (4.8 %) in receipt of antimicrobials that did not have signs and symptoms of infection and 13 residents (4.4 %) had both an infection and were receiving antimicrobials. The total number of residents taking antimicrobials was 27 (9.2%) and the total number with an infection was 20 (6.8%).

Figure 4 Nursing Home Residents with HCAI and / or Receiving Antimicrobials



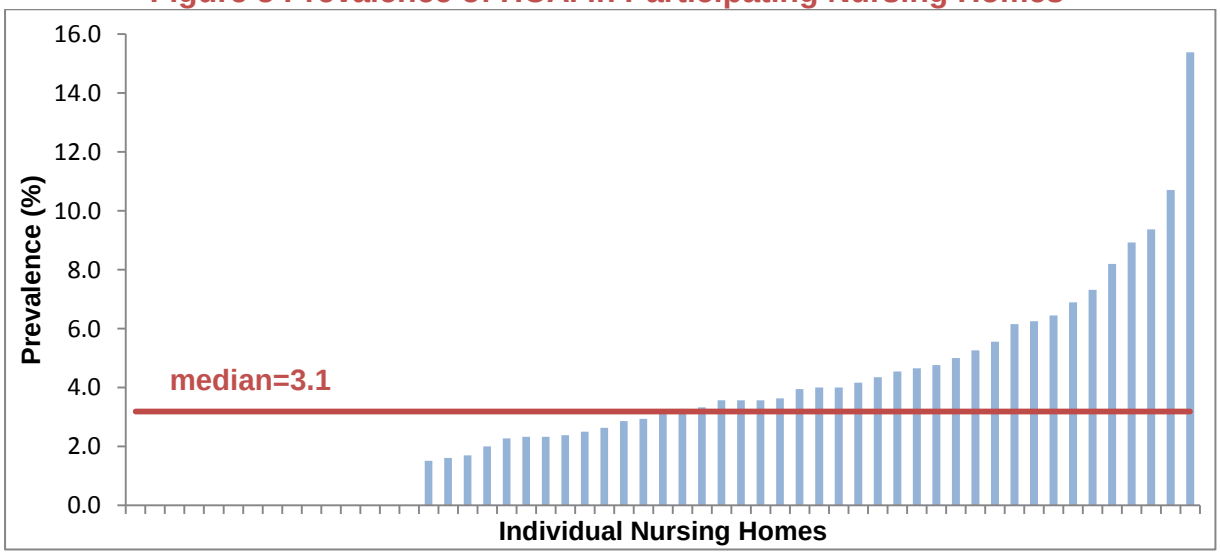
2.4 Healthcare Associated Infections (HCAIs)

2.4.1 Prevalence of Healthcare Associated Infection

Nursing Homes

There were 78 infections recorded in 77 Nursing home residents. One resident (1.3%) had two infection sites while the remaining 76 (98.7%) had only one [**Figure 5**]. The prevalence of HCAI was 3.3% (95% CI 2.7 - 4.1%; 77/2321) and ranged from 0% to 15.4% (median 3.1%). Fifteen (27.3%) of Nursing homes recorded no (0) infections. Three (1.2%) residents with signs and symptoms of an infection were not receiving antimicrobials at the time of the survey.

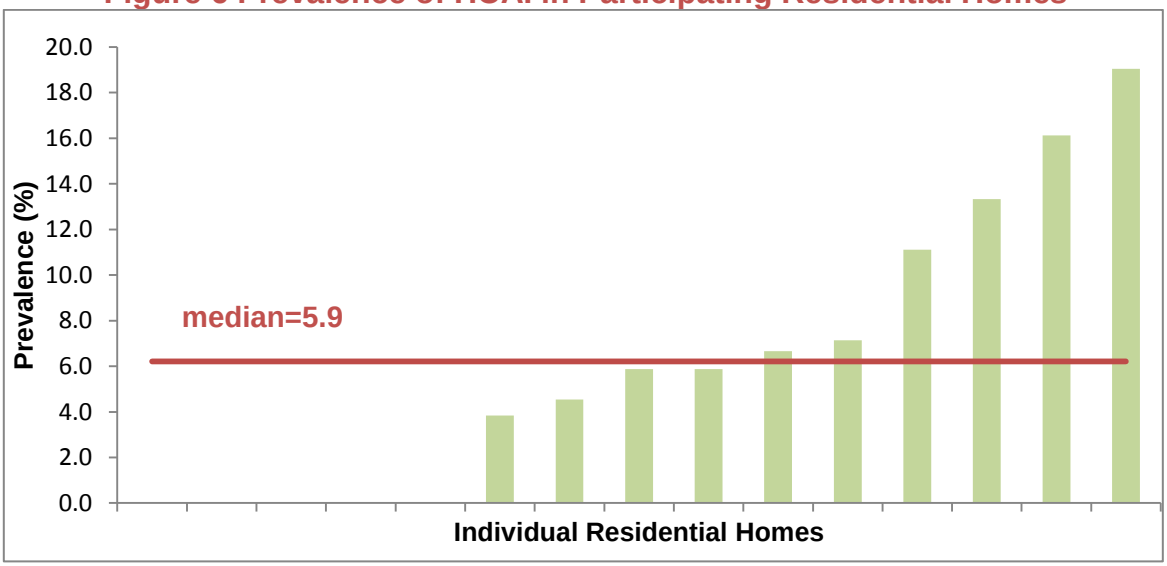
Figure 5 Prevalence of HCAI in Participating Nursing Homes



Residential Homes

There were 20 infections recorded in 20 Residential home residents. HCAI prevalence was 6.8% (20/293) and ranged from 0% to 19% (median 5.9%) [Figure 6]. Five Residential homes recorded no (0) infections. Seven (20.6%) residents with infection signs and symptoms were not receiving antimicrobials at the time of the survey.

Figure 6 Prevalence of HCAI in Participating Residential Homes



Summary Point: Nursing Homes

- 77 residents had 78 HCAIs
- The prevalence of HCAI was 3.3%
- HCAI prevalence in Nursing homes ranged from 0% to 15.4%
- 15 (27.3%) Nursing homes recorded 0 infections.

Summary Point: Residential Homes

- 20 residents had 20 HCAIs
- The prevalence of HCAI was 6.8%
- HCAI prevalence in Residential homes ranged from 0% to 19%
- 5 (33.3%) Residential homes recorded 0 infections.

2.4.2 Prevalence of HCAI and Resident Characteristics

The HCAI prevalence in both types of homes was compared by age and gender, as well as by care load indicator (incontinence, disorientation, impaired mobility); and risk factors (urinary catheter, surgery in last 30 days, pressure sores and other wounds) [Table 4].

Nursing Homes

Resident Characteristics

HCAI prevalence was 3.8% in male residents compared with 3.1% in female residents and 3.8% in those 85 years and under compared with 2.7% in the over 85s. Residents with HCAIs ranged in age from 38-101 years.

Care Load Indicators

HCAI prevalence was 3.8% in Nursing home residents with incontinence compared to 2.2% in those without and was with 3.7% in those with impaired mobility compared to 2.8% in those without. Prevalence of HCAI in those with disorientation (3.3%) was similar to those without (3.4%).

Risk Factors

HCAI prevalence was higher in Nursing home residents with a urinary catheter (11.6% with, compared to 2.9% without), recent surgery (28.6% with, compared to 3.2% without), pressure sores (7.9% with, compared to 3.1% without) and 'other wounds' (12.1% with, compared to 2.9% without). There were no residents with a HCAI that had a vascular catheter.

Table 4 Prevalence of HCAI in Nursing Homes

		2012	2017		
		HCAI Prevalence (%) (95%CI)	HCAI Prevalence (%) (95% CI)	Number of Residents (% Residents)	Number with HCAI (%)
Gender	Male	4.85% (3.12 – 7.45)	3.8% (2.7 – 5.4)	783 (33.7%)	30 (39.0%)
	Female	5.76% (4.38 – 7.53)	3.1% (2.3 – 4)	1538 (66.3%)	47 (61.0%)
Age	≤85	3.90% (2.67 – 5.65)	3.8% (2.9 – 5.0)	1288 (55.5%)	49 (63.6%)
	>85	6.42% (4.70 – 8.73)	2.7% (1.9 – 3.9)	1033 (44.5%)	28 (36.3%)
Incontinence	No	3.75% (2.39 – 5.85)	2.2% (1.3 – 3.6)	644 (27.7%)	14 (18.2%)
	Yes	6.55% (5.01 – 8.54)	3.8% (3 – 4.8)	1677 (72.3%)	63 (81.8%)
Disorientation	No	3.63% (2.33 – 5.59)	3.4% (2.4 – 4.8)	828 (35.7%)	28 (36.4%)
	Yes	6.54% (4.95 – 8.58)	3.3% (2.5 – 4.3)	1493 (64.3%)	49 (63.6%)
Impaired Mobility	No	3.92% (2.63 – 5.82)	2.8% (2 - 4)	1063 (45.8%)	30 (39.0%)
	Yes	6.85% (5.16 – 9.04)	3.7% (2.8 – 4.9)	1258 (54.2%)	47 (61.0%)
Urinary Catheter	No	4.94% (3.84 – 6.34)	2.9% (2.2 – 3.7)	2200 (94.8%)	63 (81.8%)
	Yes	13.51% (7.51 – 23.12)	11.6% (7 – 18.5)	121 (5.2%)	14 (18.2%)
Vascular Catheter	No	-	3.3% (2.7 – 4.1)	2315 (99.7%)	77 (100%)
	Yes	-	0% (0 39.0)	6 (0.3%)	0
Recent Surgery	No	5.27% (4.16 – 6.66)	3.2% (2.6 – 4)	2314 (99.7%)	75 (97.4%)
	Yes	30.00% (10.78 – 60.32)	28.6% (8.2 – 64.1)	7 (0.3%)	2 (2.6%)
Pressure Sores	No	4.50% (3.46 – 5.82)	3.1% (2.5 – 3.9)	2232 (96.2%)	70 (90.9%)
	Yes	30.95% (19.07 – 46.03)	7.9% (3.9 – 15.4)	89 (3.8%)	7 (9.1%)
Other wounds	No	4.34% (3.32 – 5.67)	2.9% (2.2 – 3.6)	2205 (95%)	63 (81.8%)
	Yes	21.74% (13.64 – 32.82)	12.1% (7.3 – 19.2)	116 (5.0%)	14 (18.2%)

Residential Homes

Resident Characteristics

HCAI prevalence was slightly higher in male residents (n=6/79; 7.6%) compared with female residents (n=14/214; 6.5%) and higher in those aged over 85 years (n=11/137; 8.0%) compared with 85 years and under (n=9/156; 5.8%). Residents with HCAIs ranged in age from 64-98 years.

Care Load Indicators

HCAI prevalence was the same for residents with incontinence (n=7/103; 6.8% compared to n=13/190; 6.8% without). The prevalence of HCAI was higher in those with impaired mobility (n=1/12; 8.3%) compared to those without (n=19/281; 6.8%) and in those with disorientation (n=13/157; 8.3%) was compared to those without (n=7/136; 5.1%).

Risk Factors

HCAI prevalence was higher in Residential home residents with a urinary catheter (n=2/10; 20.0% with, compared to n=18/283; 6.4% without), with recent surgery (n=1/8; 12.5% with, compared to n=19/285; 6.7% without), with pressure sores (n=1/3; 33.3% with, compared to n=19/290; 6.6% without) and with 'other wounds' (n=4/16; 25.0% with, compared to n=16/277; 5.8% without).

Table 5 Prevalence of HCAI in Residential Homes

		2017		
		Prevalence of HCAI (95% CI)	Number of Residents (% Residents)	Number with HCAI (%)
Gender	Male	7.6% (3.5-15.6)	79 (26.7%)	6 (30%)
	Female	6.5% (3.9-10.7)	214 (73.0%)	14 (70%)
Age	≤85	5.8% (3.1-10.6)	156 (53.2%)	9 (45%)
	>85	8.0% (4.5-13.8)	137 (46.8%)	11 (55%)
Incontinence	No	6.8% (4.0-11.4)	190 (64.8%)	13 (65%)
	Yes	6.8% (3.3-13.4)	103 (35.2%)	7 (35%)
Disorientation	No	5.1% (2.5-10.2)	136 (46.4%)	7 (35%)
	Yes	8.3% (4.9-13.7)	157 (53.6%)	13 (65%)
Impaired Mobility	No	6.8% (4.4-10.3)	281 (95.9%)	19 (95%)
	Yes	8.3% (1.5-35.4)	12 (4.1%)	1 (5%)
Urinary Catheter	No	6.4% (4.1-9.8)	283 (96.6%)	18 (90%)
	Yes	20% (5.7-51.0)	10 (3.4%)	2 (10%)
Vascular Catheter	No	6.8% (4.5–10.3)	293 (100%)	20 (100%)
	Yes	-	0 (0%)	0
Recent Surgery	No	6.7% (4.3-10.2)	285 (97.3%)	19 (95%)
	Yes	12.5% (2.2-47.1)	8 (2.7%)	1 (5%)
Pressure Sores	No	6.6% (4.2-10.0)	290 (99.0%)	19 (95%)
	Yes	33.3% (6.1-79.2)	3 (1.0%)	1 (5%)
Other Wounds	No	5.8% (3.6-9.2)	277 (94.5%)	16 (80%)
	Yes	25.0% (10.2-49.5)	16 (5.5%)	4 (20%)

Summary Point: Nursing Homes

Resident Characteristics:

- Higher prevalence in male residents (3.8% v 3.1%)
- Higher prevalence in those 85 years and under (3.8% v 2.7%)

Care Load Indicators:

- Higher prevalence in those with incontinence (3.8% v 2.2%)
- Higher prevalence in those with impaired mobility (3.7% v 2.8%)
- Similar prevalence in those with disorientation (3.4% v 3.3%)

Risk Factors:

- Higher prevalence in those with urinary catheters (11.6% v 2.9%)
- Zero prevalence in those with vascular catheters (0% v 3.3%)
- Higher prevalence in those with recent surgery (28.6% v 3.2%)
- Higher prevalence in those with pressure sores (7.9% v 3.1%)
- Higher prevalence in those with ‘other wounds’ (12.1% v 2.9%)

Summary Point: Residential Homes

Resident Characteristics:

- Higher prevalence in male residents (7.6% v 6.5%)
- Higher prevalence in those over 85s (8.0% v 5.8%)

Care Load Indicators:

- Same prevalence in those with incontinence (6.8% v 6.8%)
- Higher prevalence in those with impaired mobility (8.3% v 6.8%)
- Higher prevalence in those with disorientation (8.3% v 5.1%)

Risk Factors:

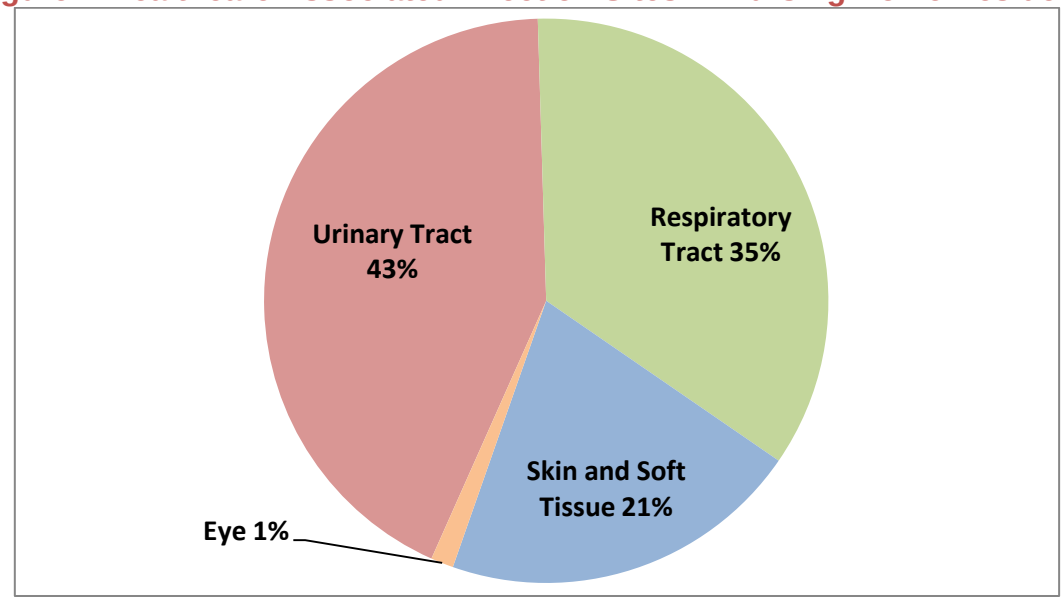
- Higher prevalence in those with urinary catheter (20% v 6.4%)
- No residents had a vascular catheter in place
- Higher prevalence in those with recent surgery (12.5% v 6.7%)
- Higher prevalence in those with pressure sores (33.3% v 6.6%)
- Higher prevalence in those with ‘other wounds’ (25.0% v 5.8%)

2.4.3 Distribution of Healthcare Associated Infections in LTCFs

Nursing Homes

Urinary tract infections (43%; n=34), respiratory tract infections (35.1%; n=27) and skin and soft tissue infections (20.8%; n=16) were the most commonly reported infections in Nursing homes. There was 1 (1.3%) reported case of eye infection [Figure 7].

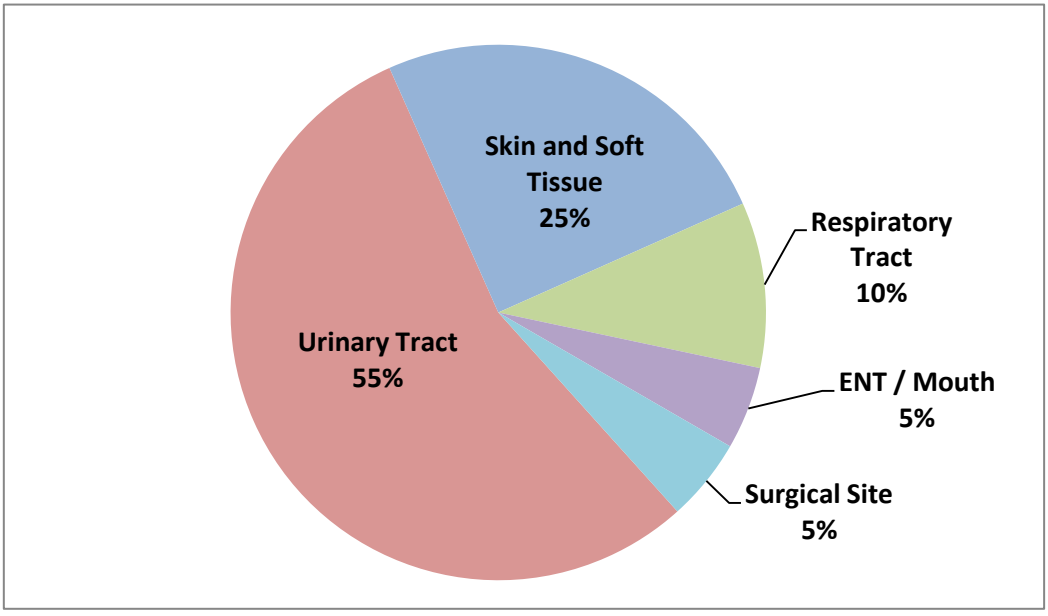
Figure 7 Healthcare Associated Infection Sites in Nursing Home Residents



Residential Homes

The most commonly reported infection sites and the order of frequency was similar for Residential homes when compared with Nursing homes [UTI (n=11; 55%), RTI (n=2; 10%) and SSTI (n=5; 25%)]. The other infection sites reported were a single oral infection (n=1; 5%) and a surgical site infection (n=1; 5%) [Figure 8].

Figure 8 Healthcare Associated Infection Sites in Residential Home Residents



Summary Point: Nursing Homes

Urinary tract infections (43%), respiratory tract infections (35%), and skin and soft tissue infections (21%) were the most commonly reported infection sites.

Summary Point: Residential Homes

Urinary tract infections (55%), skin and soft tissue infections (25%), and respiratory tract infections (10%) were the most commonly reported infection sites.

2.5 Antimicrobial Use

2.5.1 Prevalence of Antimicrobial Use

Nursing Homes

On the day of the survey, a total of 248 antimicrobials were prescribed. Five residents were in receipt of more than one antimicrobial resulting in a prevalence of antimicrobial use in Nursing homes of 10.5% [range 1.6 - 25% (median 10.7%)]. [Figure 9]

Residential Homes

On the day of the survey, a total of 27 antimicrobials were prescribed. There were no (0) residents in receipt of more than one antimicrobial resulting in a prevalence of 9.2%. There were two Residential homes where there were no (0) residents taking antimicrobials; antimicrobial use ranged from 0.0% to 33.3% (median 6.9%) [Figure 10].

Summary Point: Nursing Homes

- A total of 248 antimicrobials were prescribed
- The prevalence of antimicrobial use was 10.5%

Summary Point: Residential Homes

- A total of 27 antimicrobials were prescribed
- The prevalence of antimicrobial use was 9.2%

2.5.2 Purpose of Prescription and Target Infection Sites

Nursing Homes

Over half of the 248 prescriptions were given as prophylaxis (n=125; 50.4%) while 49.6% (n=123) were prescribed for therapeutic reasons [Table 6].

The main infection sites targeted were the urinary tract in 68.5% (n=170) of cases, followed by the respiratory tract (n=52; 21%) and then by skin and soft tissue (n=23; 9.3%) [Table 6].

Table 6 Number and Prevalence of Antimicrobials by Site and By Infection

Treated Site	2012		2017	
	Purpose of Treatment		Purpose of Treatment	
	Prophylaxis	Therapeutic	Prophylaxis (%)	Therapeutic (%)
Urinary Tract	65 (72.2%)	25 (27.8%)	118 (69.4)	52 (30.6%)
Respiratory Tract	4 (16.6%)	20 (83.3%)	5 (9.6%)	47 (90.4%)
Skin and Soft Tissue	1 (6.3%)	15 (93.8%)	1 (4.3%)	22 (95.7%)
Other		5 (100%)-	1 (33.3%)	2 (66.7%)
TOTAL	51.5 %	48.5%	125 (50.4%)	123 (49.6%)

Residential Homes

Over half of the 27 prescriptions were given therapeutically (n=15; 55.6%), while 44.4% (n=12) were prescribed as prophylaxis.

The main infection sites targeted were the urinary tract (n=19; 70.4%), followed by the skin and soft tissue infections (n=5; 18.5%) and then respiratory tract (n=3; 11.1%).

Summary Point: Nursing Homes

- 50.4% of all prescriptions were for prophylaxis.
- The most frequent target site for prescriptions mirrored the most common infection sites.

Summary Point: Residential Homes

- 44.4% of all prescriptions were for prophylaxis.
- The most frequent target site for prescriptions mirrored the most common infection sites.

2.5.3 Antimicrobial Prescribing

2.5.3.1 Prescriber Role and Prescribing Location

Nursing Homes

The majority of antimicrobials (n=236; 95.2%) given in Nursing homes were prescribed by a general practitioner (GP). Most of these were prescribed within the Nursing home (n=214; 86.2%). There were 22 prescriptions (8.9%) prescribed by the GP outside of the facility (actual location information is not recorded). Twelve residents (4.8%) were prescribed antimicrobials in hospital [Table 7].

Table 7 Prescriber Role and Location for Nursing Homes

Location and Role of Prescriber	2012	2017
	Number (%)	Number (%)
GP: ALL	131 (94.9%)	236 (95.2%)
GP: Nursing home	108 (78.3%)	214 (86.2%)
GP: Elsewhere	23 (16.7%)	22 (8.9%)
Other Doctor: In hospital	5 (3.6%)	12 (4.8%)
Unknown	2 (1.4%)	0

Residential Homes

The majority of antimicrobials (n=26; 96.3%) given in Residential homes were prescribed by a GP within the home (n=24; 88.9%) although there were 2 prescriptions (7.4%) prescribed by the GP outside of the facility (actual location information is not recorded). One resident's prescription (3.7%) was prescribed in hospital [Table 8].

Table 8 Prescriber Role and Location for Residential Homes

Location and Role of Prescriber	2012	2017
	Number (%)	Number (%)
GP: ALL	15 (71.4%)	26 (96.3%)
GP: Residential home	-	24 (88.9%)
GP: Elsewhere	-	2 (7.4%)
Other Doctor: In hospital	3 (14%)	1 (3.7%)
Another Medical Doctor	3 (14%)	-
Unknown	0	0

Summary Point: Nursing Homes

- 95.2% were prescribed by a GP
- 86.2% were prescribed in the Nursing Home

Summary Point: Residential Homes

- 96.3% were prescribed by a GP
- 88.9% were prescribed in the Residential Home

2.5.3.2 Route of Administration

Nursing Homes

All the antimicrobials prescribed were for oral administration (n=248; 100%).

Residential Homes

All the antimicrobials prescribed were for oral administration (n=27; 100%).

Summary Point: Nursing Homes

- 100% were administered orally

Summary Point: Residential Homes

- 100% were administered orally

2.5.3.3 Review or End Date for Antimicrobials

Nursing Homes

Participating Nursing homes were asked if antimicrobial prescriptions had a review or end date. Regardless of the purpose of the prescription, 48.4% (n=120) responded in the affirmative, whilst the remainder (51.6%; n=128) did not have an end or review date. The majority of therapeutic antimicrobials had an end/review date recorded (n=120; 97.6%) while none (0) of the prophylactic antimicrobials had this.

Residential Homes

There were end or review dates for 15 (55.6%) of the 27 prescriptions and no response for one. Twelve (80%) of the 15 therapeutic prescriptions had an end/review date; and one Residential home did not provide a response. Only a quarter (n=3) of the prophylaxis prescriptions written had end or review dates.

Summary Point: Nursing Homes

- 51.6% of all prescriptions did not have a review / end date
- 97.6% of therapeutic prescriptions had a review / end date recorded
- No prescriptions for prophylaxis had a review / end date recorded

Summary Point: Residential Homes

- 44.4% of all prescriptions did not have a review / end date
- 80% of therapeutic prescriptions had a review / end date recorded
- 25% of prescriptions for prophylaxis had a review / end date recorded

2.5.4 Selection of Antimicrobials and Microbiology Results

In the model employed in the UK, microbiology results are generally sent from the laboratory directly to GPs and are not routinely shared with LTCFs. Data was however, collected on laboratory testing and the outcomes of any tests performed.

Nursing Homes

Fifty five (70.5%) of the HCAIs did not have a laboratory test performed. Although 23 (29.5%) samples were submitted for testing, results for 17 (73.9%) were not available on the day of the survey. For the remainder, (n=6; 26.1%), results were available.

Residential Homes

Fifteen (75%) of the HCAIs did not have a laboratory test performed. For the remainder (n=5, 25%), samples were submitted for analysis. Four (20%) did not have results available on the day of the survey.

Summary Point: Nursing Homes

- 29.5% of HCAIs had samples sent for laboratory testing
- 5.1% of HCAIs had results available

Summary Point: Residential Homes

- 25% of HCAIs had samples sent for laboratory testing
- 5% of HCAIs had results available

2.5.5 Antimicrobials Prescribed

Antimicrobials were reported using the WHO Anatomical Therapeutic Chemical (ATC) classification system which classifies the active substances in a drug in a hierarchy with five different levels.

