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Guidance for the Public Health Management of Pertussis

Version number: 1.0

Publication Date: 21st July 2025

Please note that this document should be used in tandem with:

- Identification and management of Pertussis in Primary care and other ambulatory care settings – Algorithm
- Laboratory Test Selection Algorithm for Confirmation of Clinically Suspected Cases of Pertussis
- Algorithm for the management of close contacts of Pertussis
- Pertussis Oral Antibiotic Treatment and Chemoprophylaxis Recommendations

Readers should not rely solely on the information contained with these guidance outputs. Guidance information is not intended to be a substitute for advice from other relevant sources. Clinical judgement and discretion will be required in the interpretation and application of this guidance document. This guidance document is regularly reviewed based upon emerging evidence at national and international levels and national policy decisions. In tandem with this, the guidance will be formally reviewed on a three-year cycle.

For further information please contact rgdu@hpsc.ie

VERSION HISTORY

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Contents

Glossary of acronyms and abbreviations

CBR	Consensus Based Recommendations
CHI	Children's Health Ireland
CIDR	Computerised Infectious Disease Reporting
DFA	Direct Fluorescent Antibody
DNHP	Director of National Health Protection
DPH	Departments of Public Health
DTaP	Diphtheria, tetanus, and acellular pertussis (full dose) containing vaccine
DTP	Diphtheria, Tetanus and Pertussis
ECDC	European Centre for Disease Prevention and Control
ELISA	Enzyme-linked immunosorbent assay
GDG	Guideline Development Group
GMS	General Medical Services
GP	General Practitioner
HCW	Health and care Worker
HPAC-ID	Health Protection Advisory Committee for Infectious Diseases
HPSC	Health Protection Surveillance Centre
HSE	Health Service Executive
IgG	Immunoglobulin G
IPC	Infection Prevention and Control
NHPO	National Health Protection Office
NIAC	National Immunisation Advisory Committee
N-IMT	National Incident Management Team
NIO	National Immunisation Office
NPA	Nasopharyngeal Aspiration
NPS	Nasopharyngeal Swab
OCT	Outbreak Control Team
PCI	Primary Childhood Immunisation
PCR	Polymerase Chain Reaction
PCRA	Point of Care Risk Assessment
PCRS	Primary Care Reimbursement Service
PHE	Public Health England
PHRA	Public Health Risk Assessment
PNS	Per nasal Swab
PPE	Personal Protective Equipment
PPV	Positive Predictive Value
PT	Pertussis Toxin
ptxA-pr	Pertussis Toxin Promoter
RGDU	Research and Guideline Development Unit
SME-TG	Subject Matter Expert Topic Group
Tdap	Tetanus, diphtheria and acellular pertussis (low) dose containing vaccine
UKHSA	United Kingdom Health Security Agency
WHO	World Health Organization

Preface

Purpose

This guidance provides detailed public health advice on the prevention and management of cases and contacts of pertussis in Ireland. The purpose of this guidance is to provide nationally consistent guidance to regional Departments of Public Health (DPH) and National Health Protection in responding to a notifiable disease event relating to pertussis (case or outbreak). This document specifies detailed public health guidance on the risk assessment of possible, probable and confirmed pertussis cases, the management of their contacts and a description of the laboratory testing services available to support this. This guidance has been adapted from Guidance on the management of cases of pertussis in England during the re-emergence of pertussis in 2024 (UKHSA, 2024) (1) and Guidelines for the Public Health Management of Pertussis in England (PHE, 2018) (2).

This guidance review was undertaken by a multidisciplinary guideline development group (GDG) convened by the Director of National Health Protection, HSE Public Health: NHPO in 2024 (please see Appendix A for membership) and should be considered in conjunction with other relevant HSE Public Health: NHPO guidance and algorithms for the public health management of pertussis available here.

Acknowledgements

The NHPO is grateful for the contributions that many individuals and organisations have made to the development of this guideline. A full list of guideline development group members and external stakeholders involved in the development of this guideline are outlined in Appendix A

Methodology

This guidance has been adapted from UKHSA and PHE sources following a comprehensive search and appraisal of international guidelines (3). The methodology applied to adapt the UKHSA and PHE guidance was based primarily on Consensus Based Recommendations (CBR) as per the Framework for the development of National Health Protection Guidance in Ireland. This methodology is used to assist practitioners when developing public health guidance and where reaching expert consensus is needed to determine the applicability, acceptability and feasibility of the recommendations from the source guidance.

Consensus methods require a group or panel of experts, the Guideline Development Group (GDG), to review existing evidence (or the evidence on which the source guideline is based), the interpretation of that evidence in the local context and agree on recommendations. Each

chapter within the guidance was reviewed by content experts from across Ireland with expertise in the specific topic. The appointed chair of the group acted as facilitator of the consensus process. Criteria for the 'consensus process working group' membership included:

- extensive in-depth knowledge and experience of the topic in question
- no existing conflict of interest that would prohibit ability to make a balanced judgement relating to the topic in question.