Nursing Homes

Antibacterials for systemic use (ATC J01) accounted for the majority of prescriptions (n=247, 99.2%) with only two (0.8%) prescriptions being for antiprotozoals (ATC P01). Drug preparations containing a combination of antimicrobials accounted for 18 prescriptions (7.3%); the majority of prescriptions were for single antimicrobial preparations.

The three most frequently prescribed classes of antimicrobials were the beta-lactams (n=65, 26.2%) followed by the trimethoprim and sulphonamide class (n=57, 22.9%), and then the cephalosporins (n=55, 22.2%) [Table 9].

Table 9 Classes of Antimicrobials Prescribed in Nursing Homes

Antimicrobial Class	ATC Code	Number (%)
Beta-Lactams	J01C	65 (26.2%)
Trimethoprim and Sulphonamide	JO1E	57 (22.9%)
Cephalosporins	J01D	55 (22.2%)
Nitrofuran derivatives	J01X	43 (17.3%)
Macrolides and Lincosamides	J01F	10 (4.0%)
Tetracyclines	J01A	9 (3.6%)
Quinolones	J01M	6 (2.4%)
Nitroimidazole derivatives	P01A	2 (0.8%)
Combination of Antimicrobials	J01R	1 (0.4%)

Residents in Nursing homes were prescribed a total of 17 different antimicrobial agents [Table 10]. The three most commonly prescribed antimicrobial agents were

trimethoprim (n=56, 22.6%), cefalexin (n=54, 21.8%) and nitrofurantoin (n=43, 17.3%).

Table 10 Individual Antimicrobials Prescribed in Nursing Homes

Individual Antimicrobials	2012	2017
	Frequency (%)	Frequency (%)
Trimethoprim	40 (29.0%)	56 (22.6%)
Cefalexin	12 (8.7%)	54 (21.8%)
Nitrofurantoin	30 (21.7%)	43 (17.3%)
Amoxicillin	15 (10.9%)	28 (11.3%)
Co-Amoxiclav	8 (5.8%)	16 (6.5%)
Flucloxacillin	9 (6.5%)	15 (6%)
Doxycycline	2 (1.4%)	9 (3.6%)
Ciprofloxacin	2 (1.4%)	6 (2.4%)
Other Penicillins	0 (-)	6 (2.4%)
Clarithromycin	6 (4.3%)	5 (2%)
Azithromycin	2 (1.4%)	3 (1.2%)
Metronidazole	1 (0.7%)	2 (0.8%)
Erythromycin	2 (1.4%)	1 (0.4%)
Fluconazole combination	1 (0.7%)	1 (0.4%)
Cefradine	1 (0.7%)	1 (0.4%)
Co-Trimoxazole	0 (-)	1 (0.4%)
Clindamycin	0 (-)	1 (0.4%)
Ceftriaxone (IV)	1 (0.7%)	0 (-)
Chloramphenicol	1 (0.7%)	0 (-)
Cubicin (IV)	1 (0.7%)	0 (-)
Unknown Agent	2 (1.4%)	0 (-)
Topical	2 (1.4%)	EXCLUDED
Total	138 (100%)	248 (100%)

Residential Homes

Antibacterials for systemic use (ATC J01) accounted for all the prescriptions (n=27, 100%). Drug preparations containing a combination of antimicrobials accounted for two prescriptions (7.4%); the majority of prescriptions were for single antimicrobials

The three most frequently prescribed antimicrobials classes were nitrofuran derivatives (n=10; 37.0%), beta-lactams (n=9; 33.3%) and cephalosporins (n=3; 11.1%) [Table 11].

Table 11 Classes of Antimicrobials Prescribed in Residential Homes

Antimicrobial Class	ATC Code	Number (%)
Nitrofuran derivatives	J01X	10.0 (37.0%)
Beta-Lactams	J01C	9.0 (33.3%)
Cephalosporins	J01D	3.0 (11.1%)
Trimethoprim and Sulfonamides	J01E	2.0 (7.4%)
Tetracyclines	J01A	2.0 (7.4%)
Macrolides and Lincosamides	J01F	1.0 (3.7%)

There were 9 different antimicrobial agents prescribed [Table 12]. The three most commonly prescribed agents were nitrofurantoin (n=10, 37.1%), flucloxacillin (n=4, 14.8%) and cefalexin (n=3, 11.1%).

Table 12 Individual Antimicrobials Prescribed in Residential Homes

Individual Antimicrobials	2012	2017
	Frequency (%)	Frequency (%)
Nitrofurantoin	5 (7.1%)	10 (37.1%)
Flucloxacillin	1 (1.4%)	4 (14.8%)
Cefalexin	3 (4.3%)	3 (11.1%)
Amoxicillin	2 (2.9%)	2 (7.4%)
Trimethoprim	7 (35.0%)	2 (7.4%)
Co-Amoxiclav	2 (2.9%)	2 (7.4%)
Doxycycline	0 (-)	2 (7.4%)
Azithromycin	0 (-)	1 (3.7%)
Other Penicillins	0 (-)	1 (3.7%)
Total	20 (100%)	27 (100%)

Summary Point: Nursing Homes

- 99.6% of prescriptions were antibacterials.
- The most frequently prescribed classes of antimicrobials were the beta-lactams (n=65, 26.2%) followed by the trimethoprim and sulphonamides class (n=57, 22.9%), and then the cephalosporins (n=55, 22.2%).
- The most commonly prescribed antimicrobial agents were trimethoprim (22.6%), cefalexin (21.8%) and nitrofurantoin (17.3%).

Summary Point: Residential Homes

- 100% of prescriptions were antibacterials.
- The most frequently prescribed antimicrobials classes were nitrofuran derivatives (n=10; 37.0%), beta-lactams (n=9; 33.3%) and cephalosporins (n=3; 11.1%).
- The most commonly prescribed agents were nitrofurantoin (37.1%), flucloxacillin (14.8%) and cefalexin (11.1%).

SECTION 3 COMMON HEALTHCARE ASSOCIATED INFECTIONS

This section presents an in-depth analysis of the most common healthcare associated infections and the most frequent antimicrobial prescriptions. For the 3 most common HCAIs, each section describes the rates and prevalence as they relate to resident characteristics, care load indicators and risk factors. Each HCAI is also broken down according to diagnostic certainty and microbiological results. Where samples were sent for laboratory culture, sensitivity testing was also performed including susceptibility to:

- Oxacillin (OXA), a marker for methicillin-resistance
- Glycopeptides (GLY)
- Third-generation cephalosporins (C3G)
- Carbapenems (CAR)

The AMU section describes the antimicrobial prescribing practice including the nature of the prescription (therapeutic vs prophylaxis) and adherence to the primary care prescribing guidance available at the time of the survey.

3.1 Urinary Tract

Urinary tract infections (UTIs) were the most commonly reported HCAIs in both Nursing and Residential homes. Unlike RTIs and SSTIs, UTIs were not divided into types of UTI. They were however, categorised according to certainty of diagnosis. The three groups were as follows:

1) Confirmed: residents with signs / symptoms and a positive urine culture.
2) Probable: residents with signs / symptoms and the urine culture was either not been performed, or the results were negative or unknown.
3) Imported: residents who had recently transferred to the LTCF and were still in receipt of treatment, but where no one had knowledge of the resident's signs/symptoms prior to transfer.

3.1.1 Urinary Tract Infections: Nursing Homes

On the day of the survey, 34 (43.5%) of the HCAI diagnoses were UTIs and the prevalence of UTIs was 1.5 (34/2321) per 100 eligible residents.

The majority of residents with a UTI were female (n=22; 64.7%). The prevalence of UTIs amongst female residents was 1.4% (22/1538) compared to 1.5% (12/783) amongst males.

The majority of residents with a UTI were aged 85 years or younger (n=22; 64.7%), a prevalence of 1.7% (22/1288). The prevalence of UTIs amongst older residents was 1.2% (12/1033).

The majority of residents with a UTI were incontinent (n=29; 85.3%); the prevalence of incontinence in those with UTIs was 1.7% (29/1677) compared to 0.8% (5/644) in those without. Those with UTIs that were disorientated accounted for 64.7% (n=22); the prevalence was 1.5% (22/1493) which was similar to those without at 1.4% (12/828). Half (n=17) of those with a UTI had impaired mobility; prevalence was 1.4% (17/1258) similar to those without at 1.6% (17/1063).

Urinary catheters were present in 11 (32.4%) of residents with an UTI (prevalence 9.1%; 11/121). One resident (2.9%) had undergone recent surgery (prevalence 14.3%; 1/7) and 3 residents (8.8%) had a pressure sore (prevalence 3.4%; 3/89). None of the residents with UTIs had a vascular catheter or 'other' wounds.

Out of 34 infections, 2 (5.9%) UTIs were confirmed with a positive urine culture. Two (5.9%) of the 34 infections were classed as imported while the remainder, (n=30; 88.2%) were classed as probable UTIs. The Nursing homes indicated that for 31 (91.2%) UTIs, there was no microbiological examination performed. For the remainder, there was 1 (2.9%) isolate that could not be identified by the lab and 2 (5.9%) positive urine cultures both isolated *Escherichia coli*. The sensitivity results for these isolates were reported as unknown.

Summary Point: Nursing Home

Resident Characteristics:

- UTIs were the most commonly reported HCAI (43.5%)
- UTI prevalence was 1.5%
- Similar in males and females (1.5% v 1.4%)
- Higher in those ≤85y v >85y (1.7% v 1.2%)

Care Load Indicators:

- Higher prevalence in those with Incontinence (1.7% v 0.8%)
- Similar prevalence in those with Disorientation (1.5% v 1.4%)
- Similar prevalence in those with Impaired Mobility (1.4% v 1.6%)

Risk Factors:

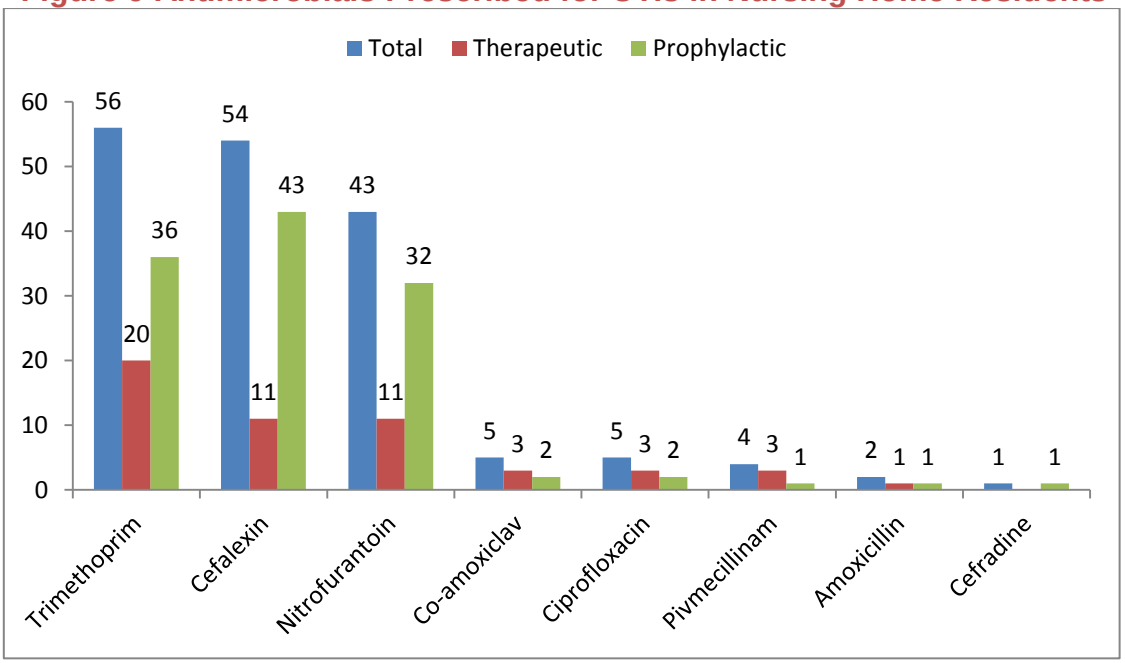
- Higher in those with Urinary Catheters (9.1% v 1.0%)
- Higher prevalence in those with Recent Surgery (14.3% v 1.4%)
- Higher prevalence in those with Pressure Sores (3.4% v 1.4%)
- None of the residents with UTIs had Vascular Catheters or 'Other Wounds'

3.1.2 Prescribing for Urinary Tract Infections in Nursing Homes

There were a total of 170 (68.5%) prescriptions for 8 different antimicrobials preparations [Figure 9]. Four residents with a UTI were in receipt of more than one antimicrobial prescription. Three medications accounted for 90% of all antimicrobials prescriptions for the treatment for UTI: trimethoprim (n=56, 32.9%), cefalexin (n=54; 31.8%) and nitrofurantoin (n=43; 25.3%).

The majority of UTI prescriptions were prescribed for prophylactic purposes (n=118; 69.4%) [Figure 9]. The prevalence of uroprophylaxis in Nursing homes was 5.1%. The rate for females was 6.2% compared with 2.9% for male residents.

Figure 9 Antimicrobials Prescribed for UTIs in Nursing Home Residents



The 2016 guidelines "Northern Ireland Management of Infection Guidelines for Primary and Community Care 2016" applied at the time of the survey. Taking into account this guidance, of the 52 therapeutic prescriptions, only 34 (65.4%) are for any of the 'first-line' antimicrobials in the antimicrobial guidance. Eighteen (34.6%) of the antimicrobials given therapeutically for UTIs were not prescribed in line with

this guidance; however, there was no evidence provided to indicate whether or not these antimicrobials (cefalexin, co-amoxiclav, ciprofloxacin, amoxicillin and cefradine) were prescribed on the basis of culture sensitivities.

Of the antimicrobials prescribed for uroprophlyaxis, 52 (44.1%) were in line with the recurrent UTI guidance at the time. It is unclear whether the other antimicrobials prescribed for prophylaxis (cefalexin, co-amoxiclav, ciprofloxacin, pivmecillinam, amoxicillin and cefradine) were based on culture results.

Summary Point: Nursing Home

- The majority (68.5%) of prescriptions were for UTIs.
- Trimethoprim (n=56, 32.9%), cefalexin (n=54; 31.8%) and nitrofurantoin (n=43; 25) were the most frequently prescribed antimicrobials.
- The majority (69.4%) of UTI prescriptions were for prophylaxis
- The prevalence of uroprophylaxis was 5.1%
- The prevalence of uroprophylaxis was higher in women (6.2% v 2.9%)
- 65.4% of therapeutic prescriptions were in line with guidelines
- 44.1% of uroprophylaxis prescriptions were in line with guidance.

3.1.3 Urinary Tract Infections: Residential Homes

On the day of the survey, 11 (55%) of the HCAI diagnoses were UTIs and the prevalence of UTIs was 3.8 per 100 eligible residents. The majority of residents with a UTI were female (n=7; 63.6%). The prevalence of UTIs amongst female residents was 3.3% compared to 8.9% (4/79) amongst males. Six residents with a UTI were aged over 85 years, and five residents were aged 85 years or younger giving a prevalence of 4.4% (6/137) and 3.2% (5/156) respectively.

Just under half (n=5; 45.5%) of those with a UTI were incontinent resulting in a prevalence of 4.9% (5/103). Of those residents with a UTI, the majority (n=7; 63.6%) were disorientated and the prevalence of disorientation was 4.5% (7/157). Fewer of those with UTIs had impaired mobility (n=1; 9.1%) resulting in a prevalence of incontinence amongst those with UTIs of 8.3% (1/12). Urinary catheters were present in 2 (18.2%) of residents with an UTI (prevalence 20.0%; 2/10). None of the residents with UTIs had a vascular catheter. One resident (9.1%) had undergone recent surgery (prevalence 12.5%; 1/8), 1 resident (9.1%) had a pressure sore (prevalence 33.3%; 1/3), and 2 (18.2%) had 'other' wounds (prevalence 12.5%; 1/16).

All the UTIs were classed as probable infections as no microbiology results were available.

Summary Point: Residential Home

Resident Characteristics

- UTI was the most commonly reported HCAI (55%)
- UTI prevalence was 3.8%
- Higher prevalence in female v male residents (8.9% v 3.3%)
- Higher in those >85y v ≤85y (4.4% v 3.2%)

Care Load Indicators:

- Higher prevalence in those with incontinence (4.9% v 3.2%)
- Higher prevalence in disorientation (4.5% v 2.9%)
- Higher prevalence in those impaired mobility (8.3% v 3.6%)

Risk Factors:

- Higher in those with urinary catheters (20% v 3.2%)
- Higher prevalence in those with recent surgery (12.5% v 3.5%)
- Higher prevalence in those with pressure sores (33.3% v 3.4%)
- Higher prevalence in those with 'other wounds' (12.5% v 3.2%)
- None of the residents with a UTI had a vascular catheter

3.1.4 Prescribing for Urinary Tract Infections in Residential Homes

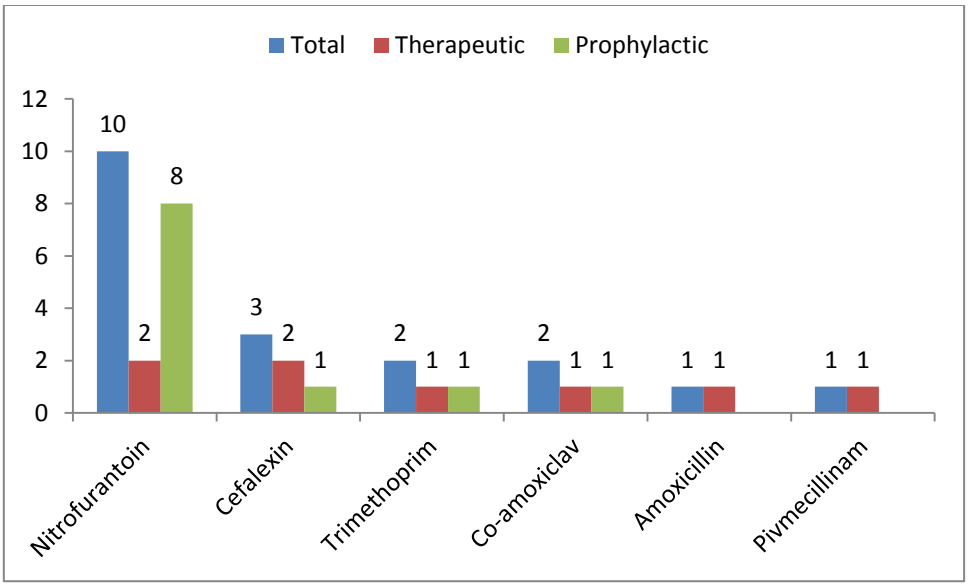
There were a total of 19 (70.4%) prescriptions for 6 different antimicrobials preparations [Figure 12]. No residents were in receipt of more than one antimicrobial prescription. The most frequently prescribed medication for UTI was nitrofurantoin which accounted for 52.6% (n=10) of all prescriptions for UTI.

Eleven (57.9%) prescriptions for UTI were prescribed for prophylaxis [Figure 10]. The prevalence of uroprophylaxis in the Residential homes was 3.8 per 100 residents (11/293). For female residents, the prevalence of uroprophylaxis was 4.7% (10/214) compared to 1.3% (1/79) of male residents. Nitrofurantoin accounted for 72.7% (n=8) of prescriptions for uroprophylaxis.

Of the antimicrobials prescribed for uroprophlyaxis, 8 (72.7%) were in line with the recurrent UTI guidance at the time. It is unclear on what bases the single prescription for nitrofurantoin as prophylaxis in a male resident was prescribed as there were no UTI prophylaxis guidelines for males at the time of the survey.

Of the 8 therapeutic prescriptions, four (50%) were for any of the antimicrobials features in the UTI antimicrobial guidance. Four (50%) of the antimicrobials given therapeutically for UTIs were not prescribed in line with this guidance. There was no information provided to indicate whether or not these antimicrobials (cefalexin, co-amoxiclav and amoxicillin) were prescribed on the basis of culture sensitivities.

Figure 10 Antimicrobials Prescribed for UTIs in Residential Home Residents



Summary Point: Residential Home

- The majority (70.3%) of prescriptions were for UTIs.
- Nitrofurantoin (n=10; 52.6%) was the most frequently prescribed antimicrobial.
- The majority (57.9%) of UTI prescriptions were for prophylaxis
- The prevalence of uroprophylaxis was 3.8%
- The prevalence of uroprophylaxis was higher in women (4.7% v 1.3%)
- 50% of therapeutic prescriptions were in line with guidance
- 72.7% of prophylaxis prescriptions were in line with guidance.

3.2 Respiratory Tract

Respiratory tract infections (RTIs) were the 2nd most commonly reported HCAI in Nursing homes and the 3rd most commonly reported HCAI in Residential homes.

There were four types of RTI: identified 1) influenza-like illness ('Flu'), 2) pneumonia, 3) other lower RTI and 4) common cold syndromes / pharyngitis. The latter category has been described for the purposes of this report as upper RTIs or URTIs.

Only 2 diagnostic categories of were used to describe RTIs, confirmed and imported. With the exception of pneumonia, confirmed RTI cases were based on clinical signs / symptoms only. Confirmation of pneumonia required clinical signs /symptoms and a positive chest X-ray. For all types of RTI, imported infections were those being treated on the day of the survey, but with no documentation of signs / symptoms.

3.2.1 Respiratory Tract Infections: Nursing Homes

On the day of the survey, 27 (34.6%) of the HCAI diagnoses were RTIs and the prevalence of RTIs was 1.2 per 100 eligible residents. Of the 27 RTIs diagnosed, LRTIs were the most common (n=24; 88.9%), followed by the URTIs (n=2; 7.4%). There was one (3.7%) reported case of pneumonia and no cases of 'Flu'.

The majority of residents with a RTI were female (n=17; 63%). The prevalence of RTIs amongst female residents was 1.1% compared to 1.3% amongst males.
The proportions of those with an RTI aged over 85 and 85 years and under, were similar at 13 (48.1%) and 14 (51.9%) respectively. The prevalence for over 85 was 1.3% and for 85 years and under was 1.1%.

The majority of residents with an RTI were incontinent (n=23; 85.2%) and the prevalence of incontinence in those with RTIs was 1.4% (23/1677). Those with RTIS that were disorientated accounted for 59.3% (n=16) resulting in a prevalence of 1.1% (16/1493). Impaired mobility was present in 77.8% (n=21) of residents with an RTI, a prevalence of 1.7% (21/1258) [Table 17].

Of the residents with an RTI, only 1 (3.7%) had a urinary catheter resulting in a prevalence of 0.8% (1/121). None of the residents with RTIs had a vascular catheter, recent surgery or a pressure sore. Three (11.1%) residents with an RTI had 'Other' wounds, a prevalence of 2.6% (3/116).

Of the 27 RTIS, there were 24 LRTI, all of which were classed as confirmed. The remaining 3 RTIs were classed as a confirmed pneumonia and 2 confirmed URTIs. There were no 'imported' or probable RTIs. The Nursing homes indicated that for 24 (88.9%) RTIs, no microbiological samples were sent. For the remainder (n=3; 11.1%), there was 1 (33.3%) isolate that could not be identified by the lab and 2 (66.7%) results that were not available.

Summary Point: Nursing Home

Resident Characteristics:

- RTI was the 2nd most commonly reported HCAI (34.6%)
- RTI prevalence was 1.2%
- Similar prevalence in Male and Female residents (1.1% v 1.3%)
- Similar prevalence in those over and under 85y (1.3% v 1.1%)
- LRTIs were the most common type of RTI (88.9%)

Care Load Indicators:

- Higher prevalence in those with Incontinence (1.4% v 0.6%)
- Similar prevalence in those with Disorientation (1.1% v 1.3%)
- Higher prevalence in those with Impaired Mobility (1.7% v 0.6%)

Risk Factors:

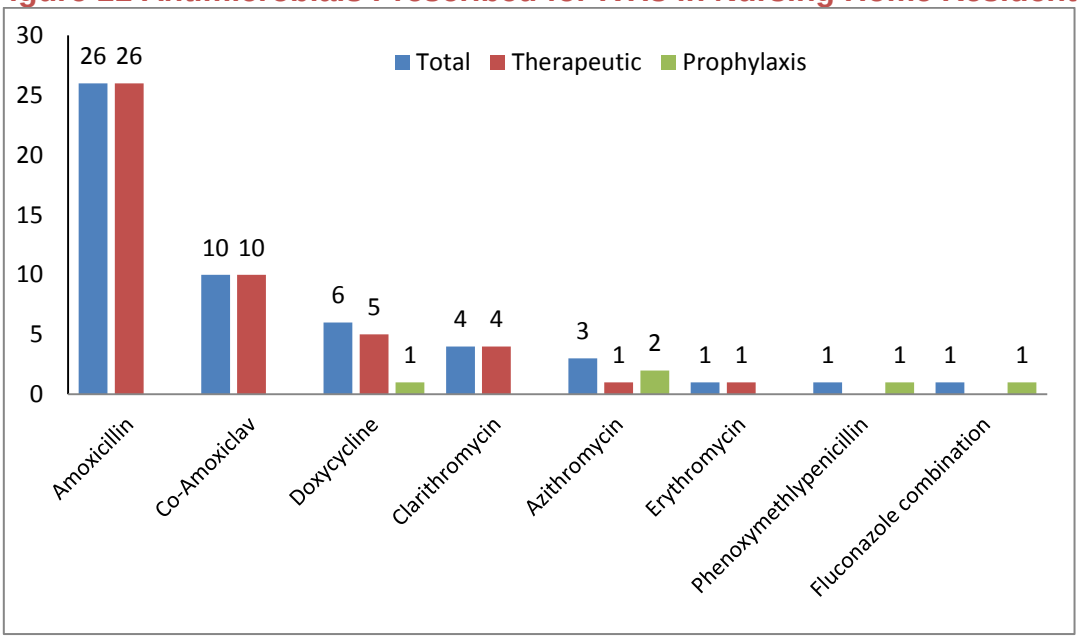
- Lower in those with Urinary Catheters (0.8% v 1.2 %)
- Higher prevalence in those with 'Other Wounds' (2.6% v 1.1%)
- None of the residents with UTIs had Vascular Catheters, Recent Surgery or Pressure Sores

3.2.2 Prescribing for Respiratory Tract Infections in Nursing Homes

There were a total of 52 (21.0%) prescriptions for 8 different antimicrobials. There were no residents in receipt of more than one antimicrobial. Amoxicillin accounted for half of all prescriptions (n=26; 50%).

The distribution of antimicrobials prescribed for treatment and prophylaxis of RTIs is shown in Figure 11; the majority of RTI prescriptions were prescribed for therapeutic purposes (n=47; 90.4%). Only 5 (9.6%) prescriptions were for prophylaxis.

Figure 11 Antimicrobials Prescribed for RTIs in Nursing Home Residents



The 2016 guidelines (Northern Ireland Management of Infection Guidelines for Primary and Community Care 2016) applied at the time of the survey, and differentiated between the treatment of URTIs, LRTIs and pneumonias.

Therapeutic recommendations for URTIs included phenoxymethylpenicillin as 'first-line' followed by clarithromycin. Both of the residents with URTIs were prescribed amoxicillin, which was not in line with guidance at the time.

For the 24 receiving treatment for LRTIs (non-pneumonic), the recommended first line antimicrobial was amoxicillin, followed by doxycycline and clarithromycin. The majority (n=17; 70.8%) of prescriptions were in line with guidance (amoxicillin n=10; doxycycline n=4; clarithromycin n=3). Seven (29.2%) prescriptions (1 for azithromycin and 6 for co-amoxiclav) were not in keeping with guidelines.

The guidelines for the treatment of pneumonia apply specifically to community acquired pneumonia and the severity of the condition dictates the choice of antimicrobial. For those being treated for pneumonia and remaining 'at home' i.e. within the care facility, the first line choice was amoxicillin, followed by clarithromycin, and doxycycline. The single prescription for pneumonia was for co-amoxiclav which was not in line with primary care guidance but was initiated in hospital.

Of the remaining (n=20; 42.5%) therapeutic antimicrobials prescribed (amoxicillin n=14; doxycycline n=1; co-amoxiclav n=3; clarithromycin n=1) all bar erythromycin (n=1; 2.1%) featured in the 2016 guidelines for the treatment of RTIs. However, there was no clear indication as to the type of RTI they were being used to treat, making adherence difficult to assess. Of the 52 therapeutic prescriptions, 36 (69.2%) potentially met with RTI guidance. There is no indication, including no culture results, as to why this medication was selected.

There was no common choice of respiratory tract prophylaxis antimicrobial. Azithromycin was prescribed twice, doxycycline, phenoxymethylcillin and a drug preparation containing azithromycin, secnidazole and fluconazole were each prescribed once. The guidelines gave no recommendations for prophylaxis in respiratory tract infections.

Summary Point: Nursing Home

- The 2nd (21.0%) most common reason for prescriptions were RTIs.
- Amoxicillin accounted for 50% of prescriptions.
- 90.4% of RTI prescriptions were therapeutic
- 69.2% of therapeutic prescriptions were in line with guidance
- 9.6% of RTI prescriptions were prophylactic in nature
- There were no primary care guidelines for prophylaxis at the time of the survey.

3.2.3 Respiratory Tract Infections: Residential Homes

On the day of the survey, 2 (10%) of the HCAI diagnoses were RTIs and the prevalence of RTIs was 0.7 per 100 eligible residents. The two RTIs diagnosed were both classified as confirmed LRTI.

Both residents with an RTI were female (n=2). The prevalence of RTIs amongst female residents was 0.9% (2/214). Residents with a RTI were both over 85 years old (prevalence 1.5%; 2/137).

Both residents with an RTI were classified as disorientated (prevalence 1.3%; 1/157) and one was incontinent (1.0%; 1/103). Neither had impaired mobility.

None of the residents with RTIs had any Risk Factors for HCAI.

None of the RTIs had samples sent for laboratory testing.

Summary Point: Residential Home

HCAI prevalence was:

- RTI were the third most common HCAIs (10%)
- RTI prevalence was 0.7%
- Higher prevalence in Female residents (0.9% v 0%)
- Higher in those over 85years (1.5% v 0%)

Care Load Indicators:

- Higher prevalence in those with Incontinence (1.0% v 0.5%)
- Higher prevalence in Disorientation (1.3% v 0%)
- None of the residents with RTIs had impaired mobility.

Risk Factors:

- None of the residents with RTIs had any Risk Factors for HCAI.

3.2.4 Prescribing for Respiratory Tract Infections in Residential Homes

There were a total of 3 (11.1%) prescriptions for 3 different antimicrobials preparations [Figure 12]. No residents were in receipt of more than one antimicrobial prescription. Two of the antimicrobials prescribed (amoxicillin and doxycycline) were prescribed for therapeutic purposes. Azithromycin (n=1) was prescribed prophylactically.

There were 2 LRTIs (non-pneumonic) recorded, only 1 of which was in receipt of an antimicrobial, the first line recommendation, amoxicillin. Although the prescription for the other therapeutic prescription of doxycycline gave no indication as to the type of RTI being treated, therefore it is difficult to assess whether or not this prescriptions was in line with.

There were no primary care guidelines regarding prophylaxis for RTIs, so it is unclear on what basis the single prescription of azithromycin was made.

Summary Point: Residential Home

- The 3rd (11.1%) most common reason for prescription was RTIs.
- Two out of 3 prescriptions were therapeutic
- 1 out of 3 prescriptions was prophylaxis
- Adherence to guidelines could not be assessed

3.3 Skin and Soft Tissue

Skin and soft tissue infections (SSTIs) were the 3rd most commonly reported HCAIs in Nursing homes and the 2nd most commonly reported HCAIs in Residential homes.

There were 4 categories of SSTIs: 1) cellulitis/soft tissue/wound infection, 2) scabies, 3) herpes simplex or herpes zoster infection and 4) fungal infection.

Only 2 categories of diagnostic certainty were used to describe SSTIs, confirmed and imported. For each of the different types of SSTI, with the exception of cellulitis/soft tissue/ wound infections, confirmed cases were based on the presence of relevant signs and symptoms and a physician diagnosis or laboratory confirmation. Diagnosis of cellulitis/soft tissue/ wound infections was based on either clinical signs and /or symptoms only. For all types of SSTIs, imported infections were those being treated on the day of the survey, but with no documentation of signs / symptoms.

3.3.1 Skin and Soft Tissue Infections: Nursing Homes

On the day of the survey, there were 16 Nursing home residents with SSTIs (20.5%). The prevalence of SSTIs was 0.7 per 100 eligible residents. Only one type of SSTI was identified, namely cellulitis / skin / wound infections.

There were equal numbers of male and female residents with a SSTI (n=8; 50%). The prevalence of SSTIs amongst female residents was 0.5% compared to 1.0% amongst males. The majority of residents with an SSTI were aged 85 years or less (n=13; 81.3%). The prevalence of SSTIs amongst older residents was 0.3% compared to 1.0% for those aged 85 years or less.

The majority of residents with an SSTI were incontinent (n=12; 75%) and the prevalence of incontinence in those with SSTIs was 0.7% (12/1677). Those with SSTIS that were disorientated accounted for 68.8% (n=11) resulting in a prevalence of 0.7% (11/1493). Impaired mobility was present in 62.5%% (n=10) of residents with an SSTI, prevalence of 0.8% (10/1258).

Urinary catheters were present in 12.5% (n=2) of residents with an SSTI a prevalence of 1.7% (2/121). None of the residents with SSTIs had a vascular catheter. One resident (6.3%) had undergone recent surgery (prevalence 14.3%; 1/7), 4 residents (25%) had a pressure sore (prevalence 4.5%; 4/89), and 11 (68.8%) had ‘other’ wounds (prevalence 9.5%; 11/116).

Although the majority (93.8%; n=15) of infections were confirmed, 1 (6.3%) infection was an imported infection. The single imported infection and 9 of the confirmed infections did not have sampling performed (n=10; 62.5%). For the remainder, 6 (37.5%) were sent for examination but the results were unavailable for 4 (66.7%). Two (33.3%) samples for which results were available, both contained *S. aureus.* One isolate was resistant to oxacillin, a marker of methicillin-resistance, while the other sensitivities for both isolates were unknown.

Summary Point: Nursing Home

HCAI prevalence was:

- SSTI was the 3rd most commonly reported HCAI (20.5%)
- SSTI prevalence was 0.7%
- The only type of SSTI was cellulitis / skin / wound infections
- Higher prevalence in male residents (1.0% v 0.5%)
- Higher prevalence in those 85 years and under (1.0% v 0.3%)

Care Load Indicators:

- Similar prevalence in those with Incontinence (0.7% v 0.6%)
- Similar prevalence in those with Disorientation (0.7% v 0.6%)
- Similar prevalence in those with Impaired Mobility (0.8% v 0.6%)

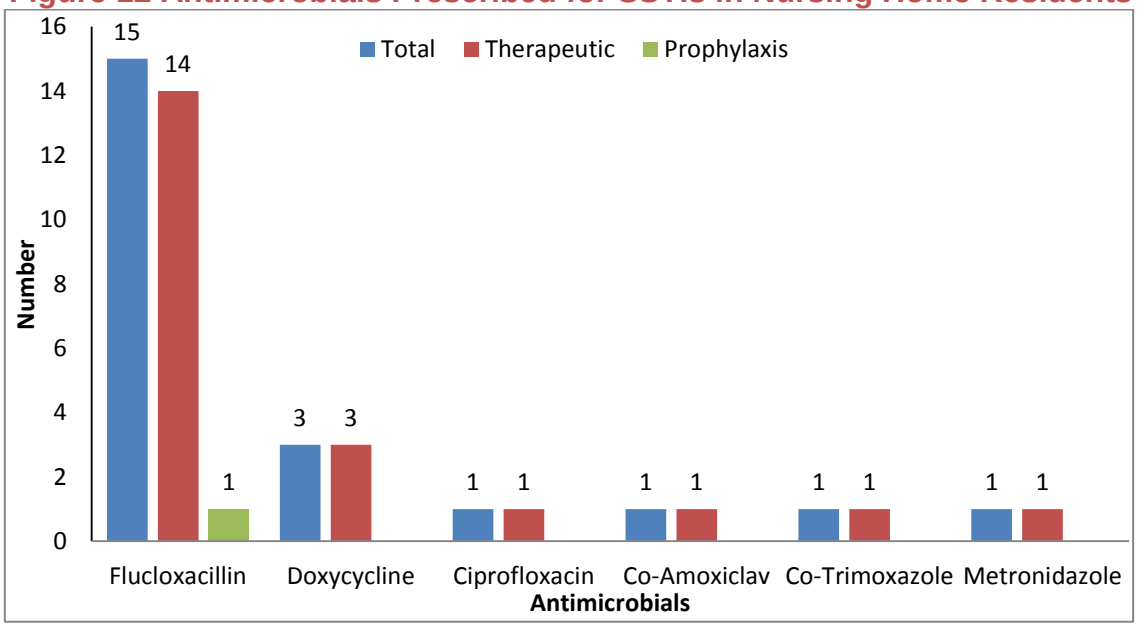
Risk Factors:

- Higher in those with urinary catheters (1.7% v 0.6%)
- Higher prevalence in those with recent surgery (14.3% v 0.6%)
- Higher prevalence in those with pressure sores (4.5% v 0.5%)
- Higher prevalence in those with 'other wounds' (9.5% v 0.2%)
- None of the residents with SSTIs had vascular catheters

3.3.2 Prescribing: for Skin and Soft Tissue Nursing Homes

There were a total of 23 (9.3%) prescriptions for 7 different antimicrobial preparations. There was 1 resident in receipt of more than one prescription. Flucloxacillin accounted for most of these prescriptions (n=15; 65.2%). The majority (n=22; 95.7%) of prescriptions were therapeutic in nature, with only one (4.3%), for flucloxacillin, being made for prophylactic purposes. The distribution of antimicrobials prescribed for SSTIs is shown in Figure 12.

Figure 12 Antimicrobials Prescribed for SSTIs in Nursing Home Residents



The therapeutic guidelines in use at the time of the survey, state that for cellulitis the first line antimicrobial of choice is flucloxacillin, with second line being clarithromyicin. Where there is a risk of MRSA, the first line antimicrobial is doxycycline. The majority (74.0%; n=17) of prescriptions included antimicrobials listed in guidance.

The use of ciprofloxacin, clindamycin, co-amoxiclav, co-trimoxazole and metronidazole are not consistent with the 2016 guidelines and there was no indication given as to whether these therapeutic prescriptions were made on the basis of culture results or sensitivities or on the advice of a specialist.

There were no recommendations for primary care prescribers regarding prophylaxis in the 2016 guidelines and no information was provided regarding the reason for the prescription of flucloxacillin, although it was prescribed within the facility and by a GP.

Summary Point: Nursing Home

- The 3rd (9.3%) most common reason for prescription was SSTI.
- Flucloxacillin accounted for 65.2% of prescriptions.
- The majority (95.7%) of SSTI prescriptions were therapeutic
- 74% of therapeutic prescriptions were in line with guidance
- Adherence to prophylaxis guidance could not be assessed

3.3.3 Skin and Soft Tissue Infections: Residential Homes

On the day of the survey, there were 5 Residential home residents with SSTI (25%). The prevalence of SSTIs was 1.7 per 100 eligible residents.

Four of the 5 residents with an SSTI were female. The prevalence of SSTI amongst female residents was 1.9% compared to 1.3% amongst male residents. Three residents with an SSTI were 85 years or less. The prevalence of SSTIs amongst the over 85s was 1.5% compared with 1.9% for those aged 85 years or less.

None of the 5 residents with SSTIs had impaired mobility while 1 was noted to be incontinent (prevalence 1.0%; 1/103) and 3 were disorientated (prevalence 1.9%; 3/157).

None of the residents with SSTIs had urinary catheters, vascular catheters, recent surgery, pressure sores and 'other' wounds. A single (20%) resident with an 'Other' Wound had an SSTI, a prevalence of 6.3% (1/16).

Four (80%) of the 5 SSTIs were cellulitis / skin / wound infections and 1 (20%) was a Herpes simplex or herpes zoster infection. The majority (60%; n=3) of infections were confirmed infections, while 2 (40%) including the single herpetic infection were classed as imported. With the exception of the imported non-herpetic infection, there was no laboratory sampling performed (n=4; 80%). *S. aureus,* isolated from the single (20%) sample sent, was sensitive to oxacillin; the other sensitivity was unknown.

Summary Point: Residential Home

Resident Characteristics:

- SSTI was the 2nd most commonly reported HCAI (25%)
- SSTI prevalence was 1.7%
- Higher prevalence in Female residents (1.9% v 1.3%)
- Higher prevalence in those 85 years and under (1.9% v 1.5%)
- The majority (80%) of SSTIs were cellulitis / skin / wound infections

Care Load Indicators:

- Lower prevalence in those with Incontinence (1.0% v 2.1%)
- Higher prevalence in those with Disorientation (1.9% v 1.5%)
- None of the residents with SSTIs had Impaired Mobility (0% v 1.8%)

Risk Factors:

- Higher prevalence in those with 'Other Wounds' (6.3% v 1.4%)
- None of the residents with SSTIs had Urinary Catheters, Vascular Catheters, Recent Surgery, Pressure Sores and 'Other' Wounds.

3.3.4 Prescribing for Skin and Soft Tissue Infections in Residential Homes

There were a total of 5 (18.5%) prescriptions for 2 different antimicrobials preparations. There were no residents in receipt of more than one prescription. Flucloxacillin accounted for the majority (n=4; 80%) of these prescriptions. All 5 prescriptions were for therapeutic purposes.

Both cellulitis/skin/wound and herpetic infections were identified. The guidelines for cellulitis are the same as those described above in section 3.3.2. All 5 antimicrobials (4 for flucloxacillin, 1 for doxycycline) appear to be in keeping with guidelines.

The single patient diagnosed with a herpetic infection was not recorded as being in receipt of an antimicrobial as antivirals were excluded from the survey.

Although there were no prescriptions for prophylaxis in Residential homes, it should be noted that there are no primary care guidelines for prophylaxis of SSTIs.

Summary Point: Residential Homes

- The second (18.5%) most common reason for antimicrobial prescription
- Flucloxacillin accounted for 80% of prescriptions.
- 100% of prescriptions were therapeutic
- 100% of therapeutic prescriptions were in line with relevant guidance

SECTION 4 FACILITY COORDINATION

In addition to collecting individual level data on the healthcare associated infection and antimicrobial use, the survey collected specific information at an institutional level. This information related to medical care and coordination, infection control practice, and antimicrobial policy.

4.1 Medical Care and Coordination

This section sought to identify those responsible for the provision of medical care including antimicrobial prescribing, the nature of medical activity coordination and the accessibility of the medical / clinical records of LTCF residents. As the model of care and coordination differs across the UK and Europe, this information could provide valuable insight into the impact of the model applied on the provision of care including antimicrobial prescribing.

Nursing Homes

All (100%) of the 55 Nursing homes surveyed, indicated that medical resident care was provided by the patient's own personal GP or a group practice.

When questioned about whether medical activities in the facility were coordinated by a coordinating medical physician, 21.8% (n=12) indicated that there was no coordination of medical activity, either internally or externally. The remainder (n=43; 78.2%) of the Nursing homes indicated that there was a physician from outside the facility that coordinated medical activities.

The majority of Nursing homes (85.5%; n=47) stated that the medical / clinical records of all the residents in the facility could be consulted by the physician in charge of medical coordination of a facility. In contrast, only 14 (25.5%) of Nursing homes indicated that these records could be accessed by nursing staff.

Residential Homes

All (100%) of Trust controlled Residential homes, medical resident care was provided by the patient's own personal GP or a group practice.

External coordination of medical activities occurred in 46.7% (n=7), while no coordination was noted in 53.8% (n=8) of Residential homes. In 12 (80%) of the 15 Residential homes, medical records were accessible by the coordinating external medical physician. Compared to Nursing homes, a higher proportion (46.7%, n=7) of records were accessible by nursing staff.

4.2 Infection Prevention & Control Practice

Infection prevention and control (IPC) policy is defined as a coherent series of precautions and actions to avoid infections and transmission of pathogens within a population. This section looks at the aspects of IPC policy present in or available to the LTCF including IPC expertise, and access to IPC advice.

Nursing Homes

The majority (94.5%; n=52) of Nursing homes reported that there were persons with training in IPC available to the staff of the facility. Of those with access to an IPC trained person, 48 (92.3%) indicated that the relevant person was a nurse, while for four (7.7%), there was access to both a nurse and a doctor. In the majority of facilities, the available person was located outside of the facility (n=26; 50%). The

remainder were located within the facility (n=20; 38.5%), or both internally and externally (n=6; 11.5%).

Residential Homes

All 15 (100%) Residential homes had access to a person with training in IPC available to the staff of the facility. In 10 of these, there was access to both a doctor and a nurse with relevant training, whilst in n=5, the relevant person was a nurse. The trained personnel were located externally in the majority of homes (n=13; 86.7%), while in two homes (13.3%) there was access to both internal and external expertise.

4.3 Infection Prevention and Control Committee

Other important aspects of IPC policy surveyed were the presence of an IPC committee and the formal access to help and expertise from an external IPC team. An IPC committee was defined in the protocol as a multidisciplinary committee consisting of at least the person with training in IPC (IPC practitioner), as well as an administrator, a coordinating physician and other potential team members. This team could be based within the LTCF (internal) or sit outside the LTCF (external). Where present, the regularity of meetings of IPC committees was also surveyed.

Nursing Homes

There were no infection control committees (internal or external) in any of the Nursing homes and as a consequence, there were no committee meetings.

However, 98.2% (n=54) reported that they could ask for help and expertise from an external infection control team on a formal basis.

Residential Homes

Nine (60%) of Residential homes reported the presence of an infection control committee (internal or external). Of those with a committee, meetings ranged in frequency from three per year (n=6; 66.7%), to six per year (n=2; 22.2%), to a maximum of nine per year ((n=1; 11.1%).

All of the Residential homes reported that they could ask for help and expertise from an external infection control team on a formal basis.

4.4 Written Protocols

During the survey the availability of 5 written IPC protocols was explored.

Nursing Homes

Over 94% of Nursing homes had written protocols on hand hygiene (98.2%), and on the management of MRSA and/or other MDRO (94.5%), enteral feeding (94.5%) and urinary catheters (94.5%). Protocols on the management of vascular catheters were only available in 47.3% (n=26) of Nursing homes.

Residential Homes

All 15 (100%), Residential homes reported the availability of written protocols for management of MRSA and/or other MDROs, as well as for hand hygiene. Fourteen out of 15 (93.3%) had written guidelines on the management of urinary catheters; two (13.3%) reported protocols for the management of venous catheters / lines and one (6.7%) had this for the management of enteral feeding.

4.5 Surveillance

The survey asked if the LTCF had a programme of surveillance e.g. annual report, in place for healthcare-associated infections.

Nursing Homes

Twenty (36.4%) of Nursing homes reported that they had a surveillance programme of HCAI in their facility.

Residential Homes

Only two (13.3%) reported the presence of an HCAI surveillance programme.

4.6 Hand Hygiene

Good hand hygiene is a central principle of IPC [7]. Numerous aspects of policy and practice were surveyed including the existence of a written protocol, staff education and training and hand hygiene practice and products used within the facility.

Nursing Homes

A written protocol on hand hygiene was present in 98.2% of Nursing homes (n=54).

A hand hygiene training session for care professionals had been organised in the preceding year in 50 of the 55 Nursing homes surveyed (90.9%).

Of the list of products for hand hygiene provided, all Nursing homes reported the use of alcohol rub solution, and liquid soap (antiseptic/other). Alcohol wipes were used in 43 (78.2%) of Nursing homes and bar soap was used in clinical areas in only one home (1.8%).

The most frequently used hand hygiene method for unsoiled hands was hand washing with water and non-antiseptic soap (n=20; 36.4%), followed by hand washing water with antiseptic soap (n=19; 34.5%) and finally hand disinfection with an alcohol rub (n=16; 29.1%).

The total volume of alcohol hand rub used for hand hygiene ranged from 10 – 600 litres per year. The volume of alcohol rub per resident ranged from 0.73 to 46.97mls per year.

The number of hand hygiene opportunities that were observed in the preceding year ranged from 0 – 480.

Residential Homes

All Residential homes reported that they had a written hand hygiene protocol in their facility.

A hand hygiene training session for care professionals had been organised in the preceding year in 14 of the 15 Residential homes surveyed (93.3%).

Of the list of products for hand hygiene provided, all Residential homes reported the use of alcohol rub solution, and liquid soap (antiseptic/other). Alcohol wipes were used in no (0%) of the Residential and no Residential homes reported the use of bar soap clinical areas.

In Residential homes, the most frequently used hand hygiene method for unsoiled hands was hand washing with water and non-antiseptic soap (n=11; 73.3%), followed by hand disinfection with an alcohol rub (n=16; 29.1%). No Residential homes reported the use of handwashing with an antiseptic soap as a frequently used hand hygiene method.

The total volume of alcohol hand rub used for hand hygiene ranged from 4 – 192 litres per year. The volume of alcohol rub per resident ranged from 0.32 to 20.95mls per year. The number of hand hygiene opportunities that were observed in the preceding year ranged from 0 – 1092.

4.7 Antimicrobial Stewardship Resources

There are ten elements that are considered to be good practice in terms of antimicrobial stewardship. These include:

- an antimicrobial committee,
- annual regular training on appropriate antimicrobial prescribing,
- written guidelines for appropriate antimicrobial use (good practice) in the facility
- data available on annual antimicrobial consumption by antimicrobial class
- a system to remind healthcare workers of the importance of microbiological samples to inform the best antimicrobial choice
- local / regional / national antimicrobial resistance profile summaries available in the LTCF or in the local GP surgeries
- a system that requires permission from a designated person(s) for prescribing restricted antimicrobials, not included in local formulary
- advice from a pharmacist for antimicrobials not included in the formulary
- a therapeutic formulary, comprising a list of antibiotics
- feedback to the local GP on antimicrobial consumption in the facility

In addition, facilities were asked to provide further information on their system for antimicrobial restriction; namely if there was 'restrictive list' of antimicrobials and which antimicrobials were included on it. For the purposes of the survey, this restrictive list included carbapenems, third generation cephalosporins, fluoroquinolones, vancomycin, mupirocin, glycopeptides, broad spectrum antibiotics and intravenously administered antibiotics.

Nursing Homes

Of the 55 Nursing homes, ten (18.2%) indicated that all of these elements were not present. The most frequently present element was the presence of a system to remind healthcare workers of the importance of microbiological samples to inform antimicrobial choice (n=35; 63.6%). Written guidelines for appropriate antimicrobial (good practice) (n=16, 29.1%), a therapeutic formulary consisting of a list of antibiotics (n=14; 25.5%) and advice from a pharmacist for antimicrobials not included in the formulary (n=12; 21.8%), were the next most common elements. The following elements occurred less frequently:

- Data available on annual antimicrobial consumption by antimicrobial class (n=3; 5.5%)
- Annual regular training on appropriate antimicrobial prescribing (n=2; 3.6%)
- Local antimicrobial resistance profile summaries available in the LTCF or in the local GP surgeries (n=2; 3.6%)
- A system that requires permission from a designated person(s) for prescribing of restricted antimicrobial, not included in local formulary (n=2; 3.6%)
- An antimicrobial committee (n=1; 1.8%)
- Feedback to the local GP on antimicrobial consumption in the facility (n=1; 1.8%)

Two (3.6%) Nursing homes reported that they used a 'restrictive list' for prescribed antimicrobials. Their restrictive list was only for the intravenous (IV) administration of antibiotics. There were no restrictions placed on the prescription on any specific antibiotics, antibiotic families or classes as listed in the questionnaire in any of the homes.

Residential Homes

Two (13.3%) reported that they had none of the ten good practice elements of antimicrobial stewardship. Thirteen Residential homes (86.7%) indicated that the most frequently present element was the presence of a system to remind healthcare workers of the importance of microbiological samples to inform antimicrobial choice. Advice available from a pharmacist for antimicrobials not included in the formulary (n=5; 33.3%) and written guidelines for appropriate antimicrobial (good practice) (n=4, 26.9%) were the next most common elements.

The following elements occurred in only one Residential home (6.7%):

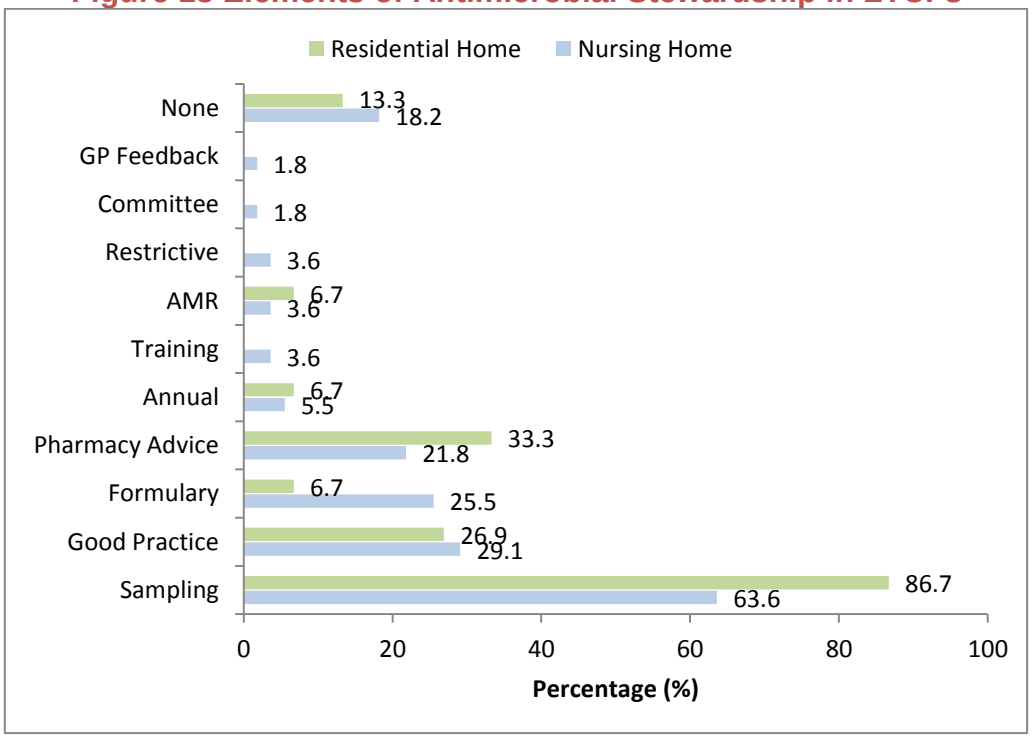
- Data available on annual antimicrobial consumption by antimicrobial class
- Local antimicrobial resistance profile summaries available in the LTCF or in the local GP surgeries
- A therapeutic formulary, comprising a list of antibiotics.

These elements occurred in none of the homes:

- An antimicrobial committee
- Annual regular training on appropriate antimicrobial prescribing
- A system that requires permission from a designated person(s) for prescribing of restricted antimicrobial, not included in local formulary
- Feedback to the local GP on antimicrobial consumption in the facility.

None of the Residential homes reported a 'restrictive list' for the prescription of antimicrobials.

Figure 13 Elements of Antimicrobial Stewardship in LTCFs



4.8 Infection Control and Antimicrobial Stewardship Resources

An important aim of the HALT survey was to develop a tool for measuring available resources for the prevention and control of infections and to assess the appropriate use of antimicrobials in LTCFs. This scoring system provides an overview of the current status of and the trends over time in IPC and AMS practice and policy in LTCFs in Northern Ireland. There is also some scope for comparison of current facilities.

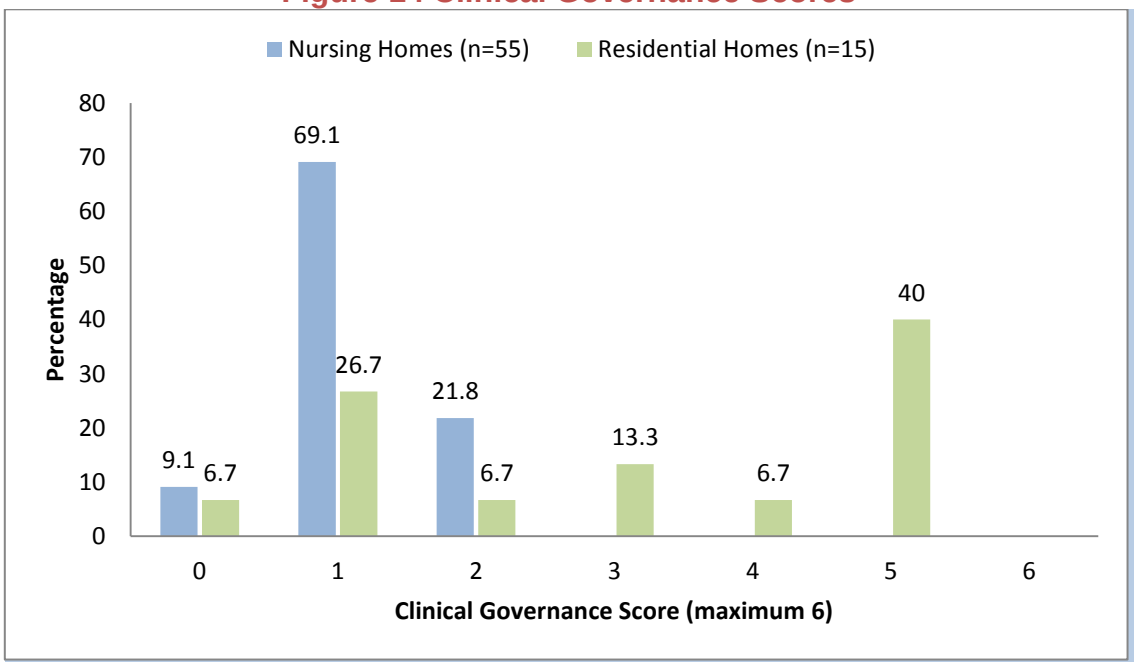
Based on questions in the institutional questionnaire elements were grouped into 7 categories [Appendix 3]. The categories of performance indicators, the elements that make up these categories and the score per answer are shown below.

4.8.1 Clinical Governance

This included organisational factors concerning infection control resources, AM policy and resident care in the facility. The maximum score possible was 6 points.

Participating Nursing homes had a mean score of 1.1 (median 1.0) compared with the Residential homes mean of 3.1 (median 3.0).

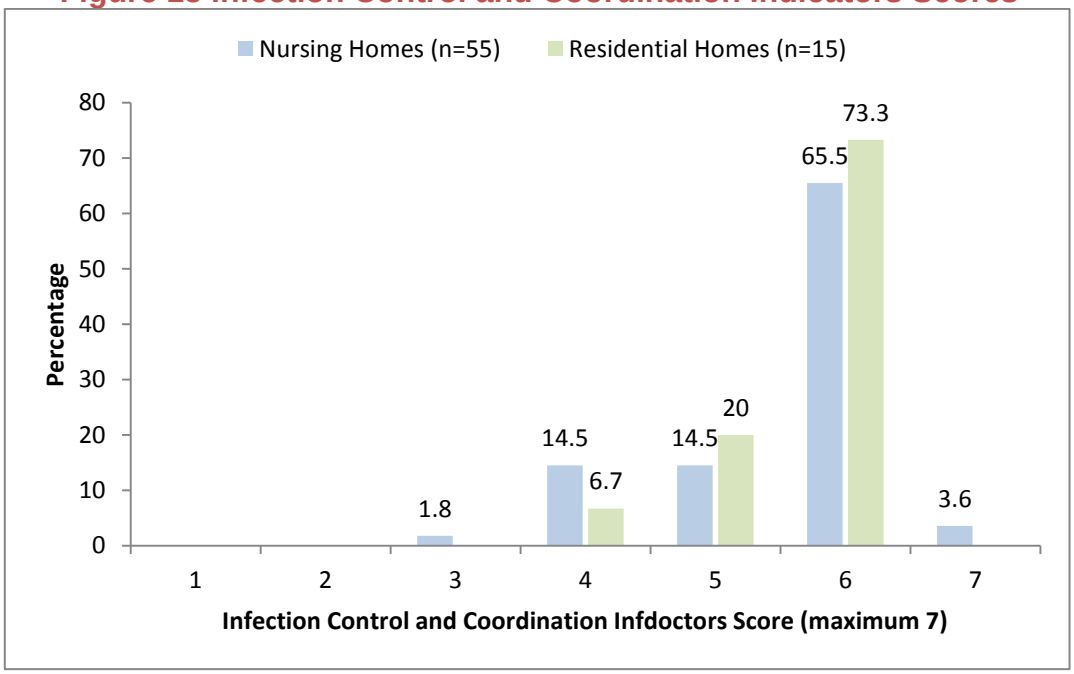
Figure 14 Clinical Governance Scores



4.8.2 Infection Control and Coordination Indicators

Infection control indicators concerned activities and efforts to prevent infections and the spread of resistant pathogens.The maximum possible score was 7. The Nursing homes mean score was 5.5, with a median of 6.0. Residential home scores were similar, with a mean of 5.7 and median of 6.0.

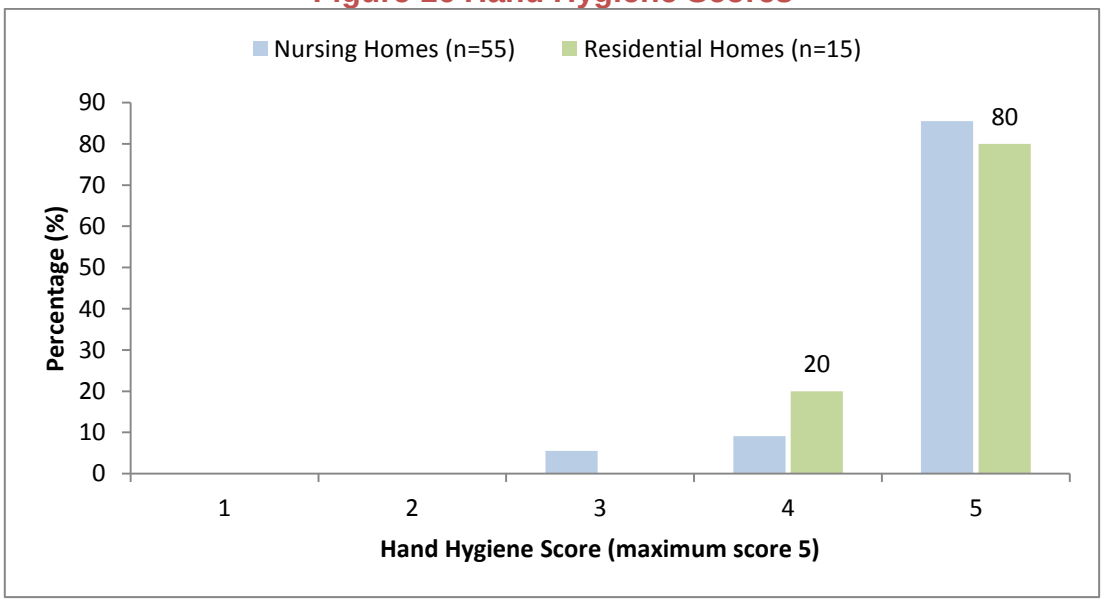
Figure 15 Infection Control and Coordination Indicators Scores



4.8.3 Hand Hygiene

This item refers to practices and efforts for the improvement of hand hygiene in the facility. The maximum score was 5. In Nursing homes, the mean score was 4.8 (median 4.0), and the comparable score for Residential homes was 4.8 (median 4.0).

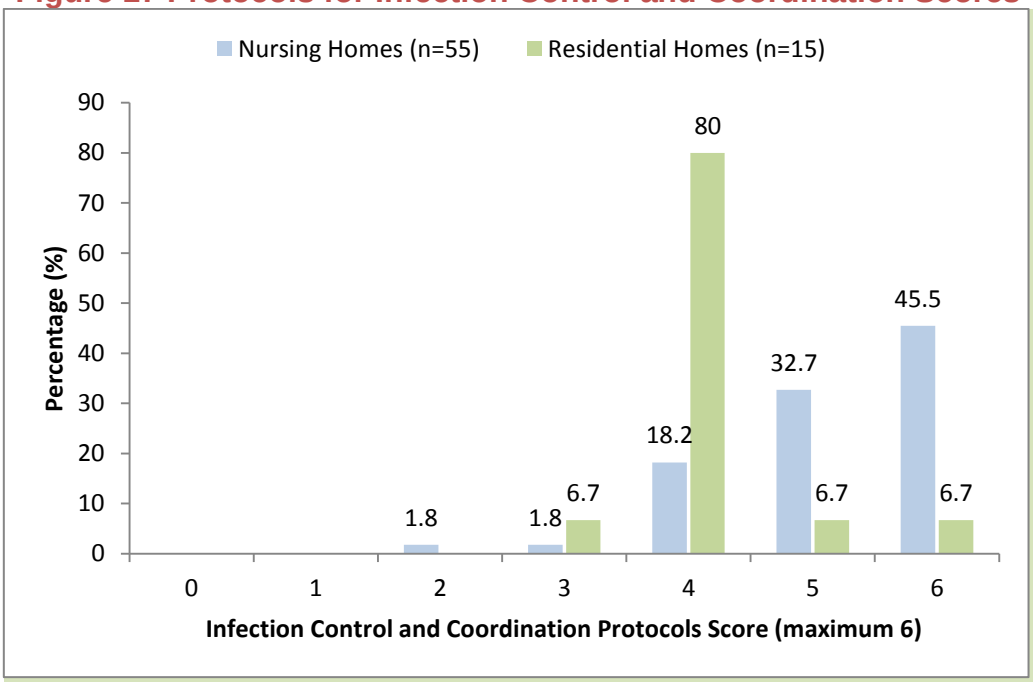
Figure 16 Hand Hygiene Scores



4.8.4 Protocols for Infection Control and Coordination

This indicator reflects the presence of written care protocols and guidelines for infection prevention and control within the facility. The maximum score possible was 6. The mean score for Nursing homes was 5.2 (median 3.0), whilst the Residential homes scored a mean of 4.1 (median 2.0).

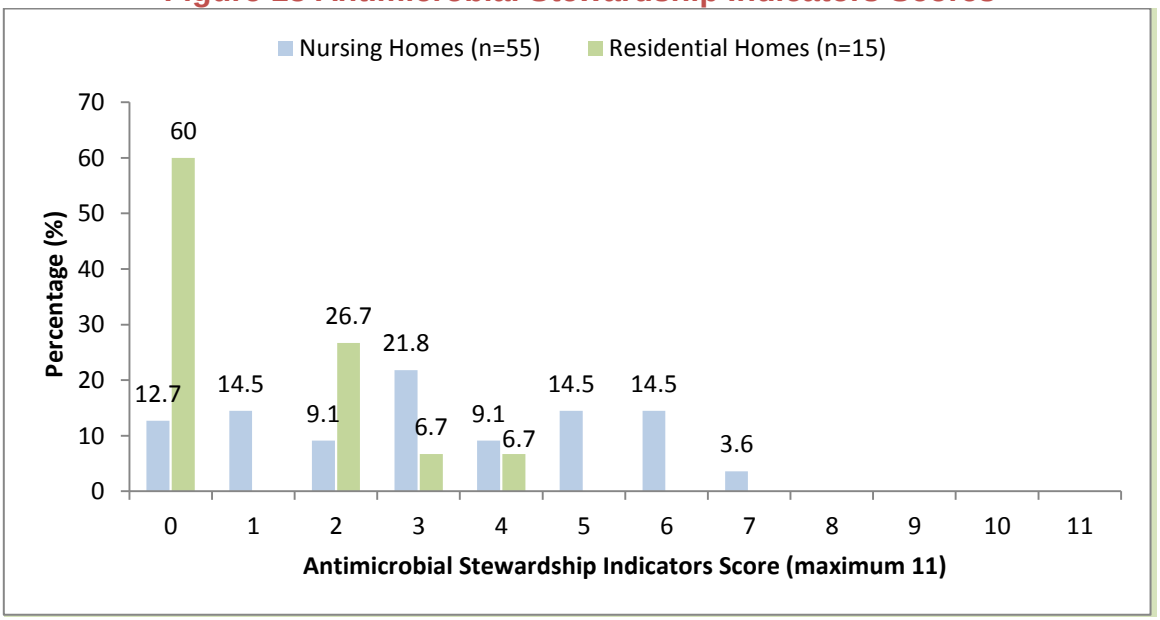
Figure 17 Protocols for Infection Control and Coordination Scores



4.8.5 Antimicrobial Stewardship Indicators

Antimicrobial stewardship indicators relate to measures to optimise rational antimicrobial use in the facilities. There were eleven elements to this item, providing a maximum score of 11. The mean score for participating Nursing homes was 3.2 (median 3.0), compared to Residential homes mean of 1.0 (median 0.0).

Figure 18 Antimicrobial Stewardship Indicators Scores

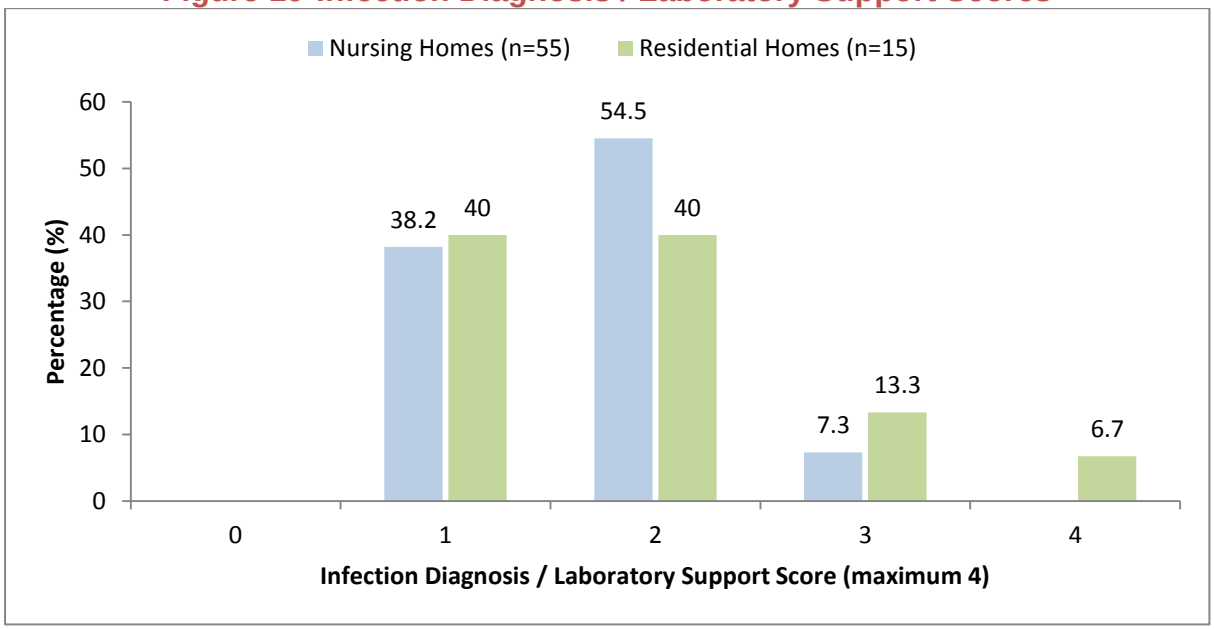


4.8.6 Infection Diagnosis / Laboratory Support

Infection diagnosis/laboratory support concerns the application of practices for supporting the diagnosis of infections in the facility in order to guide selection of appropriate antimicrobials. The maximum possible score was four. The mean score

for Nursing homes was 1.7 (median 2.0) and for Residential homes the mean was 0.9 (median 2.0).

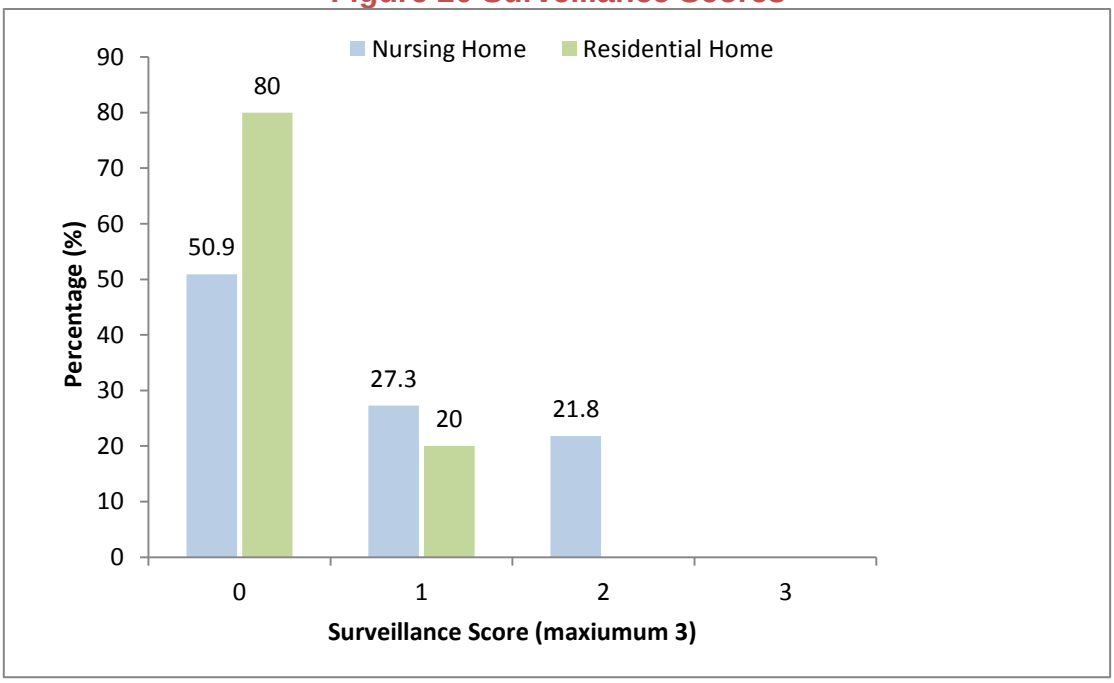
Figure 19 Infection Diagnosis / Laboratory Support Scores



4.8.7 Surveillance

Surveillance includes the presence of certain surveillance activities with a maximum score of three. The mean score for Nursing homes was 0.7 (median 0.0), as compared to Residential homes, which showed a mean of 0.2 (median 1.0).

Figure 20 Surveillance Scores



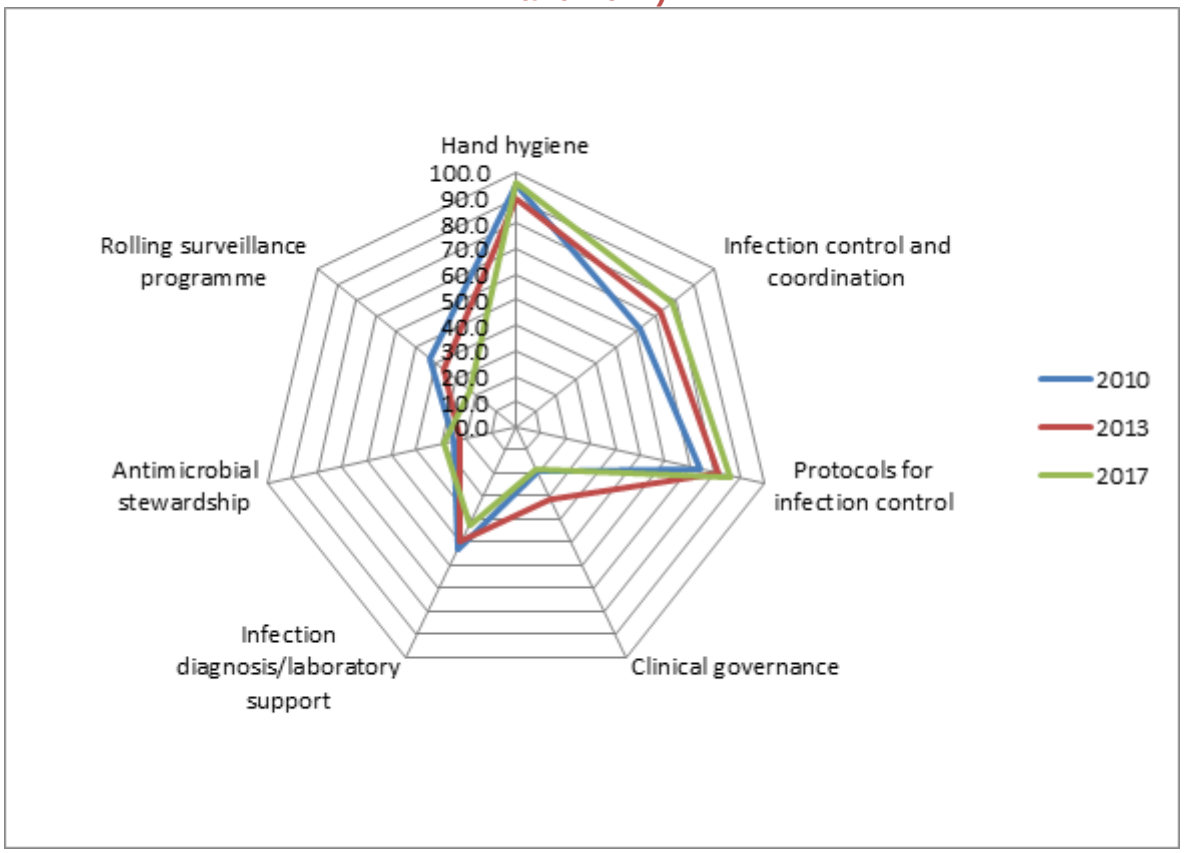
4.8.8 Comparison with Previous Scores

The overall scores for the infection control and antimicrobial stewardship items for 2017 were compared with those from 2013 and 2010. Compared with the 2013, in Nursing homes, there was an improvement in hand hygiene (4.5 to 4.8), infection

coordination and control (5.1 to 5.5), availability of protocols (4.9 to 5.2) and antimicrobial stewardship (2.5 to 3.2) scores. The 2017 scores were lower for clinical governance (1.94 to 1.1), infection diagnosis/laboratory support (1.97 to 1.7), and surveillance (1.1 to 0.7).

Compared with the 2013, in Residential homes, there was no improvement in the following scores: hand hygiene (4.8 to 4.8), antimicrobial stewardship (1.0 to 1.0), infection diagnosis/laboratory support (0.9 to 0.9), and surveillance (0.2 to 0.2). Scores increased for infection coordination and control (5.4 to 5.7) and decreased for clinical governance (3.5 to 3.1), and availability of protocols (4.8 to 4.1).

Figure 21 Comparison of IPC and AMS Scores in Nursing Homes (2010, 2013 and 2017)



SECTION 5 DISCUSSION

This report presents the findings of a repeated point prevalence survey carried out in Northern Ireland in September/October 2017. The study aimed to measure structure and process indicators relating to infection prevention and control and antimicrobial stewardship and to estimate the prevalence of healthcare associated infections and antimicrobial use in Long Term Care Facilities [LTCF].

Participation in HALT survey is voluntary, but compared with the previous survey, undertaken in 2013; there has been an increase in participation. The overall response rate was 23.3%, which is categorised by ECDC as 'good' national representativeness by the survey protocol.

5.1 Facility Characteristics

A total of 70 LTCFs participated in the HALT-3 survey in 2017. Of these, 55 were Nursing homes, LTCF that employ qualified nursing staff and cater to residents with condition(s) requiring nursing care. The remaining 15 LTCFs were Residential homes where the residents require some support but do not require nursing care.

All the Nursing homes surveyed were privately owned, with the majority being run for profit. The participating Residential homes were all Trust-controlled or statutory facilities. This distinction in ownership is important as this may dictate the nature of the governance that the facility is subject to.

Nursing homes ranged in size from 19-81 beds while Residential homes were generally smaller containing 16-39 beds.

The survey showed that those aged over 85 years and those aged 85 years and under accounted for similar proportions of residents in Nursing homes and Residential homes. These figures have not changed significantly since 2013. The gender split of residents in both facilities was similar to the 2013 survey with the majority of residents being female.

Compared with the previous survey, the 2017 results showed a higher proportion of Nursing home residents with care load indicators. There have been increases in the rates of incontinence and disorientation while impaired mobility has remained around 50%. For Residential homes, rates of disorientation and impaired mobility have changed little since 2013, although there has been a reduction in the number of residents with incontinence. A comparison of the proportion of care load indicators also showed greater functional disability in Nursing home residents compared with Residential home residents.

5.2 Facility Coordination

In NI provision of primary care for individual residing in Nursing/Care homes is the responsibility of a GP or group practice. Although there are benefits to this type of individualised service, for the LTCF, there can also be some challenges including difficulties in coordination of medical and infection prevention and control (IPC) activities.

All the Residential homes and 94.5% of Nursing homes reported access to trained IPC staff (external or internal). However, In-house access to these staff was only present in 50% of Nursing homes and 13.3% of Residential homes. Formal external IPC help and expertise is available to 100% of facilities via the PHA Health Protection Duty Room which provides advice over the phone and facility visits where appropriate.

The overall presence of written IPC protocols for hand hygiene, on the management of MRSA and/or other MDRO, enteral feeding and urinary catheters was over 90%. Protocols on the management of vascular catheters were only available in 47.3% (n=26) of Nursing homes. Continued efforts should be made to ensure that 100% of LTCFs have all relevant IPC protocols present.

Although the majority of LTCFs reported hand hygiene training sessions in the preceding year, the emphasis should remain on attaining 100%. There is a need to consider the frequency of these sessions to meet the needs taking into account staff turnover and training. The list of products for hand hygiene indicated that appropriate 'equipment' was available in 100% of Nursing and Residential homes.

5.2 Risk Factors for HCAIs

Residents in Residential homes had fewer urinary catheters, vascular catheters, and pressure sores, compared with Nursing homes. More Residential home residents had recent surgery and other wounds compared with Nursing home residents.

Although the percentage of residents with risk factors was relatively small in both facility types, it was noted that in both facility types, the prevalence of HCAIs was higher where each risk factor was present compared to those without any risk factors.

5.3 Healthcare Associated Infections in Long Term Care Facilities

The prevalence of HCAIs in Residential homes was (6.8%) while Nursing homes prevalence was reported as (3.3%). The 2013 results showed similar HCAI prevalence in both facility types.

Urinary tract infections, respiratory tract infections, and skin and soft tissue infections were the most commonly reported HCAI in the surveyed LTCF.

5.3.1 Urinary Tract Infections

43.5% of reported HCAIs were urinary tract infections. The prevalence of UTIs was higher in Residential homes compared with Nursing homes. Since 2013, the prevalence of UTIs has decreased in Nursing homes but has remained similar in Residential homes. UTI were also the most common reason for prescribing antimicrobials to treat infection in this survey. The high prevalence of incontinence and use of urinary catheters in high risk patients including older peoples should be taken into account in future quality improvement initiatives to address the burden of UTIs in LTCF.

5.3.2 Respiratory Tract Infections

Respiratory tract infections were the second most commonly reported HCAI in Nursing homes (35%) and the third most commonly reported HCAI in Residential homes (10%). There are currently no national guidelines for the prevention of pneumonia or LRTI for use in LTCF and the wider healthcare system. Development of clear guideline for the prevention of LRTI and pneumonia may assist frontline health and social care staff in reducing the risk of these infections in LTCF.

5.3.3 Skin and Soft Tissue Infections

Residential homes reported SSTIs as the second most common HCAI type (25%) while Nursing homes reported SSTI as the third most common HCAIs (20.5%). The case definitions for SSTI used in this survey did not distinguish between different types of soft tissue infections. These infections may include pressure ulcers, venous ulcers, traumatic wounds or skin tears that have become infected. The key intervention for reducing infections associated with pressure ulcers and skin tears is to prevent them developing in the first place and to manage them appropriately should they develop.

5.4 Antimicrobial Prescribing in Long Term Care Facilities

The prevalence of antimicrobial use was 10.5% in Nursing homes and 9.2% in Residential homes. The most common infection sites were UTIs, RTIs and SSTIs for antibiotic prescriptions.

Over half (50.4%) of all antimicrobial prescriptions in Nursing homes were for prophylaxis compared with 44.4% in Residential homes, the remainder of prescriptions were therapeutic. The majority of prescriptions were made by GPs. The three most frequently prescribed classes of antimicrobials were the beta-lactams (26.2%), trimethoprim and sulphonamide class (22.9%), and cephalosporins (22.2%).

5.4.1 UTI Prescribing

The majority (70.3%) of prescriptions were for UTIs. Trimethoprim was the most common antibiotic prescribed for UTIs followed by cephalexin and nitrofurantoin. The majority of UTI prescriptions were for prophylaxis. The prevalence of uroprophylaxis was 5.1% in Nursing homes and 3.8% in Residential homes. The evidence base for prophylactic use of antimicrobials for UTI is limited and not current: these data provide some preliminary evidence pertaining to routine use in LTCF. It is therefore critical that the current Antimicrobial Stewardship programmes consider these finding for to reduce inappropriate prescribing in these settings.

5.4.2 RTI Prescribing

RTIs were the second and third most common reason for antimicrobial prescribing in the Nursing and Residential homes respectively. The majority of RTI prescriptions were therapeutic. A small number of prescriptions were made for prophylactic purposes. Amoxicillin, co-amoxiclav, doxycycline and clarithromycin were the most commonly prescribed antimicrobials. While, the majority of prescriptions for

amoxicillin, doxycycline and clarithromycin were in line with the current guidance, the prescriptions for azithromycin and co-amoxiclav were not in keeping with guidelines.

5.4.3 SSTI Prescribing

SSTI were the third and second most common reason for antimicrobial prescribing in the Nursing and Residential homes respectively. Flucloxacillin and doxycycline were the most commonly prescribed antimicrobials for SSTI. Only one resident received prophylaxis for SSTI, and of the therapeutic prescriptions, 74.0% in Nursing homes and 100% in Residential homes were in adherence with those listed in guidance.

5.5 Conclusion and Priorities

Healthcare associated infections place a significant burden on LTCF in Northern Ireland. This survey has provided updated evidence regarding the epidemiology of infection in LTCF and has highlighted the importance of this type of intelligence to inform priorities for quality improvement. UTI, RTI, and SSTI were the most commonly reported infections and there is a need for HCAI specific interventions to reduce the risk of these infections in the LTCFs. The survey also highlighted that a significant number of LTCF residents are receiving antimicrobials, emphasising the need for effective stewardship programmes in these settings. The most important conclusion to be drawn from the results is that IPC and AMS need to remain central priorities in the care provided by all LTCFs in Northern Ireland.

The following quality improvement priorities are recommended:

- Explore opportunities for collaboration amongst all GP practices currently providing services to the same LTCF to strengthen and improve the links between LTCF and primary care, particularly with respect to IPC and AMS.
- Continue to work with relevant teams to improve diagnosis of infection and prescribing within LTCFs through primary care.
- Continue to raise awareness of the availability of formal IPC advice through PHA.
- Continue to reduce the HCAI burden by addressing modifiable risk factors through the proper training and the practice of good IPC.
- Develop and Implement interventions to reduce the burden of RTIs
- Implement interventions to further reduce the burden of UTIs in LTCFs.
- Promote development of pragmatic guidance and protocols on prevention and management of SSTI.
- Further improve support and education within LTCFs around antimicrobial prescribing guidance and IP&C policy and guidelines for the prevention or reduction of infections.
- Promote active review of residents on antimicrobial therapy in LTCFs.
- Undertake point prevalence surveys in LTCFs every five years.

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APPENDIX 1 – INSTITUTIONAL QUESTIONNAIRE

Institutional Questionnaire (Page 1)

Healthcare-associated infections and antimicrobial use in European long-term care facilities (HALT-3)

INSTITUTIONAL QUESTIONNAIRE

Remark: It is **essential** that each facility enrolled in HALT-3 completes this questionnaire as it collects vital data. We recommend that the person completing this questionnaire is the person in charge of the facility. If this person cannot answer some of the questions or locate the relevant information, they should request assistance from persons who are able to answer those questions. **This is especially relevant for questions relating to antimicrobial policy**.

A – GENERAL INFORMATION

DATE OF THE SURVEY IN YOUR FACILITY ☐☐ ☐☐ 201☐

FACILITY STUDY NUMBER (*allotted by your national HALT-3 coordinator*) ☐☐☐☐☐☐☐

OWNERSHIP OF THE FACILITY ☐ *Public* ☐ *For profit* ☐ *Not for profit*

QUALIFIED NURSING CARE AVAILABLE 24/24h IN THE FACILITY ☐ *Yes* ☐ *No*

IN THE FACILITY:

Total number of FTE REGISTERED NURSES	☐☐☐☐ *FTE registered nurses*
Total number of FTE NURSING ASSISTANTS	☐☐☐☐ *FTE nursing assistants*
Total number of RESIDENT ROOMS	☐☐☐☐ *Rooms*
Total number of SINGLE OCCUPANCY RESIDENT ROOMS	☐☐☐☐ *Single occupancy rooms*
Total number of SINGLE OCCUPANCY RESIDENT ROOMS WITH INDIVIDUAL TOILET AND WASHING FACILITIES	☐☐☐☐ *Rooms with individual toilet and washing facilities*

B – DENOMINATOR DATA

This table when completed will summarize the data collected in each ward (ward list) for the total population

IN YOUR FACILITY, ON THE DAY OF THE SURVEY, TOTAL NUMBER OF:

BEDS IN THE FACILITY *(both occupied and non-occupied beds)*	☐☐☐☐
OCCUPIED BEDS	☐☐☐☐
ELIGIBLE RESIDENTS:	
PRESENT AT 8 AM AND NOT DISCHARGED AT THE TIME OF THE SURVEY	☐☐☐☐
AGE OVER 85 YEARS	☐☐☐☐
MALE RESIDENTS	☐☐☐☐
RESIDENTS RECEIVING AT LEAST ONE ANTIMICROBIAL AGENT	☐☐☐☐
RESIDENTS WITH AT LEAST ONE INFECTION	☐☐☐☐
RESIDENTS WITH ANY URINARY CATHETER	☐☐☐☐
RESIDENTS WITH ANY VASCULAR CATHETER	☐☐☐☐
RESIDENTS WITH PRESSURE SORES	☐☐☐☐
RESIDENTS WITH OTHER WOUNDS	☐☐☐☐

APPENDIX 2 – RESIDENT QUESTIONNAIRE

Resident Questionnaire (Page 1)

RESIDENT STUDY NUMBER ☐☐☐☐

Public Health Agency

Healthcare-associated infections and antimicrobial use in European long-term care facilities (HALT-3)

RESIDENT QUESTIONNAIRE

ecdc

RESIDENT DATA

GENDER	☐	*Male*	☐	*Female*	
BIRTH YEAR	☐☐☐☐	*(YYYY)*			
LENGTH OF STAY IN THE FACILITY	☐	*Less than one year*	☐	*One year or longer*	
ADMISSION TO A HOSPITAL IN THE LAST 3 MONTHS	☐	*Yes*	☐	*No*	
SURGERY IN THE PREVIOUS 30 DAYS	☐	*Yes*	☐	*No*	
PRESENCE OF:					
URINARY CATHETER	☐	*Yes*	☐	*No*	
VASCULAR CATHETER	☐	*Yes*	☐	*No*	
INCONTINENCE (URINARY AND/OR FAECAL)	☐	*Yes*	☐	*No*	
WOUNDS					
- PRESSURE SORE	☐	*Yes*	☐	*No*	
- OTHER WOUNDS	☐	*Yes*	☐	*No*	
DISORIENTATION (IN TIME AND/OR SPACE)	☐	*Yes*	☐	*No*	
MOBILITY	☐	*Ambulant*	☐	*Wheelchair*	☐ *Bedridden*

On the day of the survey, the resident:

☐ *RECEIVES AN ANTIMICROBIAL AGENT* → *COMPLETE PART A*

This includes: (i) Residents receiving prophylactic antimicrobials
OR (ii) Residents receiving therapeutic antimicrobials

☐ *PRESENTS CONFIRMED OR PROBABLE INFECTION(S)* → *COMPLETE PART B*

Residents with infection(s) AND resident not receiving antimicrobials

☐ *BOTH: ANTIMICROBIAL USE AND INFECTION(S)* → *COMPLETE PART A & B*

This includes: (i) Residents with infection(s) AND receiving antimicrobials today (whether or not linked to same infection site)
OR (ii) Residents whose signs/symptoms of an infection have resolved but who are still receiving antimicrobials for that infection

APPENDIX 3 – INFECTION CONTROL AND ANTIBIOTIC STEWARDSHIP

The institutional questionnaire sought information on medical care and coordination, infection control practice and antimicrobial policy. Some questions within these sections were used to assess seven categories of performance indicators:

I. Clinical Governance
II. Infection Control (ICC)
III. Hand Hygiene
IV. Protocol for ICC
V. Antimicrobial Stewardship
VI. Infection Diagnosis / Laboratory Support
VII. Surveillance

The composition of these performance indicators were built up by attributing a score to the response to specific questions. This information was not passed to the participating facilities in order to prevent manipulation of data to influence the results.

The seven categories of performance indicators, the elements that build up these categories, the relevant questions and the score per answer are shown below:

I – Clinical governance **6 points**

D 6. How many 'Infection control committee meetings' were organised in the previous year?

If 0 meetings/year	*0 points*
If 1 meeting/year	*1 point*
If 2 meetings/year	*2 points*
If 3 or more meetings/year	*3 points*

E 4. Which of following elements are present/available in the facility?

If ‘an antibiotic committee’ = ‘Yes’ *1 point*

C 6. Can following persons consult the medical/clinical records of all residents in the facility?

If ‘The nursing staff’ = ‘Yes’ *1 point*

If ‘The physician in charge of medical coordination in the setting?’ = ‘Yes’ *1 point*

II – Infection control (ICC) indicators 7 points

D 7. If ‘Has the facility access to expert Infection Control (IC) advice?’ = ‘Yes’ *1 point*

D 4. Which of the following tasks are in operation in the facility?

If ‘infection prevention training of the nursing and paramedical staff = ‘Yes’ *1 point*

If ‘infection prevention training of the GPs and medical staff = ’Yes’ *1 point*

If ‘developing care protocols’ = ‘Yes’ *1 point*

If ’designation of a person responsible for reporting and management of outbreaks’ = ‘Yes’ *1 point*

If ‘supervision of disinfection and sterilisation of medical and care material’ = ‘Yes’ *1 point*

If ‘organisation, control, feedback of an audit of infection policies and procedures (on regular basis)’ = ‘Yes’ *1 point*

III – Hand hygiene (HH) indicators — 5 points

D 12. If 'Last year, was a hand hygiene training session organised, including all the health care professionals from the facility?' = 'Yes' *1 point*

D 8. If 'In the facility, is a written protocol available for: hand hygiene?' = *'Yes'* *1 point*

D 10. In the facility, which of following products are routinely used for hand hygiene?

If 'Alcohol rub solution' = 'Yes' *1 point*

If 'Liquid soap' = 'Yes' and 'Bar soap' = 'No' or 'empty' *1 point*

D 4. Which of the following tasks are in operation in the facility?

If 'Organisation, control, feedback on hand hygiene in the facility' = 'Yes' *1 point*

IV – Protocols for ICC — 6 points

D 8. In the facility, is a written protocol available for:

If 'the management of MRSA carriers?' = 'Yes' *1 point*

If 'the management of urinary catheters?' = 'Yes' *1 point*

If 'the management of venous catheters/lines?' = 'Yes' *1 point*

If 'the management of enteral feeding?' = 'Yes' *1 point*

D 4. Which of the following tasks are in operation in the facility?

If 'Decision on isolation & additional precautions for residents colonised with resistant microorganisms' = 'Yes' *1 point*

If ‘Offering immunisation for flu to all residents’ = ‘Yes’ *1 point*

V – Antimicrobial stewardship indicators 11 points

E 4. Which of following elements are present/available in the facility?

If ‘annual regular training on appropriate antibiotic prescribing’ = ’Yes’ *1 point*

If ‘written guidelines for appropriate AB use in the facility’ = ’Yes’ *1 point*

If ‘data available on annual AB consumption by AB class’ = ’Yes’ *1 point*

If ‘permission from a designated person(s) for prescribing of restricted ABs, not included in local formulary’ = ’Yes’ *1 point*

If ‘pharmacist providing advice on ABs not included in the formulary’ = ’Yes’ *1 point*

If ‘therapeutic formulary, comprising a list of antibiotics’ = ’Yes’ *1 point*

E 5. If written therapeutic guidelines are present in the facility, are they on:

If ‘Respiratory tract infections?’ = ‘Yes’ *1 point*

If ‘Urinary tract infections?’ = ‘Yes’ *1 point*

If ‘Wound and soft tissue infections?’ = ‘Yes’ *1 point*

E 7. If ‘Is a programme for surveillance of antimicrobial consumption and feedback in place in the facility?’ = ‘Yes’ *1 point*

E 2. If ‘Does the facility use a restrictive list of ABs to be prescribed? *(prescription requiring permission of a designated person or not to be used)’ = ’Yes’* *1 point*

VI – Infection diagnosis/laboratory support — 4 points

E 6. Do you perform a urine dipstick test for detection of urinary tract infections in the facility?

If 'Routinely' = 'Yes' — *2 points*

If 'Sometimes' = 'Yes' — *1 point*

If 'Never' = 'Yes' — *0 points*

E 4. Which of following elements are present/available in the facility?

If 'microbiological samples taken for guidance of best AB choice' = 'Yes' — *1 point*

If 'Local (i.e. for that region/locality or national if small country) antimicrobial resistance profile summaries' = 'Yes' — *1 point*

VII – Surveillance — 3 points

D 9. If 'Is a surveillance programme of healthcare-associated infections in place in the facility? *(annual summary report of number of urinary tract infections, respiratory tract infections, etc…)' = 'Yes'* — *1 point*

E 8. If 'Is a programme for surveillance of resistant micro-organisms in place in the facility? (*annual summary report for MRSA, Clostridium difficile, etc*…)' = 'Yes' — *1 point*

D 4. Which of the following tasks are in operation in the facility?

If 'Feedback on surveillance results to the nursing/medical staff of the facility' = 'Yes' — *1 point*

HSC Public Health Agency

DoH
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item 13

Title of Meeting	PHA Board Meeting
Date	21 February 2019
Title of paper	Gastrointestinal Infections in Northern Ireland Annual Surveillance Report 2017
Reference	PHA/07/02/19
Prepared by	Paul Cabrey and Catherine Hanna
Lead Director	Dr Adrian Mairs
Recommendation	For **Approval** ☐ For **Noting** ☒

1 Purpose

This report presents the epidemiological data for selected gastrointestinal infections reported in Northern Ireland in the calendar year 2017.

The report is being presented to the PHA Board for noting.

2 Background Information

The work of the Public Health Agency's surveillance team falls under PHA's Corporate Plan Objective 3, "All individuals and communities are equipped and enabled to live long lengthy lives".

The PHA has a lead role in protecting the population from infection and environmental hazards through a range of core functions including communicable disease surveillance and monitoring, operational support & advice, and education, training and research.

The effective management of infectious disease depends on high quality surveillance. Surveillance of communicable gastrointestinal infectious disease provides timely information so that public health action can result.

Epidemiological data is collated from a number of surveillance systems as outlined in the Report.

3 Key Issues

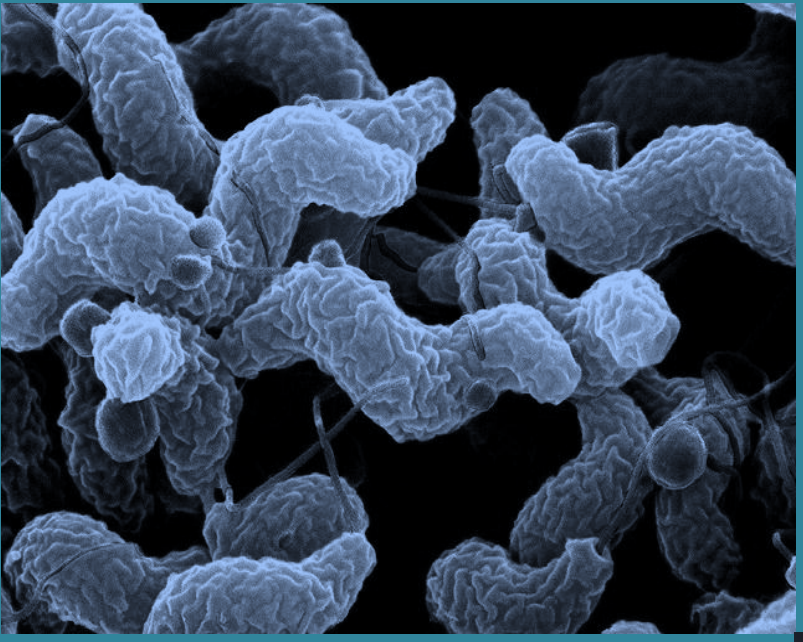
Some of the key findings from the Report are:

- *Campylobacter* infections increased by 13% in 2017 particularly amongst children.
- *Cryptosporidium* infections decreased by 10% in 2017, but remains elevated compared to years prior to introduction of changes in testing procedures.
- Laboratory confirmed cases of *E. coli* O157 decreased by 30% in 2017.
- Reports of *Giardia Lamblia* increased by 34% in 2017. This is the third year in a row that substantial increases have been seen in this organism. Whilst changes in testing protocol may account for much of this increase in the years 2015 and 2016, there would also seem to be an underlying unknown reason for the increase in 2017.
- The number of *Salmonella* infections reported decreased by 9%, with almost all of this decrease due to a large drop in reports of S. typhimurium.
- Reports of *Shigella* increased by 14% in 2017. The number of reports of *Shigella* that could not be cultured and were positive on PCR test increased substantially from 5 in 2016 to 25 in 2017 (400% increase).
- Travel remains a significant risk factor for some gastrointestinal infections, with 45% of *Salmonella* infections being related to travel outside the UK in 2017.
- There was a large decrease in the number of gastrointestinal related outbreaks, particularly in hospital settings.
- Differences in testing policy and procedures between laboratories and their recent introduction continue to make interpretation of surveillance data challenging.

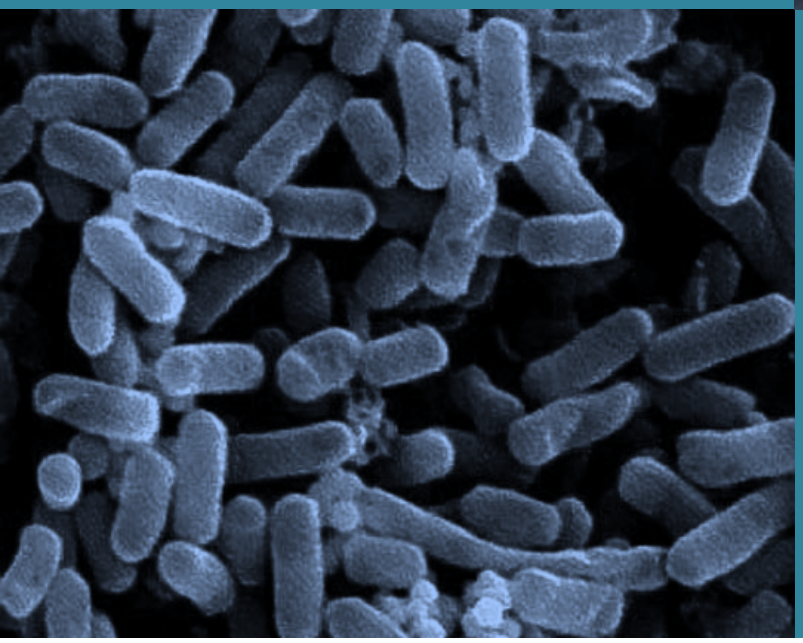
4 Next Steps

Following the PHA Board meeting, the Report will be published on the PHA website.

Surveillance will continue throughout the year with internal weekly and monthly reports to health protection consultants, nursing and surveillance staff. The next annual report covering 2018 will be published in autumn 2019.



Gastrointestinal Infections in Northern Ireland



Annual Surveillance Report 2017

HSC Public Health Agency

Gastrointestinal Infections in Northern Ireland Annual Surveillance Report 2017

Contents

Key Points

- *Campylobacter* infections increased by 13% in 2017 particularly amongst children.
- *Cryptosporidium* infections decreased by 10% in 2017, but remains elevated compared to years prior to introduction of changes in testing procedures.
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- Differences in testing policy and procedures between laboratories and their recent introduction continue to make interpretation of surveillance data challenging.

Introduction

The Public Health Agency (PHA) has a lead role in protecting the population from infection and environmental hazards through a range of core functions including communicable disease surveillance and monitoring, operational support & advice, and education, training and research.

The effective management of infectious disease depends on high quality surveillance. Surveillance of communicable gastrointestinal infectious disease provides timely information so that public health action can result.

Epidemiological data is collated from a number of surveillance systems:

- Regional CoSurv for NI laboratories – all confirmed organisms/infections are reported electronically from seven laboratories to PHA.
- Reference laboratory reporting – selected organisms are sent by the local laboratories to reference laboratories in England for typing and the results are reported to PHA.
- Notifications of Infectious Diseases (NOIDS) – General Practitioners and Hospital Physicians have a statutory duty to report notifiable infectious diseases (e.g. food poisoning) to the PHA under the Public Health Act (NI) 1967.
- HP Zone – software package used in case management, contact tracing, and outbreak investigation & control. HP Zone facilitates the capture of data and collection of timely local and regional infectious disease intelligence.
- Enhanced surveillance systems for *E. coli* O157 - an active surveillance system is in place to assemble a comprehensive clinical, epidemiological and microbiological dataset on all primary indigenous *E. coli* O157 cases.

The range of surveillance outputs is broad and includes:

- Weekly surveillance – weekly internal report to the Health Protection team.
- Monthly/quarterly and annual returns – to various external bodies including the Food Standards Agency, European Centre for Disease Control, Epidemiology of Foodborne Infections Group and Department of Health, Social Services & Public Safety.
- Annual reports and data – published yearly on the PHA website.
- Analysis of outbreaks – descriptive and/or analytical epidemiological analysis.

This report presents the epidemiological data for selected gastrointestinal infections reported in Northern Ireland in the calendar year 2017.

It should be noted that most gastrointestinal illness samples which are sent for testing are not tested for every organism listed. What testing occurs may vary between laboratories and based on clinical criteria or age.

Campylobacter

Number of cases	**1,421**
Incidence rate	**76.0 per 100,000 population**

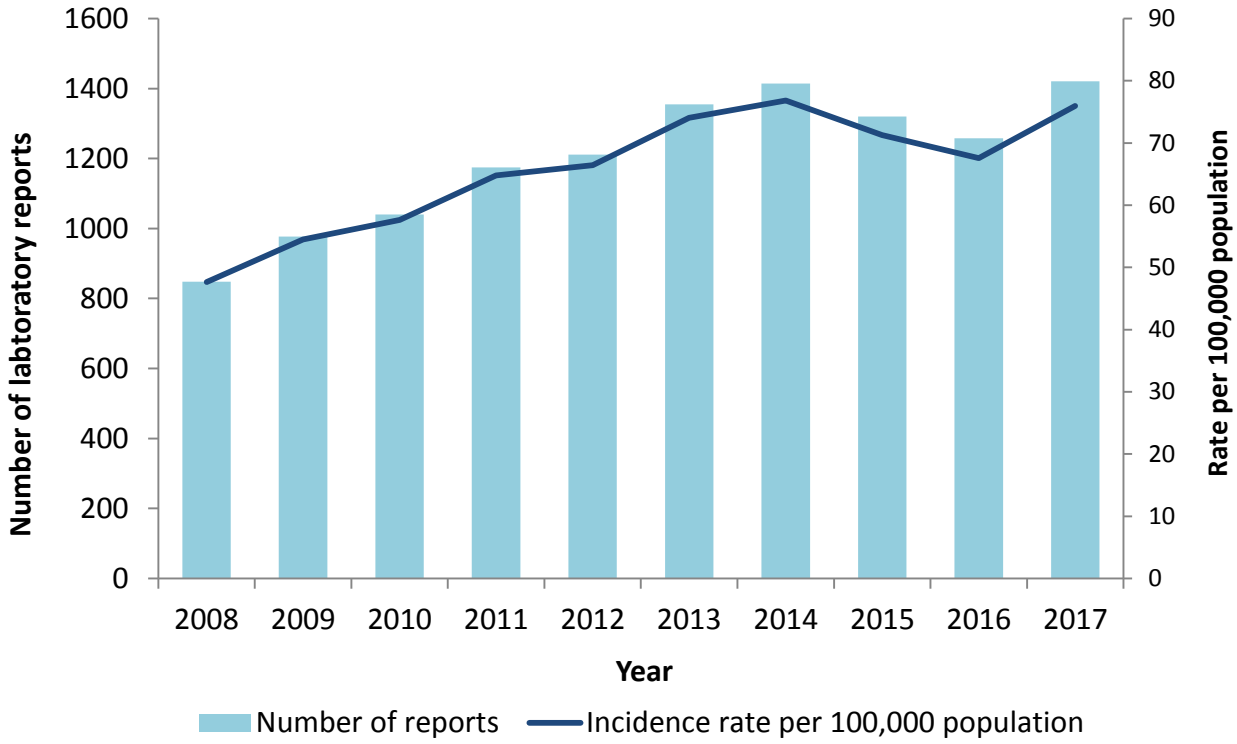
Campylobacter is the most common bacterial cause of gastrointestinal infection in the United Kingdom and Europe. Campylobacteriosis is characterised by diarrhoea, abdominal pain, malaise, fever, nausea, and vomiting. Symptoms generally last for only a few days.

The number of cases of *Campylobacter* increased in 2017 following two years of decreases. C*ampylobacter* remains the most common bacterial gastrointestinal infection in Northern Ireland with 1,421 laboratory reported cases in 2017, an increase of 13% compared to 2016 (n=1,258 cases) (Table 1, Figure 1). Bar 2014, this represents one of the highest incidence rates of Campylobacter during the past ten years (76.0 per 100,000 population).

Table 1. No of laboratory reports of *Campylobacter*, 2008 - 2017

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
848	977	1040	1175	1211	1355	1414	1320	1258	1421

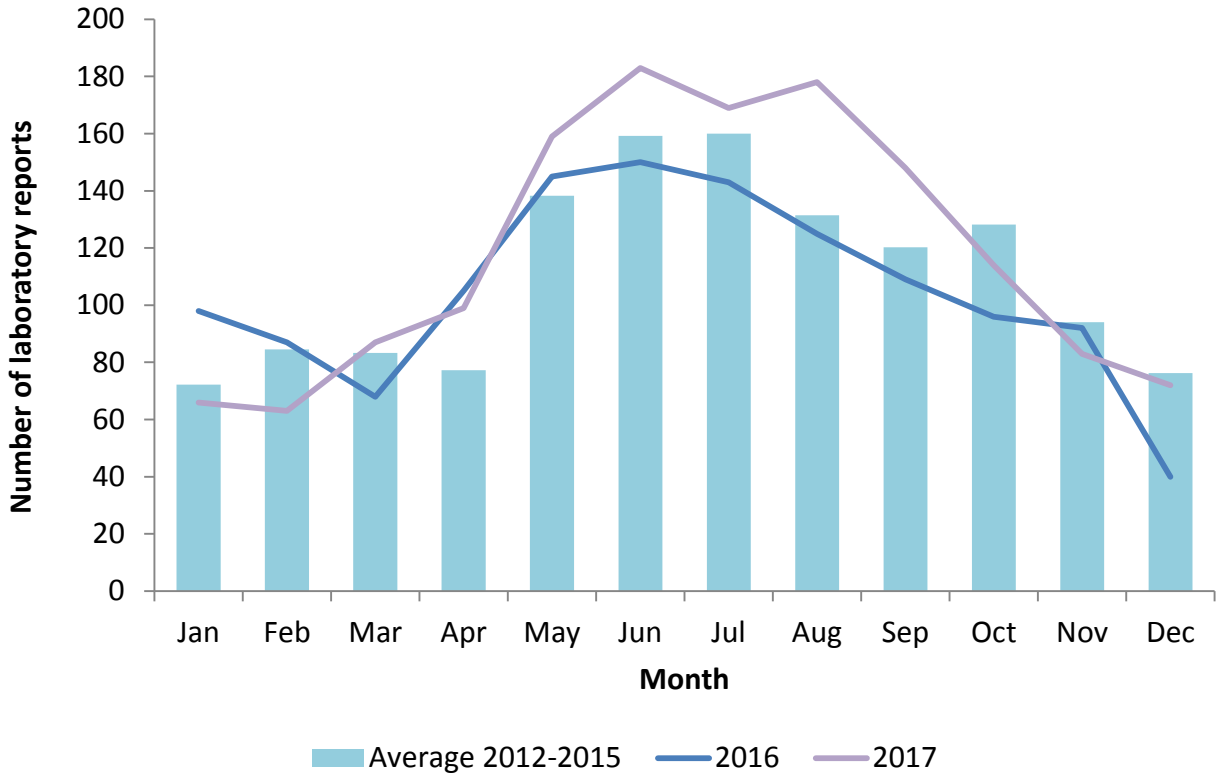
Fig 1: Laboratory reports and incidence rate of *Campylobacter*, 2008 - 2017



Cases of C*ampylobacter* follow a seasonal pattern. The number of cases generally increasing in May, with a peak in June/July and declining from September onwards.

Monthly reports in 2017 generally followed this pattern, remaining elevated between May and August before starting to reduce in September (Figure 2).

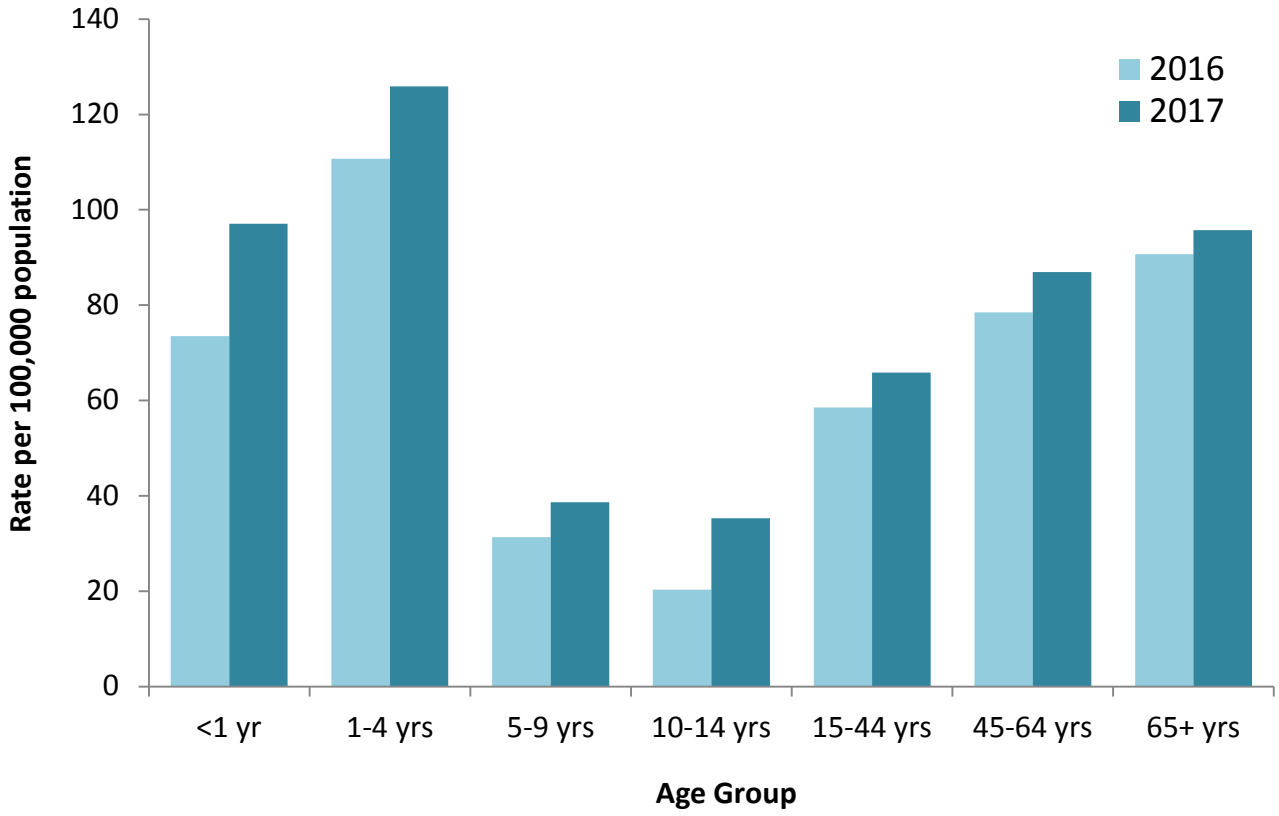
Fig 2: Monthly laboratory reports of *Campylobacter*, 2012 - 2017



All age specific rates in 2017 increased compared to 2016, with the largest increases generally seen in the younger age groups (Figure 3). The smallest increase was seen in the over 65 year age group (91 to 96 per 100,000 population), and the highest increase was seen in the 10-14 year age group (20 to 35 per 100,000 population). However, this may be due to the relatively small numbers in the 10-14 year age group. The highest age specific rate was in the 1-4 year old age group (126 per 100,000 population).

In 2017 the proportion of reported cases that were male was 57% (n=811), similar to 2016 (58%).

Fig 3: Laboratory reports of *Campylobacter*, age-specific incidence rate, 2016 - 2017



Cryptosporidium

Number of cases	**253**
Incidence rate	**13.5 per 100,000 population**

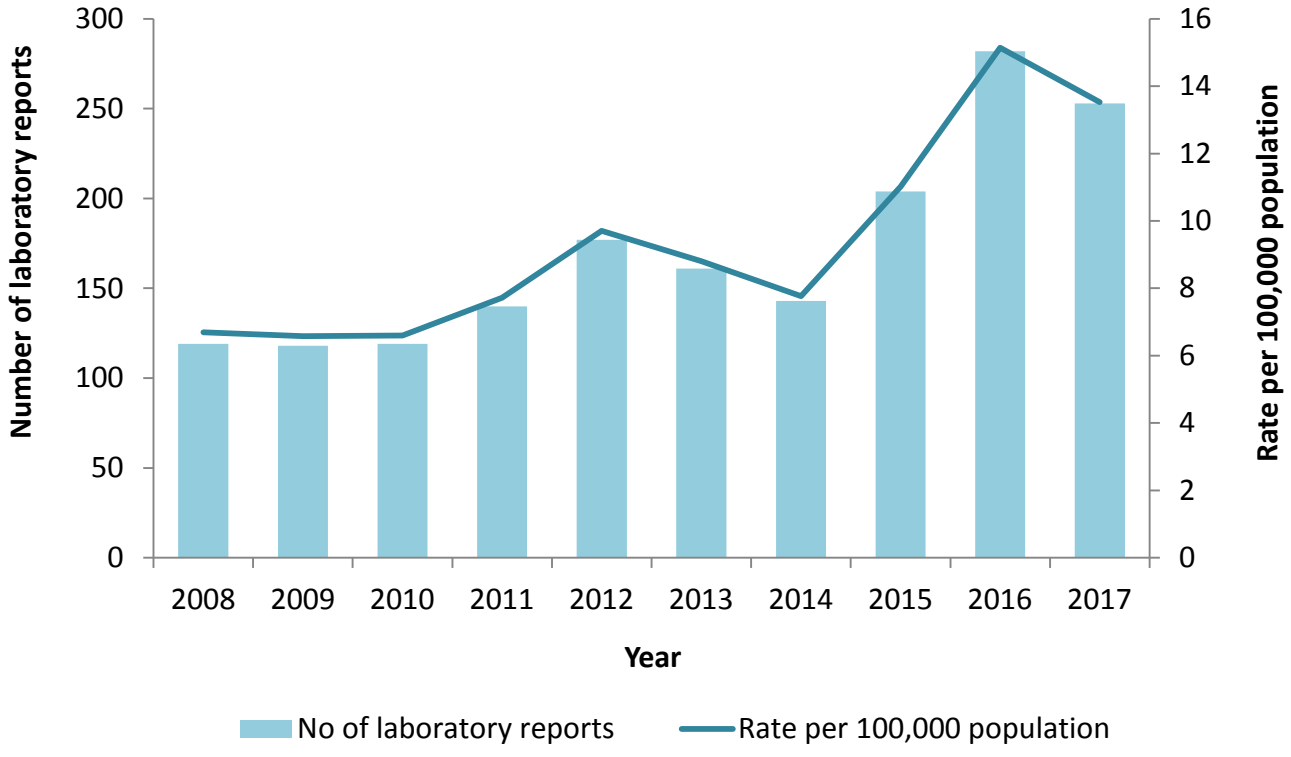
Cryptosporidium is a protozoal parasite that causes a diarrhoeal illness that can last between two days and four weeks. The infection can be more serious in people who are immunosuppressed. *Cryptosporidium* is found in lakes, streams, rivers, untreated water and occasionally in swimming pools.

Reports of Cryptosporidium decreased to 253 in 2017, falling from 282 in 2016 (10% decrease). Whilst lower than in 2016, this is still substantially higher than data from previous years due to the changes in testing policy and test type that occurred in 2015. (Table 2, Figure 4). The incidence rate of C*ryptosporidium* infection in 2017 was 13.5 per 100,000 population. One outbreak of C*ryptosporidium* was identified in 2017 and 31 cases (12%) were thought to be associated with travel outside the United Kingdom, a small increase compared to 2016 (10%).

Table 2. No of laboratory reports of *Cryptosporidium*, 2008 - 2017

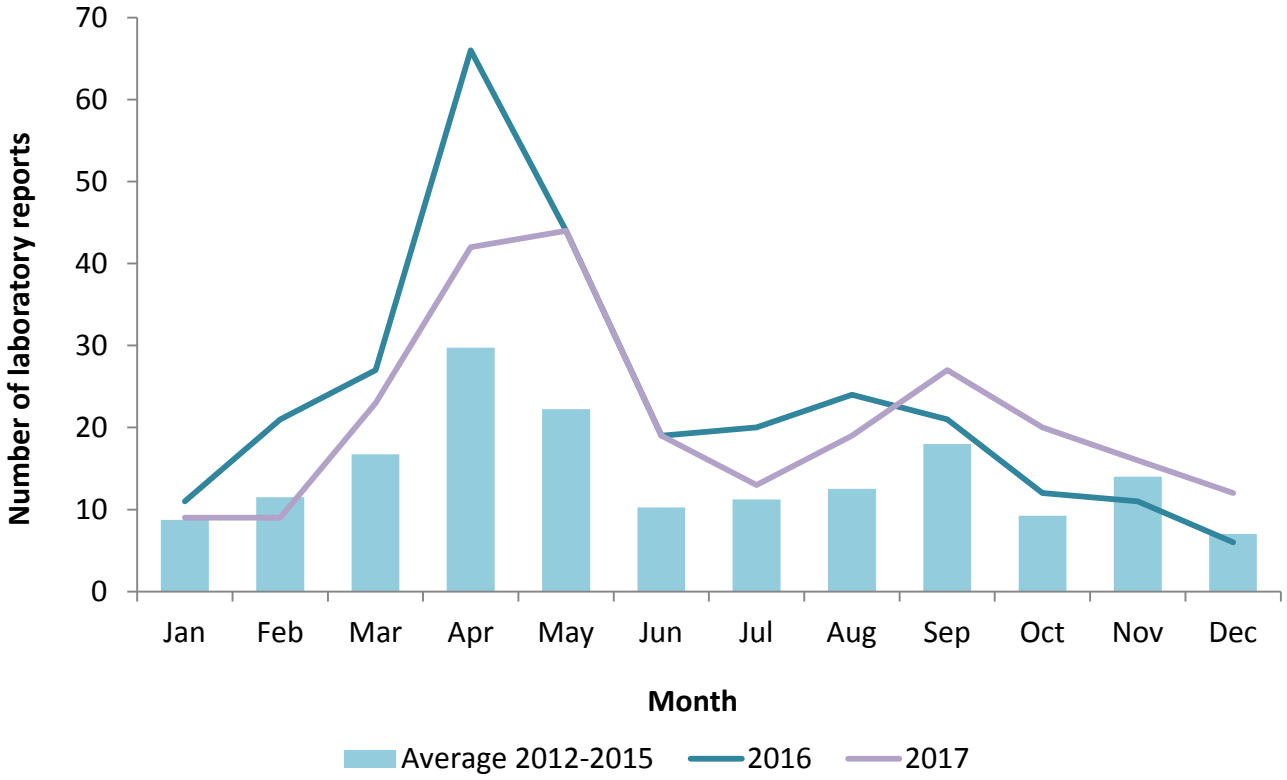
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
119	118	119	140	177	161	143	204	282	253

Fig 4: Laboratory reports of *Cryptosporidium*, 2008 - 2017



The spring peak in 2017 occurred slightly later than in the previous year and was substantially lower. The expected autumn peak was more pronounced and also later than in 2016 (Figure 5). With the exception of April, where the 2016 peak occurred, the monthly figures were fairly similar between 2016 and 2017.

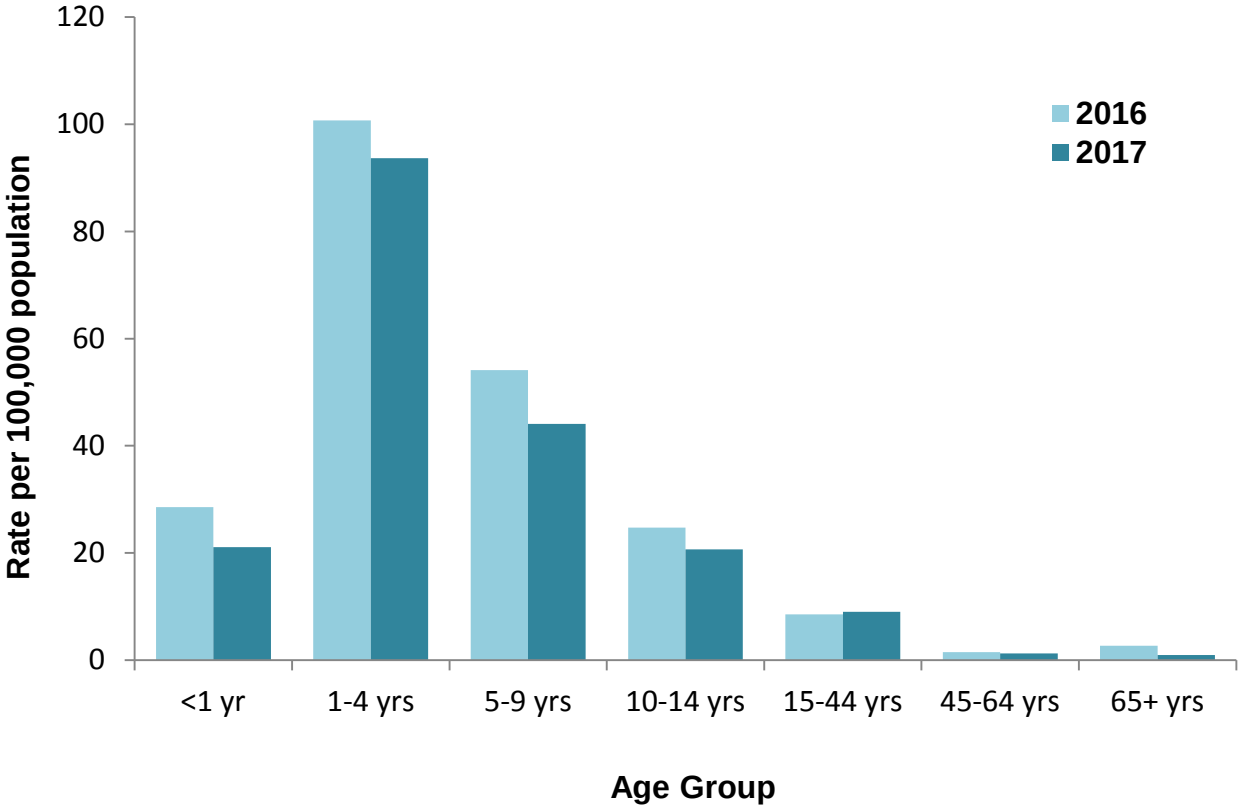
Fig 5: Monthly laboratory reports of *Cryptosporidium*, 2012 - 2017



The highest age specific rate was in the 1-4 year age group (93.6 per 100,000 population) (Figure 6). Almost all age specific rates decreased in 2017 with the exception of the 15-44 year age group which increased slightly from 8.6 per 100,000 population in 2016 to 9.0 in 2017.

The proportion of male cases was 54% in 2017, almost unchanged compared to 2016 (53%).

Fig 6: Laboratory reports of *Cryptosporidium*, Age-Specific Rate (per 100,000 population), 2016 - 2017



E. coli O157

Number of cases	**57**
Incidence rate	**3.0 per 100,000 population**

Escherichia coli O157 is a bacterial cause of gastroenteritis. Symptoms can range from mild gastroenteritis to severe bloody diarrhoea. A small proportion of patients can develop haemolytic uraemic syndrome (HUS) which is a serious life-threatening condition resulting in kidney failure.

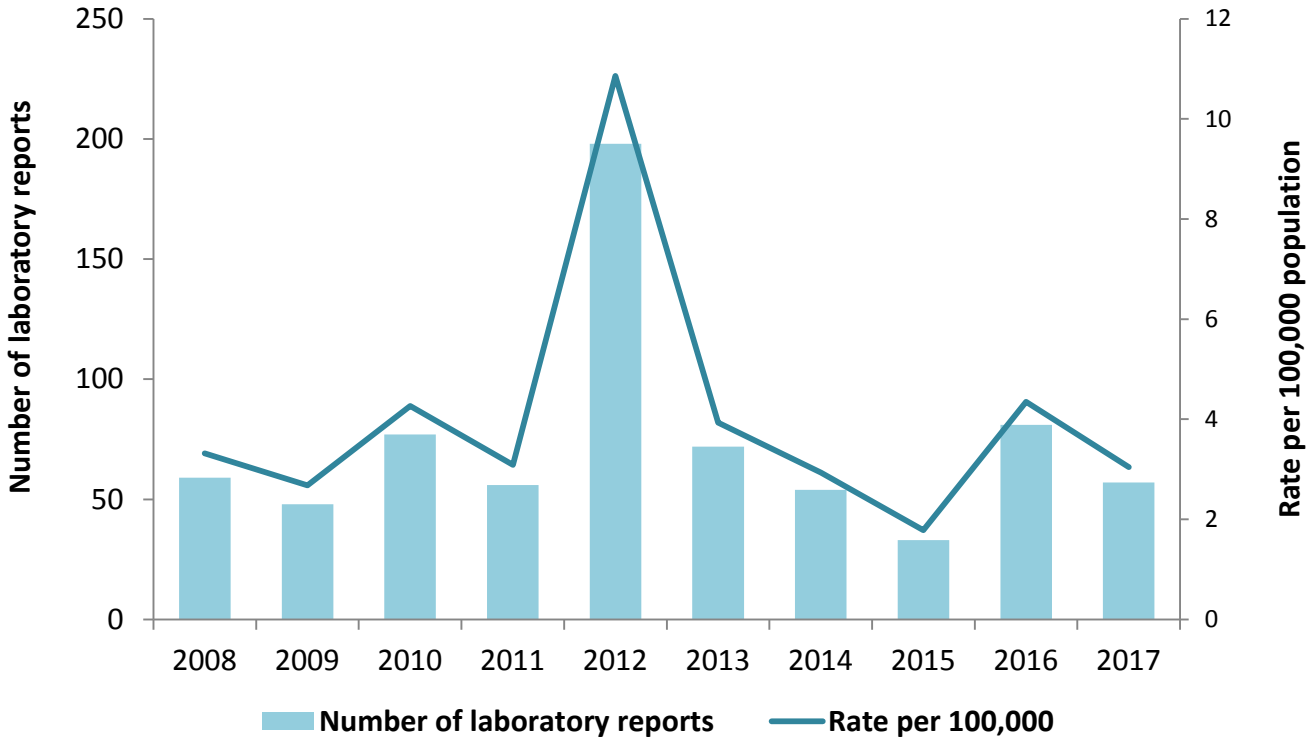
There were 57 laboratory culture confirmed cases of *E. coli* O157 reported in 2017, of which 45 (79%) tested positive as Vero cytotoxin-producing *E. coli* (VTEC). VTEC strains produce a toxin which can cause severe illness. Note that due to variations in testing across local laboratories, not all O157 cultures have been tested for the existence of this toxin. There were no cases associated with outbreaks, and 13 cases (23%) were associated with travel outside the United Kingdom (Figure 7, Table 3).

Table 3. No of laboratory reports of *E. coli* O157, 2008 - 2017

2008	2009	2010	2011	2012*	2013	2014	2015	2016	2017
59	48	77	56	198	72	54	33	81	57

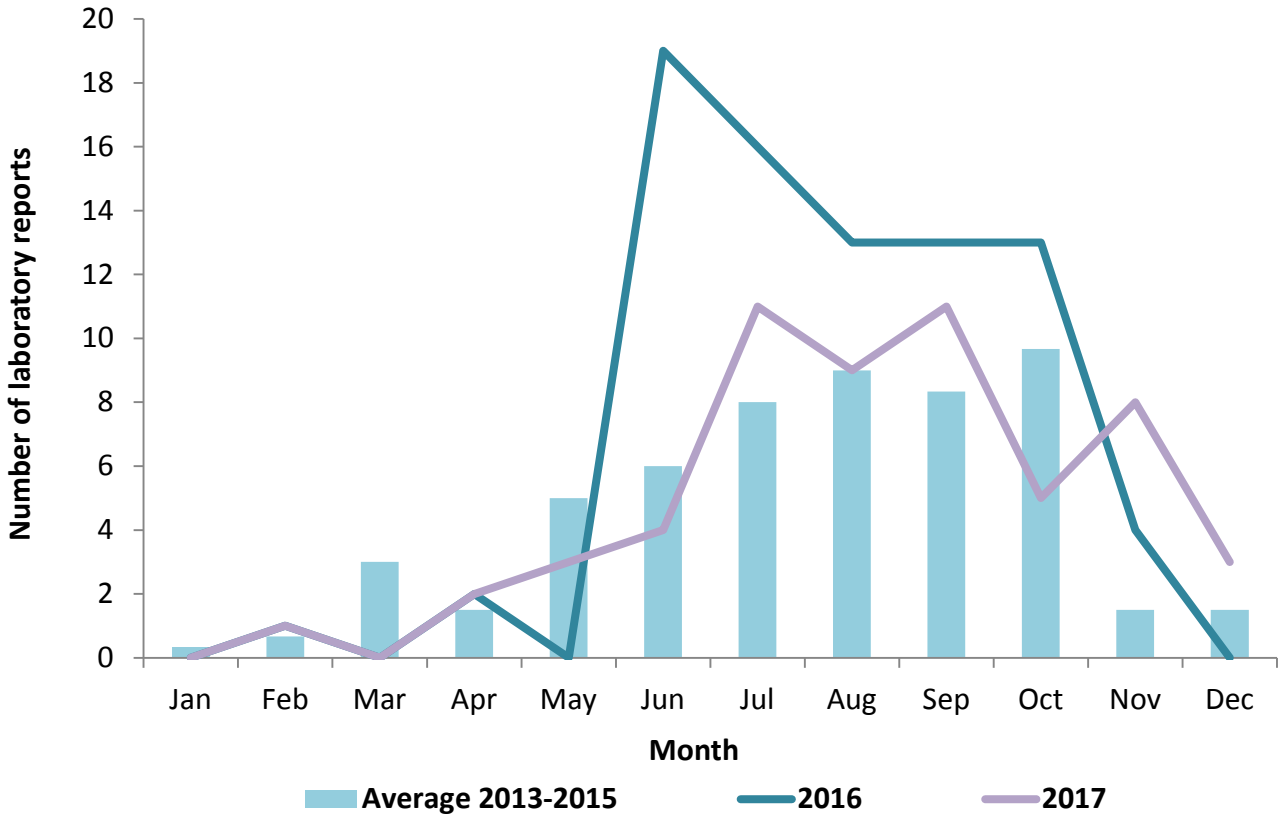
** increase due to largest recorded outbreak of E. coli in N. Ireland with 141 confirmed cases*

Fig 7: Laboratory reports of *E. coli* O157, 2008 - 2017



In 2017 the number of reports peaked slightly later than in 2016 in July and September with reports in October much lower than in recent years.

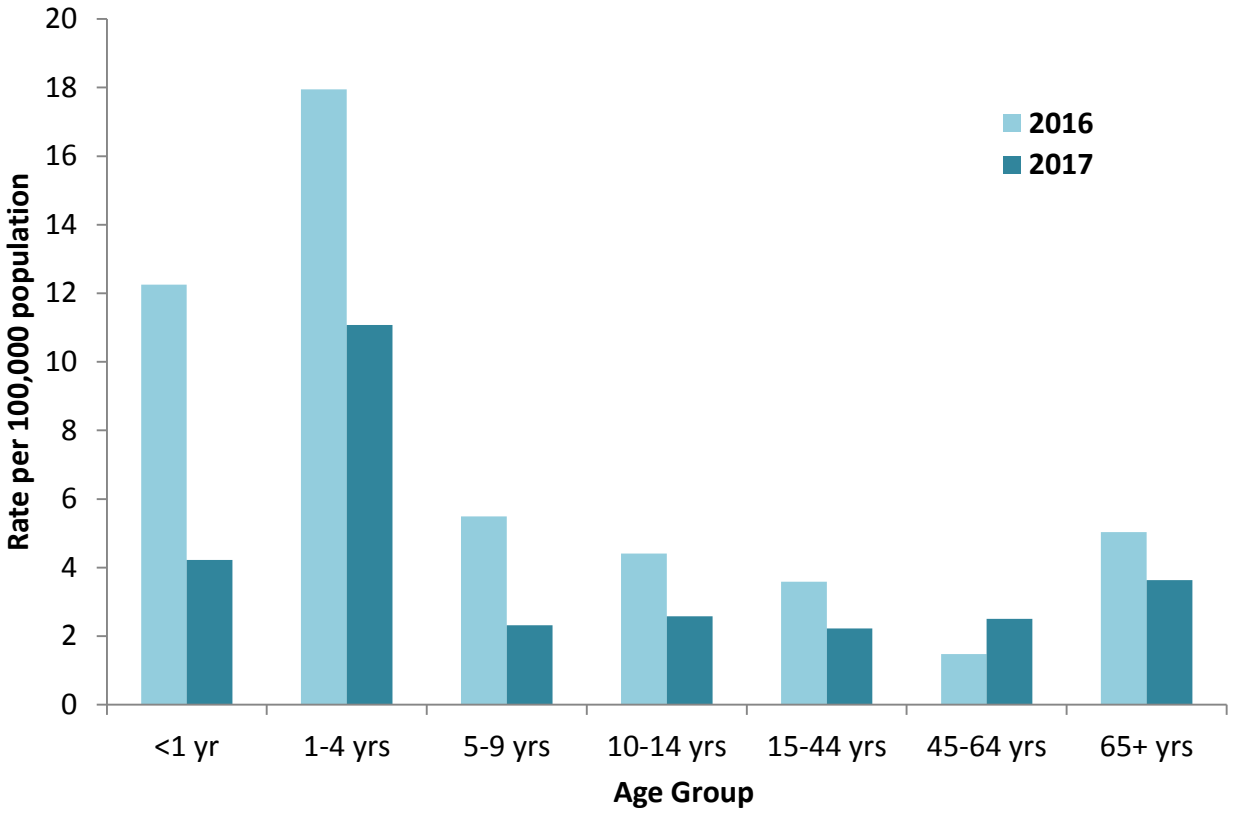
Fig 8: Monthly laboratory reports of *E. coli* O157, 2013 - 2017*



**2012 excluded due to largest recorded outbreak of E. coli in N. Ireland with 141 confirmed cases*

With the exception of the 45-64 year age group, all age-specific rates in 2017 were lower than the previous year. Similar to 2016, the highest incidence rate was in the 1-4 year age group (11 per 100,000 population). Whilst the reductions in the younger age groups appear large, this is due to the relatively small numbers in these age groups (Figure 9).

Fig 9: Distribution of *E. coli* O157 cases by age group, 2016 - 2017



Phage type data were only available for 30 cases (53%) in 2017. This is due to a lower number of O157 cultures being sent for phage and toxin typing to the reference laboratory. Phage type 32 was the largest single phage type identified in 2017 (47% of those typed).

Vero cytotoxin gene type was available for 45 cases (79%) in 2017. Toxin type VT2 was the most common toxin profile with 33% of cases (where toxin typing took place) displaying this toxin type. The majority of the remaining cases were toxin type VT1 & 2 (31%) with the remaining reports not stating the toxin profile (Table 4).

Table 4: Verotoxin (VT) genes of laboratory confirmed cases of *E. coli* O157, 2008 - 2017

VT	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
VT1	0	0	2	0	0	0	0	0	0	0
VT2	39	25	42	24	34	50	18	16	32	15
VT1+2	11	11	22	20	153	9	13	10	17	14
VT+	6	8	1	5	2	2	12	6	15	16
Total	**56**	**44**	**67**	**49**	**189**	**61**	**43**	**32**	**63**	**45**

Questionnaires were received for 56 cases (98%), with 52 reporting symptoms. Those not reporting symptoms are contacts of symptomatic cases who have tested positive for *E. coli* O157. The most common symptoms reported were diarrhoea (91%) and abdominal pain (73%), similar to previous years (Table 5). Overall, 63% of cases experienced bloody diarrhoea, with substantial variation in the age specific proportion. Although some of this variation is likely to be due to small numbers in some age groups.

Table 5: Symptoms experienced by *E. coli* O157 cases, 2017

Symptom	Number	Percentage*
Abdominal pain	41	73%
Blood in stools	35	63%
Diarrhoea	51	91%
Fever	24	43%
Nausea	32	57%
Vomiting	21	38%

** cases where a questionnaire has been received*

Hospital admissions occurred in all but one of the age groups, with 59% of cases admitted to hospital in 2017, an increase compared to 2016 (53%). There were substantial variations in the percentage hospitalised by age group but this may be due to the small numbers involved (Table 6).

Table 6: Hospitalisation of *E. coli* O157 cases by age group, 2017

Age group	Number of cases for whom questionnaire was received	Number of cases who visited GP	Number of cases who attended hospital	Number of cases hospitalised	% of age group hospitalised
<1	1	1	0	0	0%
1-4	10	7	4	3	30%
5-9	3	2	3	3	100%
10-14	3	2	3	2	67%
15-44	16	12	9	4	25%
45-64	12	3	9	9	75%
65+	11	7	7	5	45%
Total	**56**	**34**	**42**	**33**	**59%**

E. coli – serotypes other than O157

The introduction of PCR testing in several of the Northern Ireland health service laboratories has allowed for the detection of non-O157 serotypes of verotoxin positive *E. coli.* Previously only *E. coli* O157 could be identified. However, only one laboratory in Northern Ireland is currently able to identify the particular serotype involved and this is limited to the eight most commonly found serotypes. The other laboratories do not routinely send non-O157 serotypes for further identification, resulting in an underestimate of the incidence of non-O157 serotypes and variation due to geographical differences.

In addition, some specimens that test positive using PCR techniques cannot be subsequently cultured or identified. In some cases this would likely be due to the serotype being one the laboratory cannot identify, but it can also include cases of O157 where it simply has not been possible to culture the organism. Depending on the severity of the symptoms or links to existing cases, a questionnaire may not be obtained for cases only identified through PCR testing. These changes mean that data prior to 2015 is not directly comparable to current data, as well as making interpretation of more recent data difficult.

There was a substantial reduction in the number of O026 serotypes reported in 2017; however the large number in 2016 was partly due to two outbreaks (Table 7). There was also a smaller decrease in PCR only reports of toxin positive *E. coli* where serotype cannot be identified (Table 8).

Table 7: Culture positive VTEC samples where a serotype was established

Serotype	2014	2015	2016	2017
O026	18	17	33	19
O145	1	4	3	1
O091	1	2	0	0
O110	1	1	0	0
O5	0	0	1	1
Others*	4	1	1	0

* includes serotypes where only one positive has been identified in the past 4 years

There were also three cases where *E. coli* was cultured but it was not possible to identify the serotype. Samples positive for non-O157 are not routinely sent for toxin or phage typing so this information is not available for the majority of non-O157 cases.

Table 8: PCR positive only VTEC samples			
2014	**2015**	**2016**	**2017**
0	93	129	120

There were a total of 144 cases where *E. coli* was detected but the serotype was either not O157 or not typed. This includes both culture and PCR only samples. Of these 144 cases, questionnaires were obtained for 61 (42%) with 54 being symptomatic (88%).

In general the percentage of cases suffering from each of the symptoms is lower than for *E. coli* O157. Similar to O157, abdominal pain and diarrhoea are the primary symptoms reported (Table 9).

Table 9: Symptoms experienced by *VTEC non-O157** cases, 2017		
Symptom	**Number**	**Percentage***
Abdominal pain	43	70%
Blood in stools	35	57%
Diarrhoea	53	87%
Fever	22	36%
Nausea	29	48%
Vomiting	19	31%

** cases where a questionnaire has been received*

The proportion admitted to hospital was 41% compared to 19% last year (Table 10). There is substantial variation by age group which may be due, at least in part, to the small numbers involved rather than any significant underlying differences.

Table 10: Hospitalisation of *VTEC non-O157* * cases by age group, 2017

Age group	Number of cases for whom questionnaire was received	Number of cases who visited GP	Number of cases who attended hospital	Number of cases hospitalised	% of age group hospitalised
<1	3	2	3	2	67%
1-4	17	13	8	4	24%
5-9	3	1	1	1	33%
10-14	3	3	2	2	67%
15-44	16	9	8	7	44%
45-64	9	7	3	4	44%
65+	10	5	2	5	50%
Total	**61**	**40**	**27**	**25**	**41%**

* Includes culture confirmed non-O157 VTEC cases as well as untyped and unknown serotypes identified through PCR testing

Giardiasis

Number of cases	**163**
Incidence rate	**8.7 per 100,000 population**

Giardia lamblia is a protozoan parasite that causes giardiasis. The parasites are found in the gut of both humans and animals. Giardiasis can cause diarrhoea, abdominal cramps and flatulence; however up to a quarter of cases can be asymptomatic.

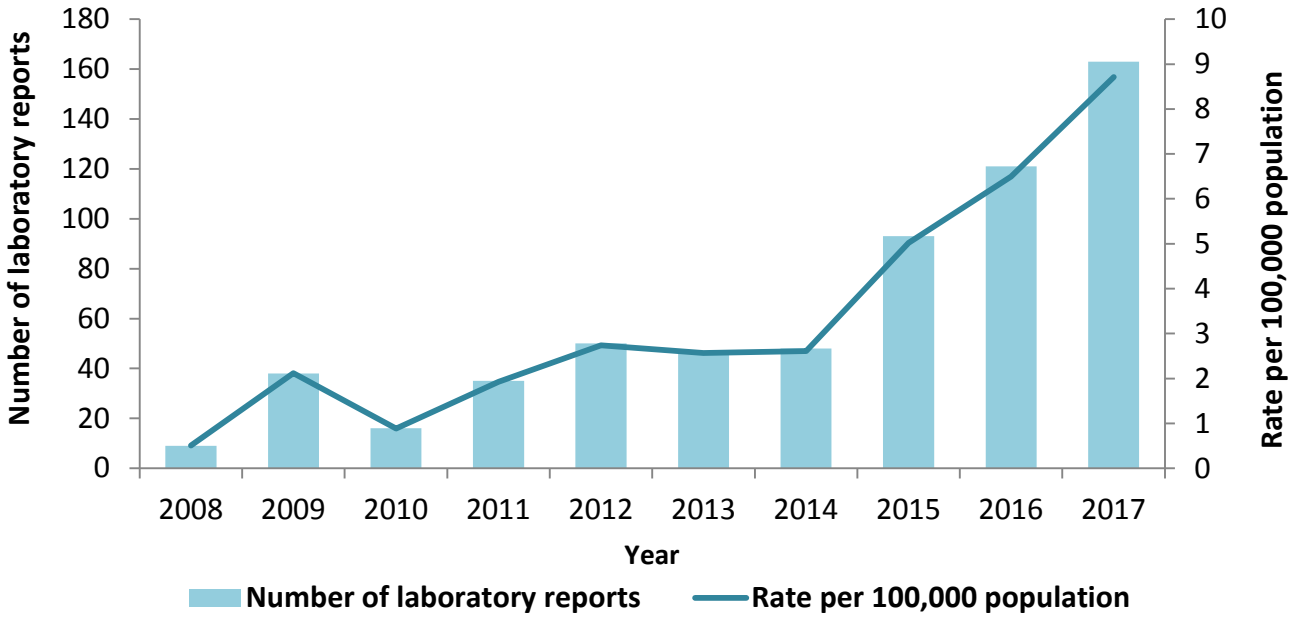
For the third year in a row there has been a large increase in the number of reported cases of giardiasis. While the increases seen in 2015 and 2016 were likely due to changes in both testing policy and test type, that of 2017 would appear to be a genuine increase. However, the cause for this is currently unknown.

Laboratory confirmed cases of giardiasis increased from 121 in 2016 to 163 in 2017 (35% increase). The incidence rate was 8.7 per 100,000 population. There were 32 (20%) cases that were reported as being likely to be associated with foreign travel (Table 11, Figure 10). The proportion of male cases was 63%, which is higher than for most gastrointestinal infectious diseases. There were no outbreaks of giardiasis reported in 2017.

Table 11. No of laboratory reports of *Giardia lamblia*, 2008 - 2017

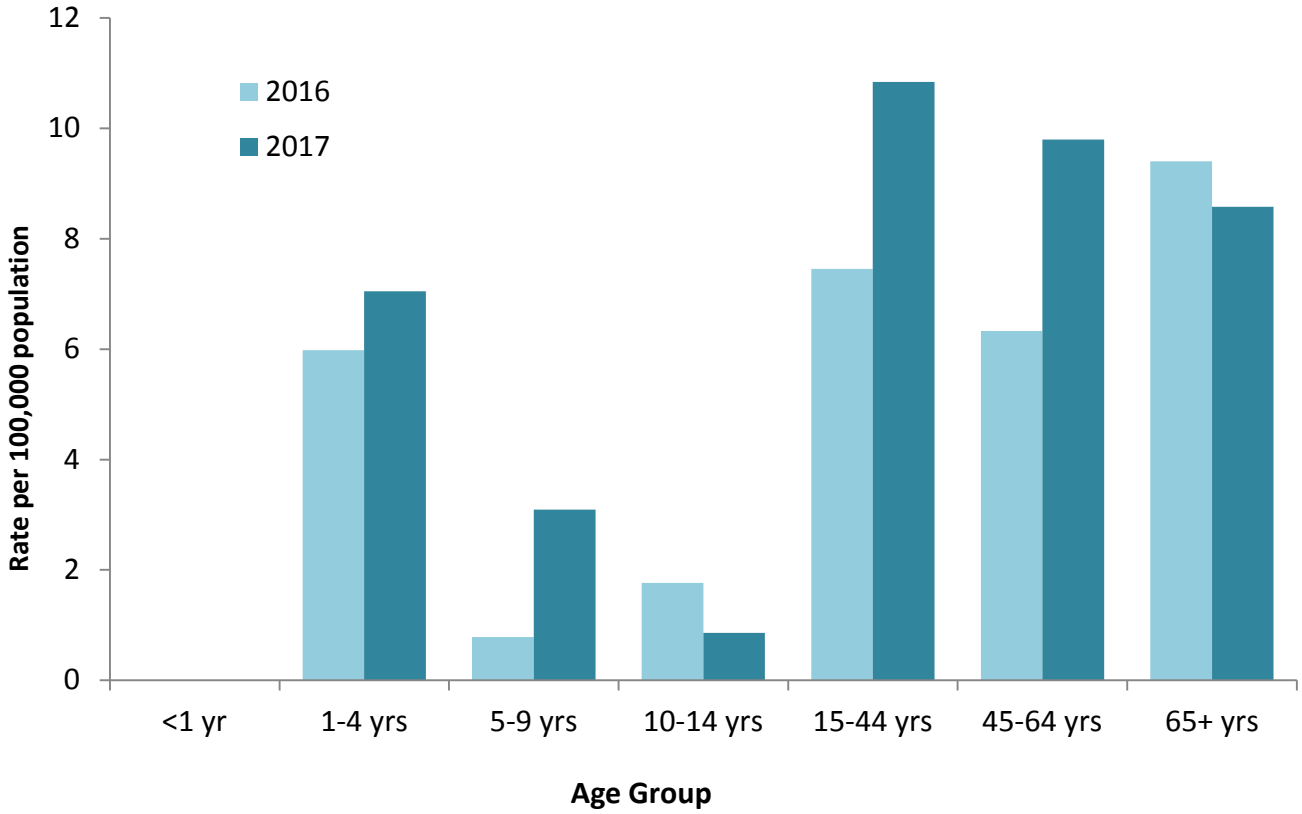
2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
9	38	16	35	50	47	48	93	121	163

Fig 10: Laboratory reports of *Giardia lamblia* (all specimen types), 2008 - 2017



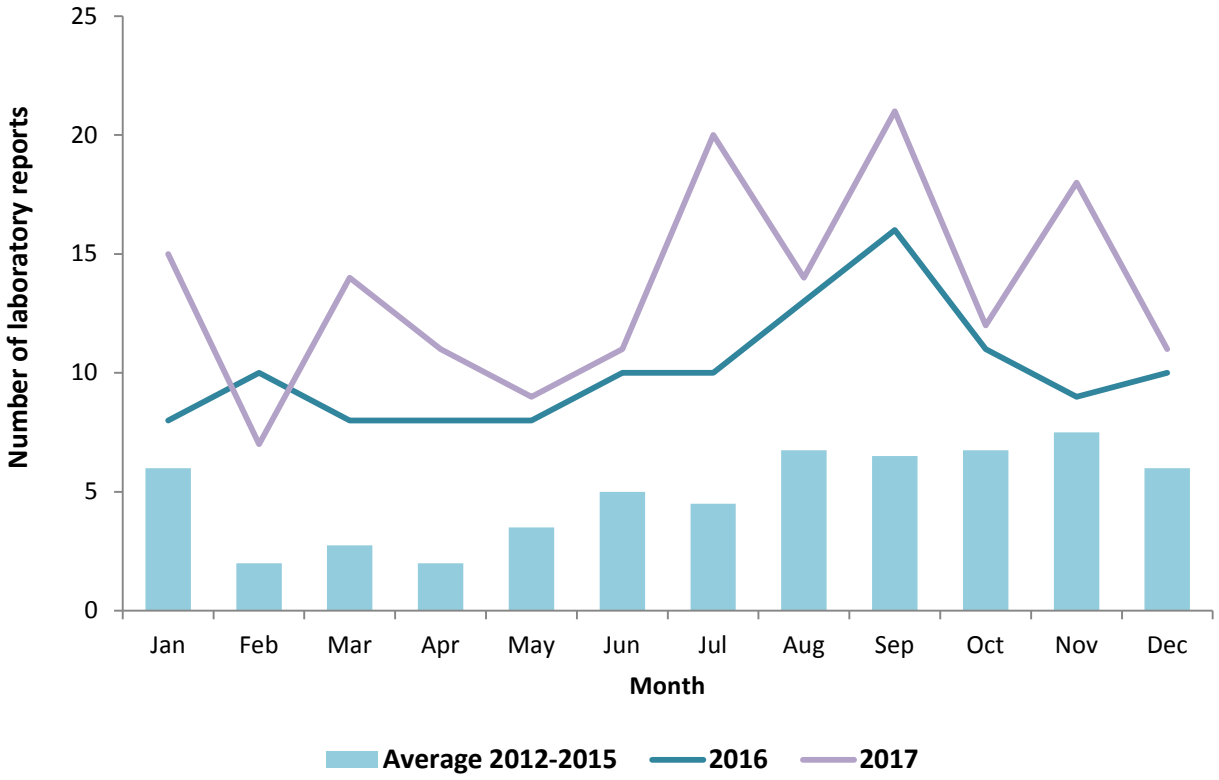
The highest incidence rate in 2017 was in the 15-44 year age group (10.8 per 100,000 population). Overall, a large majority of the cases were in adults aged 18 years and over (91.4%), with incidence rates also highest in the adult population. This is unlike many other common gastrointestinal diseases where rates tend to be highest in young children. Excluding the 10-14 year age group, which had very small numbers, only the over 65 year age group decreased, with the 15-44 and 45-64 year age groups showing substantial increases (Figure 11).

Fig 11: Laboratory reports of *Giardia lamblia* (all age groups), 2016 – 2017



While the number of cases in 2017 increased in the autumn period, there were several peaks from July to November. This is unlike 2016 which showed a pronounced single peak in September. Prior to 2015 the low numbers for this organism meant that seasonality was unclear, but the data in 2016 and 2017 would indicate that Giardia tends to peak in the autumn, which corresponds with data from England and Wales (Figure 12).

Fig 12: Monthly laboratory reports of *Giardia lamblia*, 2012 - 2017



Salmonella

Number of cases	**128 (non-typhoidal)**
Incidence rate	**6.8 per 100,000 population**

Salmonella infections are one of the most commonly reported causes of bacterial gastrointestinal infections across Europe. *Salmonella* infection is characterised by abdominal pain, diarrhoea, fever, nausea, headache and occasionally vomiting. Dehydration amongst vulnerable populations such as infants, the immunocompromised and the elderly can be severe.

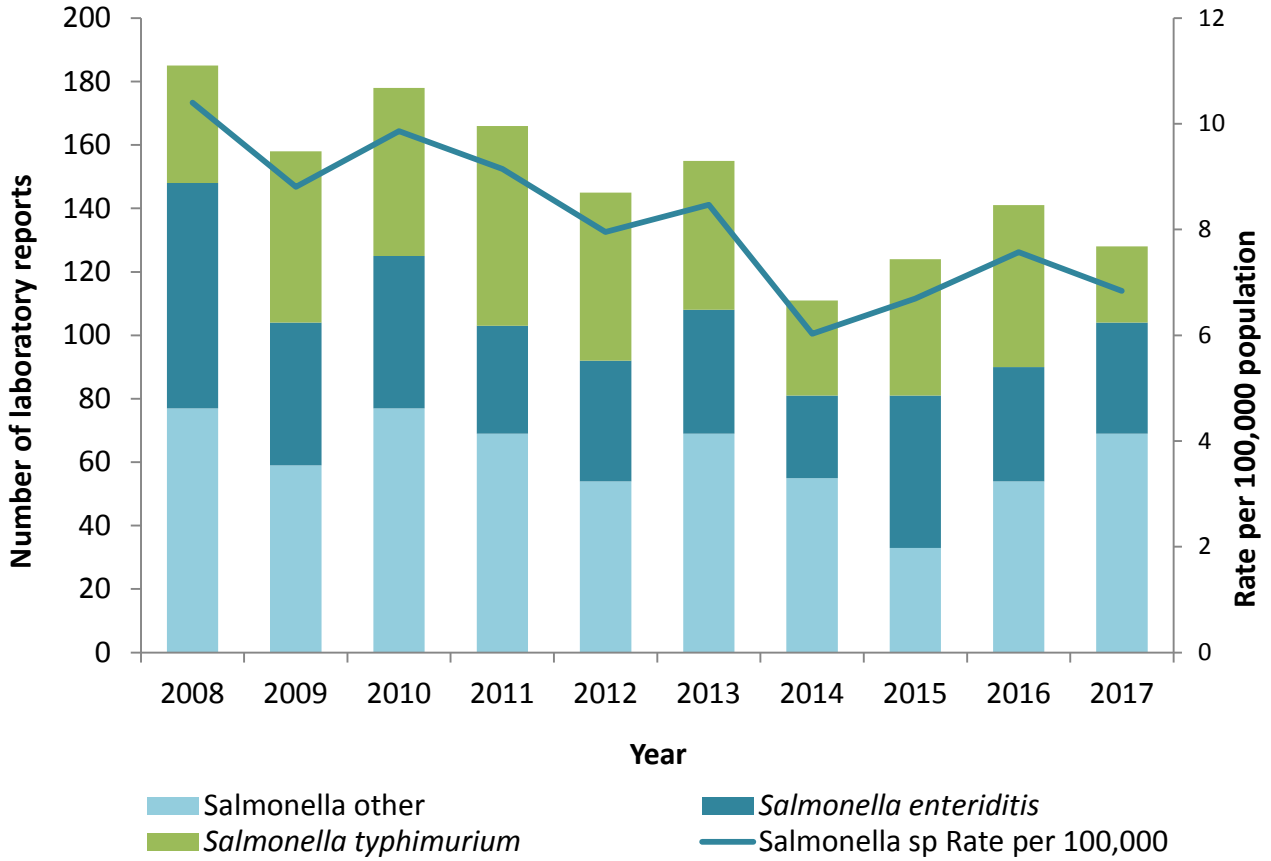
Laboratory reports of *Salmonella* fell in 2017, with the decrease almost entirely due to a large reduction in *S.* typhimurium cases. Total non-typhoidal *Salmonella* cases fell from 141 in 2016 to 128 in 2017 (9% decrease), with S. typhimurium falling from 51 cases to 24 (53% decrease). There is no apparent reason for the fall in this specific serovar at this time. The number of cases due to S. enteritidis showed only a minor decrease from 36 cases in 2016 to 35 in 2017 (3% decrease), with those for other serovars of Salmonella increasing from 54 to 69 (28% increase). The incidence of *salmonella* infections in 2017 was 6.8 per 100,000 population.

The number of reported cases that were associated with foreign travel made up 45% of all cases reported (n=57). Consistent with previous years there were differences in the proportion due to travel between serotypes, with 57% of *S.* enteriditis due to travel but only 46% in the case of *S*. typhimurium. It would appear that the reduction in cases of S. typhimurium is mainly in those considered to be acquired locally, which has led to the increase in proportion associated with travel compared to 2016 (25% increase).

There was one case each of *S.* typhi and S. paratyphi, and both were associated with travel.

In 2017 the proportion of cases in males was 47%, a small reduction compared to 2016 but within the normal range for *Salmonella*.

Fig 13: Laboratory Reports of *Salmonella*, 2008 - 2017



In 2017, *S.* enteritidis and *S*. typhimurium remain the two most frequently reported serotypes in Northern Ireland, accounting for 27% and 18% of cases respectively (Table 12).

Table 12. No of laboratory reports of *Salmonella*, 2008 - 2017

Serovar	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Enteriditis	71	45	48	34	38	39	26	48	36	35
Typhimurium	37	54	53	63	53	47	30	43	51	24
Paratyphi	1	0	2	1	1	1	1	0	2	1
Typhi	1	0	0	1	0	1	1	1	2	1
Other	77	59	77	69	54	69	55	33	54	69
Total	**187**	**158**	**180**	**168**	**146**	**157**	**113**	**125**	**145**	**130**

Similar to many gastrointestinal illnesses, S*almonella* cases follow a seasonal pattern. Reports of salmonella peaked earlier in 2017 than would normally be expected, with reports peaking in July this year compared to September in 2016 (Figure 14). Peaks for cases of the most common serotypes *S.* enteriditis and *S.* typhimurium also peaked earlier than the

previous year, in July and June, respectively (Figure 15). The difference in peak months may be partially due to the differing proportions due to travel for each of these serovars.

Fig 14: Monthly laboratory reports of *Salmonella*, 2012 – 2017

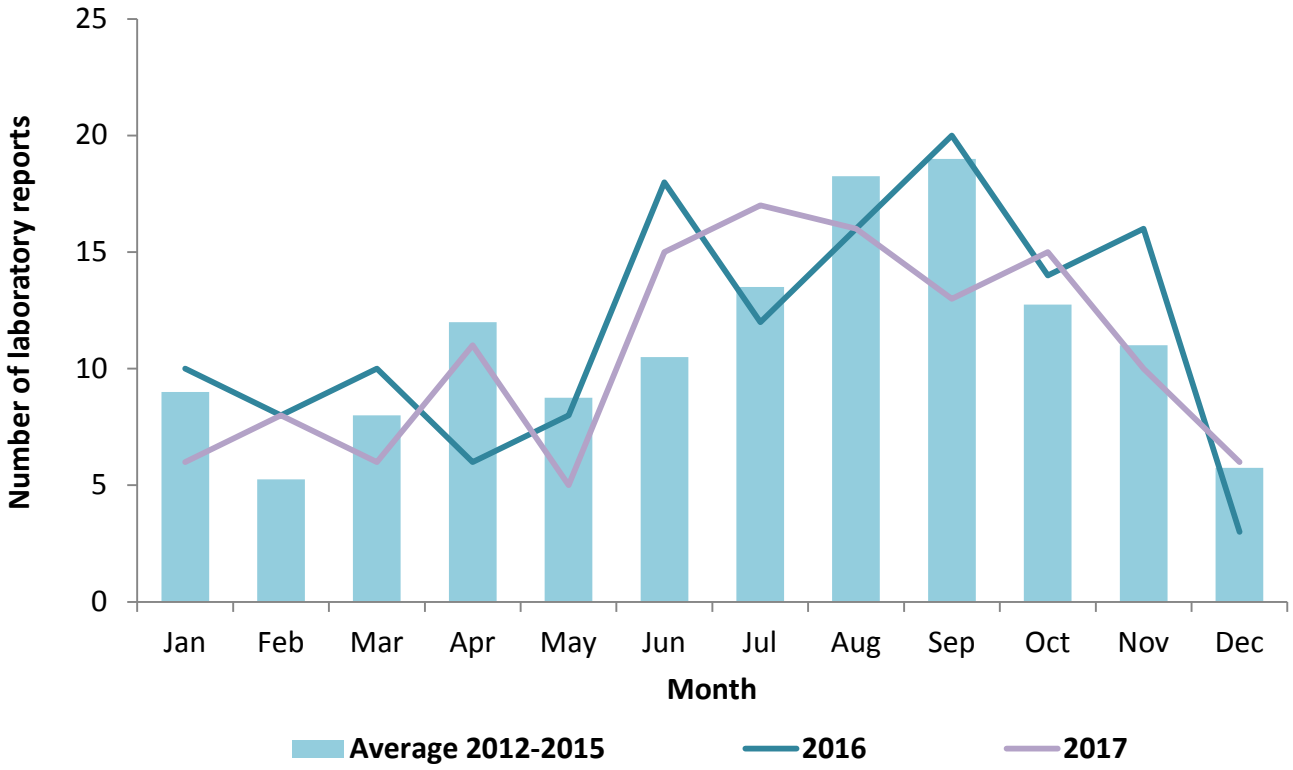
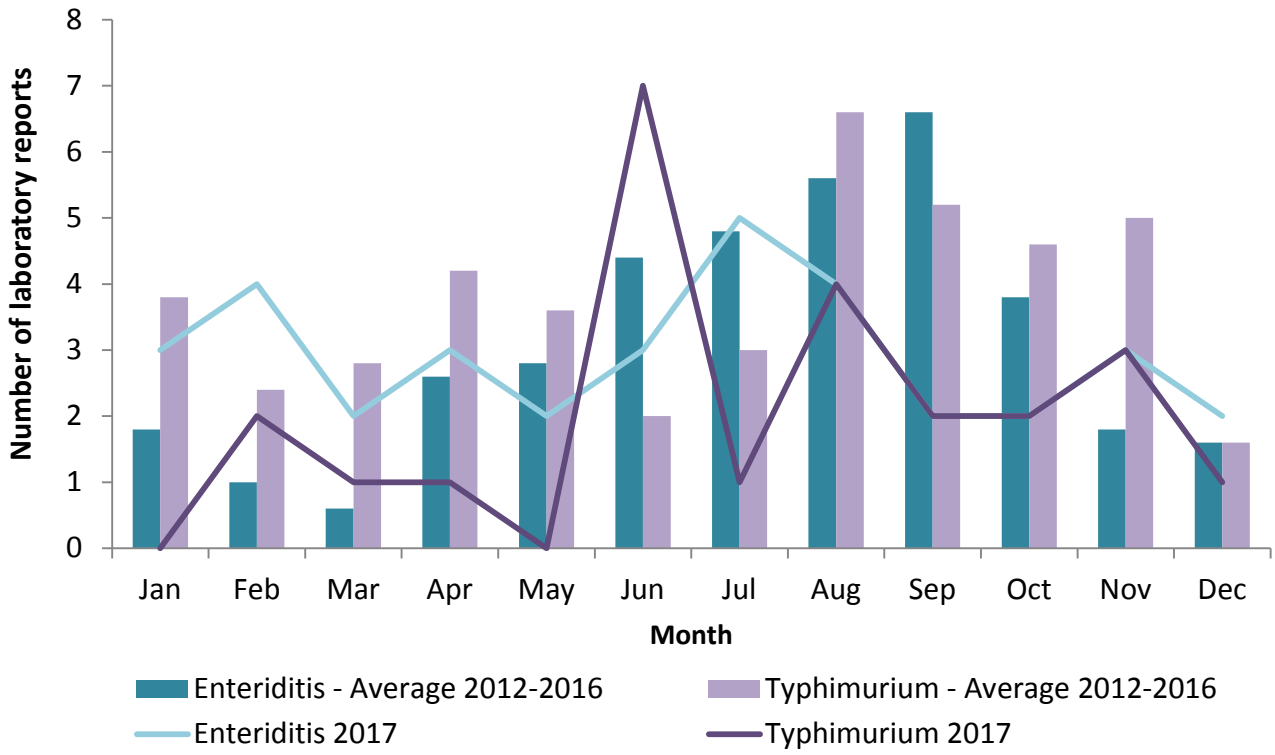
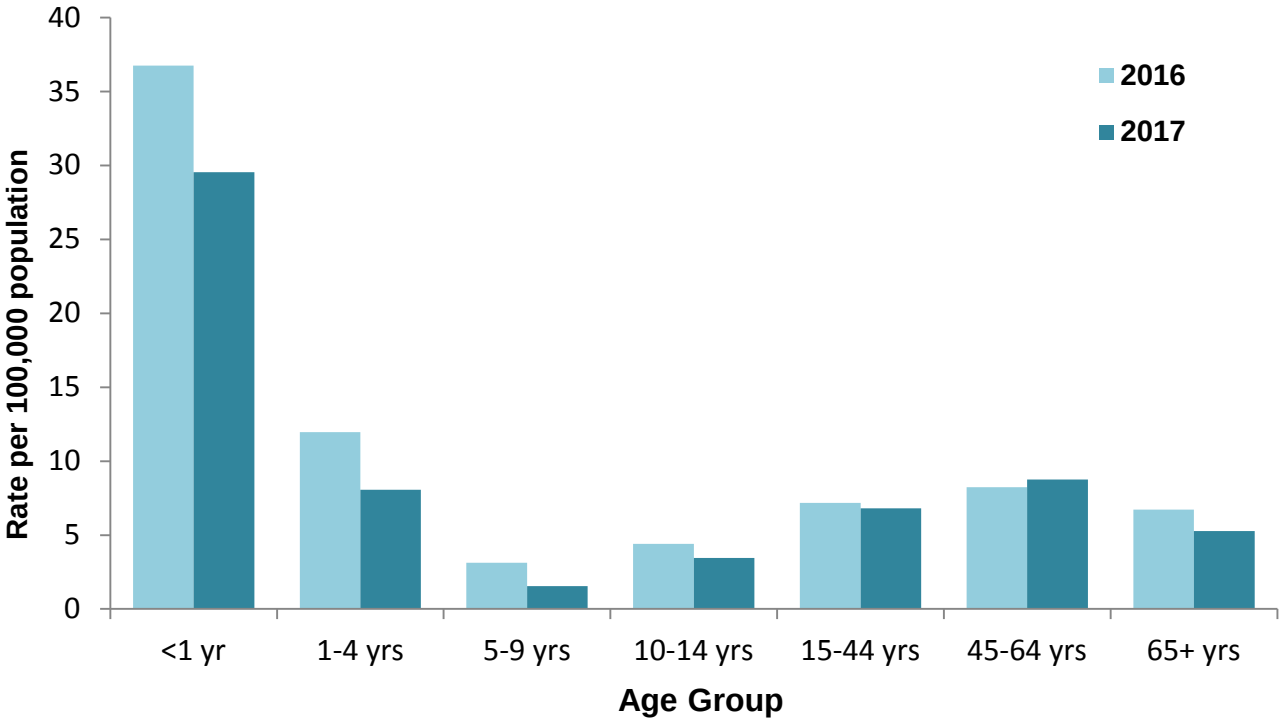


Fig 15: Monthly laboratory reports of *S.* Enteriditis and *S.* Typhimurium, 2017



Similar to 2016, the highest incidence rate in 2017 was in the under 1 year old age group, 29.6 per 100,000 population, although this represents only seven cases (Figure 16). All but one age specific rate decreased, with those in the 15-44 year age group increasing slightly.

Fig 16: Laboratory reports of *Salmonella*, age specific rates (per 100,000 population), 2016 – 2017



Other serotypes for which more than one report was received in 2017 are presented in Table 13 along with data from the previous 3 years. However, other than S. enteriditis and S. typhimurium the numbers of individual serovars remain very low. There were an additional 25 serovars reported in 2017 where there was only one associated case, five of which were seen for the first time in Northern Ireland.

Table 13. *Salmonella* serovars 2014 – 2017

2014		2015		2016		2017	
Serovar	**No**	**Serovar**	**No**	**Serovar**	**No**	**Serovar**	**No**
Java	4	Infantis	3	Infantis	7	Infantis	8
Agona	3	Stanley	3	Oranienburg	3	Mikawasima	7
Heidelberg	3	Agona	2	Agona	3	Stanley	4
Infantis	3	Heidelberg	2	Bredeney	2	Newport	4
Newport	3	Saint-Paul	2	Stanley	2	Agona	3
Saint-Paul	3	Nachshonim	2	Newport	2	Saint-Paul	3
Stanley	3	Muenchen	2	Hadar	2	Java	3
Virchow	3			Typhi	2	Montevideo	2
Braenderup	2			Paratyphi	2	Agama	2
Corvallis	*2*					Indiana	2

Shigella

Number of cases	**24**
Incidence rate	**1.3 per 100,000 population**

Shigellosis, also called bacillary dysentery, is caused by four species; *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii* and *Shigella sonnei*. The two most commonly seen in Northern Ireland are *Shigella sonnei* and *Shigella flexneri,* with the latter generally being more severe. The illness is characterised by diarrhoea, sometimes with blood and mucus and is common amongst young children. However, infection can occur in all ages after travel to areas where hygiene is poor. Invasive disease is rare but extra-intestinal complications such as Haemolytic Uraemic Syndrome (HUS) can occur.

The total number of culture confirmed laboratory reports of Shigella species increased in 2017; however, both *S. flexneri* and *S. sonnei cases* decreased with the overall increase due to reports of *S. boydii* and *S. dysenteriae* (Tables 14 & 15). The number of cases that were identified solely by PCR testing methods increased substantially from 5 in 2016 to 25 in 2017.

Table 14. No of culture confirmed laboratory reports of Shigellosis, 2008 - 2017

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
16	13	5	8	9	4	21	31	21	24

Table 15. No of culture confirmed reports of Shigellosis by serogroup, 2013 - 2017

Serogroup	2013	2014	2015	2016	2017
S. boydii	0	1	1	0	2
S. dysenteriae	0	0	0	0	2
S. flexneri	1	13	14	8	6
S. sonnei	2	7	16	12	9
Untyped	1	0	0	1	1
Total	**4**	**21**	**31**	**21**	**24**

Table 16. No of PCR only reports of Shigellosis, 2014 - 2017

	2014	2015	2016	2017
Number of reports	4	16	5	25

Fig 17: Culture confirmed laboratory reports of *Shigella*, 2008 - 2017

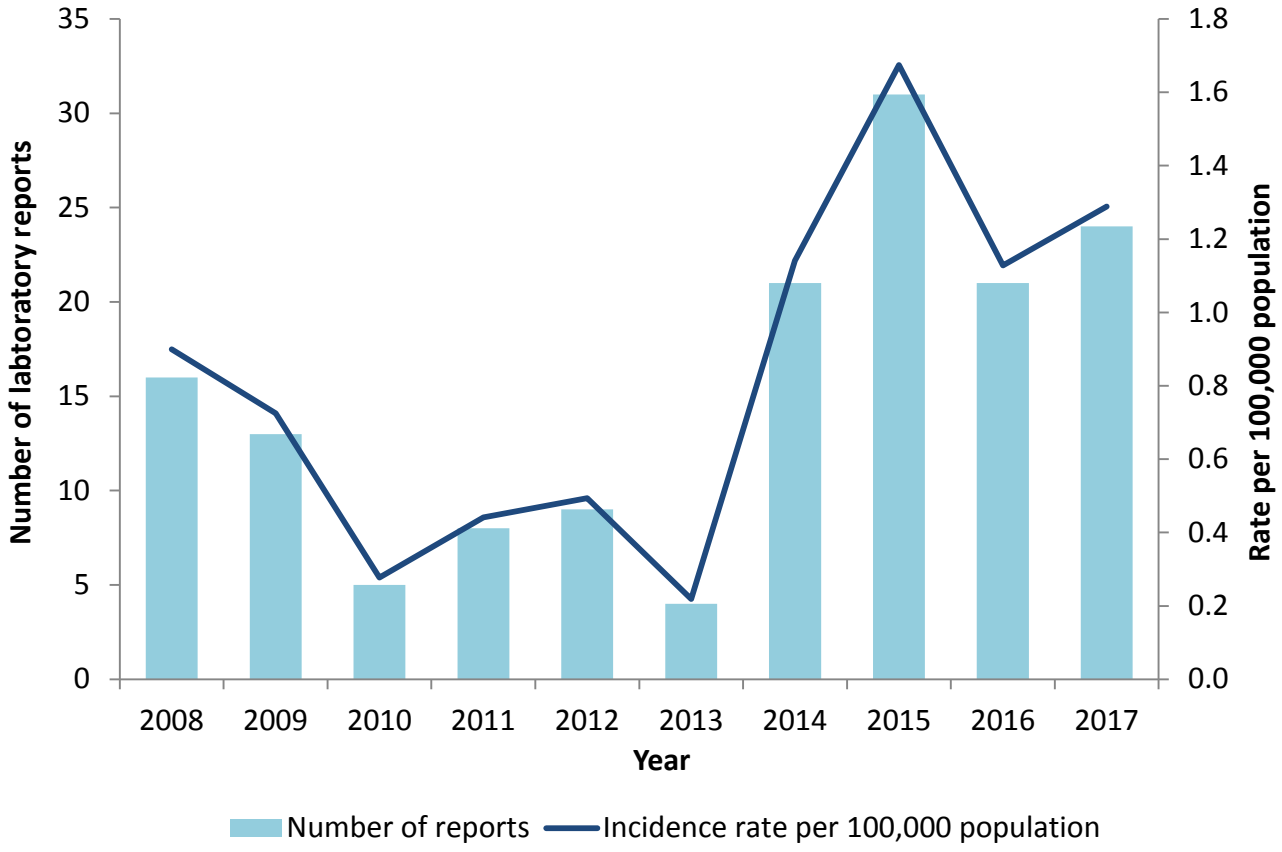
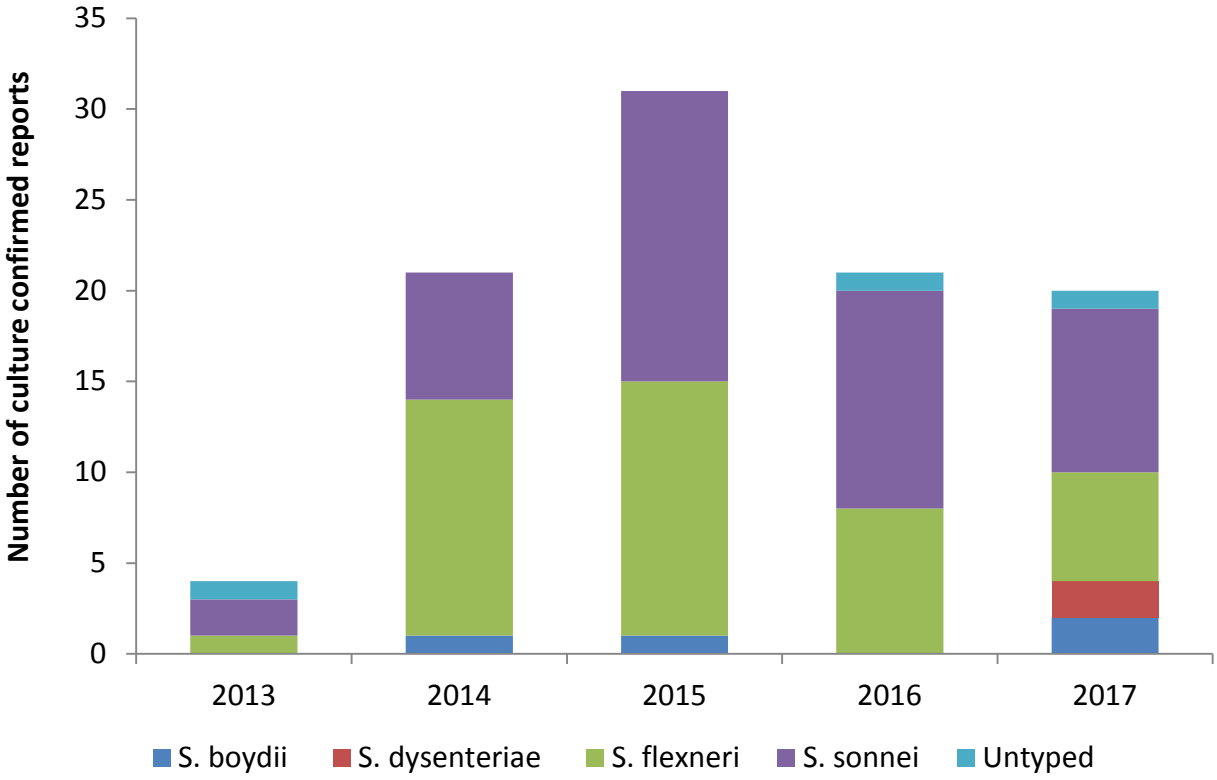


Fig 18: Culture confirmed laboratory reports of *Shigella sp* 2013 - 2017



Whilst a number of gastrointestinal infections show a larger proportion of male cases, *Shigella sp* displays a larger proportion of males than any other, particularly in those infections considered to be community acquired (i.e. not travel related). Overall 83% of culture confirmed cases are male in 2017.

Shigella sp has been involved in a number of ongoing outbreaks within the MSM (males who have sex with males) community in England. Enhanced surveillance of cases in Northern Ireland have also indicated that at least some are likely related to sexual transmission within the MSM community. This may also partially explain the high proportion of males with the infection.

Other Gastrointestinal Infections

Adenovirus (gastroenteritis)

Adenovirus causes a variety of diseases but certain serotypes can cause gastroenteritis, particularly in young children. It is estimated that it is the second most common virus causing gastroenteritis in young children. Symptoms generally include diarrhoea and vomiting but tend to be relatively mild and short-lived, although dehydration can sometimes be an issue.

Table 17. No of laboratory reports of Adenovirus (faecal), 2007 - 2016

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
270	222	127	209	207	102	125	115	104	85

Clostridium perfringens

Clostridium perfringens is widely distributed in the environment and foods and forms part of the normal gut flora in humans and animals. Food poisoning most often occurs when food (usually meat) is prepared in advance and kept warm for several hours before serving. Illness generally lasts no more than 24 hours, although elderly people may be more seriously affected. This organism is not routinely tested for in cases of gastroenteritis. In 2017 there were 25 cases of clostridium perfringens reported in Northern Ireland (Table 18).

Table 18. No of laboratory reports of Clostridium perfringens, 2007 - 2016

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
36	18	36	16	28	24	23	34	24	25

Listeria

Listeria is a rare but potentially life-threatening disease. Healthy adults are likely to experience only mild infection, causing flu-like symptoms or gastroenteritis. However, listeria infection can occasionally lead to severe blood poisoning or meningitis. Pregnant women, the elderly and people with weakened immune systems are more susceptible to listeria. It is particularly dangerous in pregnancy as although the illness is unlikely to be serious for the mother, it can cause miscarriage, premature delivery or severe illness in a newborn child. This organism is not routinely tested for in cases of gastroenteritis. In 2017 there was only one case of listeria reported in Northern Ireland (Table 19).

Table 19. No of laboratory reports of *Listeria*, 2007 - 2016

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
11	4	2	3	7	2	4	6	4	1

Norovirus

Norovirus is the most common known cause of gastrointestinal infections in the United Kingdom. Within closed settings such as hospitals the virus can cause widespread disruption because it is able to survive for long periods in the environment. It has a low infectious dose and any immunity to infection is short-lived. Norovirus infection rates peak in winter months; however, it is present in the community all year round.

The number of laboratory reports of norovirus does not necessarily reflect the level of Norovirus present in the community as many reports are associated with outbreaks. However, in outbreak situations only a small number of patients are usually tested. Once norovirus is identified there is usually no further testing done for patients associated with that outbreak. This means that relatively few cases are identified for testing.

In 2017 there were 299 laboratory reports of Norovirus reported in Northern Ireland (Table 20).

Table 20. No of laboratory reports of norovirus, 2008 - 2017

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
439	424	643	445	592	386	272	335	618	299

Rotavirus

Rotavirus is a common cause of gastroenteritis in infants and very young children, with many children suffering an infection by the age of five. Rotavirus can cause severe vomiting, severe diarrhoea and stomach cramps. Symptoms usually last from three to eight days. Adults may become infected, though repeat infections are generally less severe than infections during childhood. The majority of infections tend to occur in the spring (Table 21).

A rotavirus vaccine for children was introduced in Northern Ireland in July 2013 and a high uptake rate has been reported so far (estimated at 94% of eligible children receiving two doses of the vaccine in the first year of the programme). For further information on the rotavirus immunisation programme please see http://www.publichealth.hscni.net/news/pha-launches-rotavirus-vaccine-protect-babies-under-4-months.

Rotavirus reports increased substantially in 2017 compared to the previous year but remained lower than was seen prior to the introduction of the vaccine.

Table 21. No of laboratory reports of rotavirus, 2007 - 2016

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
724	594	599	630	543	599	210	404	101	234

Gastrointestinal Outbreaks

A total of 142 gastrointestinal outbreaks were reported in 2017 with the suspected mode of transmission for these outbreaks being either person-to-person spread or unknown in all cases.

Similar to previous years the most commonly identified causative agent of the gastrointestinal outbreaks was norovirus, which accounted for 44 (31%) of all outbreaks. Three other outbreaks had an organism identified, one as rotavirus, one as Astrovirus and one as *Cryptosporidium*.

The causative organism was not determined in 95 (67%) of the gastrointestinal outbreaks, although it is likely these were viral in origin.

During 2017 there were a total of 30 hospital outbreaks, 108 residential institution outbreaks and a further 4 outbreaks linked to other sites (e.g. nursery, conference facilities) (Table 22).

Table 22: Total distribution and location of gastrointestinal outbreaks 2017 (based on date of report to PHA)

Location	Identified Organism(s)	No of outbreaks
Hospital	Norovirus	7
	Not identified	22
	Astrovirus	1
Residential institution	Norovirus	35
	Rotavirus	1
	Not identified	72
Other	*Cryptosporidium*	1
	Norovirus	2
	Not identified	1

* In gastrointestinal outbreaks it is not normal practice for all symptomatic individuals to be tested once the causative organism has been identified. Therefore the number of symptomatic individuals is often in excess of the number of laboratory confirmed cases.

Summary

Several organisms demonstrated an increase in the number reported in 2017, including *Campylobacter, Giardia lamblia* and rotavirus.

Campylobacter reports rose (13% increase) to their highest level in the past ten years following a two year period when the number of reported cases were dropping. Some of this increase may be due to more sensitive methods of testing introduced in 2015.

Reports of *Cryptosporidium* reports decreased (10% reduction) but still remained much higher than in the years prior to testing changes in 2015. Conversely, reports of giardiasis showed a large increase for the third year in a row. Some of this increase in recent years is likely due to increased ascertainment due to the same testing changes seen in other organisms. The year on year rise would suggest that there has also been an increase in the underlying incidence of giardiasis.

E. coli O157 cases displayed a reduction in 2017 (30% decrease). However, whilst elevated, this figure is similar to those seen in earlier years. We are continuing to see relatively large numbers of other serotypes and PCR positive only specimens, although these data are difficult to interpret due to the lack of comparable data.

Reports of *Salmonella* fell in 2017 (9% decrease) with the reduction mainly due to a large decrease in *S.* Typhimuirum cases. Similar to previous years, a large proportion (45%) of reported cases were thought to be travel related and similar variations were found between different serotypes in terms of the proportion due to travel.

Shigella reports increased in 2017 (14% increase) despite a fall in the number of cases of both *S. sonnei* and *S. flexneri*. The increase seen was due to cases of *S. boydii* and *S. dysenteriae* which are rarely reported in Northern Ireland. Reports remain relatively high compared to the years prior to 2014. PCR only results increased substantially compared to 2016.

Outbreak activity fell in 2017, particularly in hospital settings. However, the majority of outbreaks were related to either Norovirus or suspected viral gastroenteritis as would normally be expected. Only one outbreak was reported as being from a non-viral source (*Cryptosporidium*).

Reports of rotavirus rose from 101 in 2016 to 234 in 2017 (132% increase) However, the total number overall remains one of the lowest reported in the past 10 years. This is likely due to the effect of the ongoing vaccination programme.

Summary table of laboratory reports

Table 23. No of laboratory reports of selected gastrointestinal infections, 2008 - 2017

Organism	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Adenovirus (faecal)	270	222	127	209	207	102	125	115	104	85
Campylobacter sp	848	977	1040	1175	1211	1355	1414	1320	1258	1421
Clostridium perfringens	36	18	36	16	28	24	23	34	24	25
Cryptosporidium sp	119	118	119	140	177	161	143	204	282	253
E coli O157	59	48	77	56	198	72	54	33	81	57
Giardia sp	9	38	16	35	50	47	48	93	120	163
Listeria sp	11	4	2	3	7	2	4	6	4	1
Norovirus	439	424	643	445	592	386	272	335	618	299
Rotavirus	724	594	599	630	543	599	210	404	101	234
Salmonella sp*	185	158	178	166	145	155	111	124	141	128
Shigella sp**	16	13	5	8	9	4	21	31	21	24

* non-typhoidal
** culture confirmed

See individual sections for more information.

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