The GDG considered the selected evidence available (scientific and/or non-scientific) and interpreted this to adequately address the proposed guidance. Modifications to source recommendations and the evidence supporting the modification were carefully documented. A formal approach was adopted to reach consensus on recommendations by combining a modified e-Delphi approach (4) and the Nominal Group Technique (5). The GDG documented the decision-making process and how they moved from the available evidence to each recommendation. Recommendations were either accepted, accepted with modifications or deemed unacceptable. Based on these decisions the panel created adapted guidance acceptable for addressing the health questions in an Irish context.

Review and approval process

All content underwent extensive review within the GDG. Each chapter was presented to the GDG for input and was revised following critical feedback. Subsequent revised versions were circulated to the GDG members for approval.

Approved versions were then sent for external review by experts in the topic. All chapters were reviewed by members of the pertussis National Incident Management Team (N-IMT) and the Area Directors of Public Health. All feedback and subsequent revisions were reviewed by the Chair of the GDG. Upon acceptance, the GDG recommended approval of the guideline to the Health Protection Advisory Committee for Infectious Disease (HPAC-ID) and the Director of National Health Protection (DNHP).

In advance of publication of the Guidance the GDG engaged with the National Patient and Service User Forum and a final draft copy was made available. This was completed in July 2025.

Future updates

A review of this guidance will be undertaken no more than three years after publication by the Research and Guideline Development Unit (RGDU) as part of the routine cycle of guidance

review. The RGDU may undertake a more rapid update of specific chapters within this guidance if new and relevant evidence is published according to need.

Disclosure Statement

The subject matter expert topic group (SME-TG) members were asked to declare potential conflicts of interest at the time of appointment. A policy for the management of conflict of interest was put in place.

Funding

The RGDU was commissioned by the pertussis National Incident Management Team (N-IMT) convened by the DNHP to undertake the work on this guidance. No funding was received for the development of this guidance and the work was delivered within the resources available to the NHPO.

Chapter 1 Background and Rationale

1.0 Introduction

1.1 Who is this guidance for

This guidance is intended for use by clinicians in general practice and other ambulatory care settings who may assess a patient presenting with possible pertussis and Regional Departments of Public Health (DPH) responsible for case and contact management as well as National Health Protection.

1.2 Clinical symptoms and transmission

Pertussis, also known as (whooping cough) is an acute bacterial infection caused by *Bordetella* pertussis, an exclusively human pathogen that can affect people of all ages. Pertussis occurs world-wide. The disease is an important cause of infant death internationally and continues to be a public health concern even in countries with high vaccination coverage. The World Health Organization (WHO) reported that in 2018, there were more than 151 000 cases of pertussis globally (6).

Transmission of the organism occurs as a result of close direct contact with an infected person (7). It is highly contagious, with up to 90% of non-immune household contacts developing the disease (8). Infection is often transmitted to young children in the home from older siblings or adults who may be harbouring the bacteria in their nose and throat. Once infected, an individual with pertussis can be infectious for four to five weeks from the onset of the illness. Greatest infectivity occurs early in the illness, in the initial catarrhal stage, even before the cough has developed, and during the first 3 weeks after the onset of cough (9). Thus, infected individuals can transmit the infection before they know they have pertussis.

The incubation period of pertussis is on average between 7-10 days (range 5-21 days). While adolescents and adults tend to have a prolonged cough illness but without other major symptoms, young unimmunised infants are the most vulnerable group with the highest rates of complications and death. The usual clinical presentation is an initial catarrhal stage with a cough that becomes paroxysmal. Paroxysms of cough usually increase in frequency and severity as the illness progresses and persist for 2-6 weeks. These paroxysms may end in vomiting, cyanosis and/or a characteristic inspiratory whoop. In young infants the typical 'whoop' may never develop, and coughing spasms may be followed by periods of apnoea.

[What does whooping cough sound like?][a]

Symptoms slowly improve in the convalescent phase, which generally lasts 2-6 weeks but can persist for months. Adults generally have a non-productive cough illness without fever (10). Serious complications include pneumonia, seizures and encephalitis. Vaccination provides the most effective strategy for preventing pertussis transmission in the population, although protection afforded by vaccination or from past infection is not lifelong.

1.3 Epidemiology of pertussis in Ireland and recent international situation

Epidemiological data on pertussis has been gathered in Ireland since 1948. During this time there has been an overall decline in incidence and the number of deaths associated with pertussis (Figure 1). A decline in pertussis incidence followed the introduction of the vaccine in the early 1950s. A resurgence of disease in the mid-1970s (following adverse media reports or alleged severe side effects of the pertussis vaccine) negatively impacted vaccination uptake. This was then followed by an upsurge in incidence of disease in the latter half of the 1970s and 1980s. As confidence in the vaccine was restored immunisation uptake increased and the incidence of whooping cough declined again.

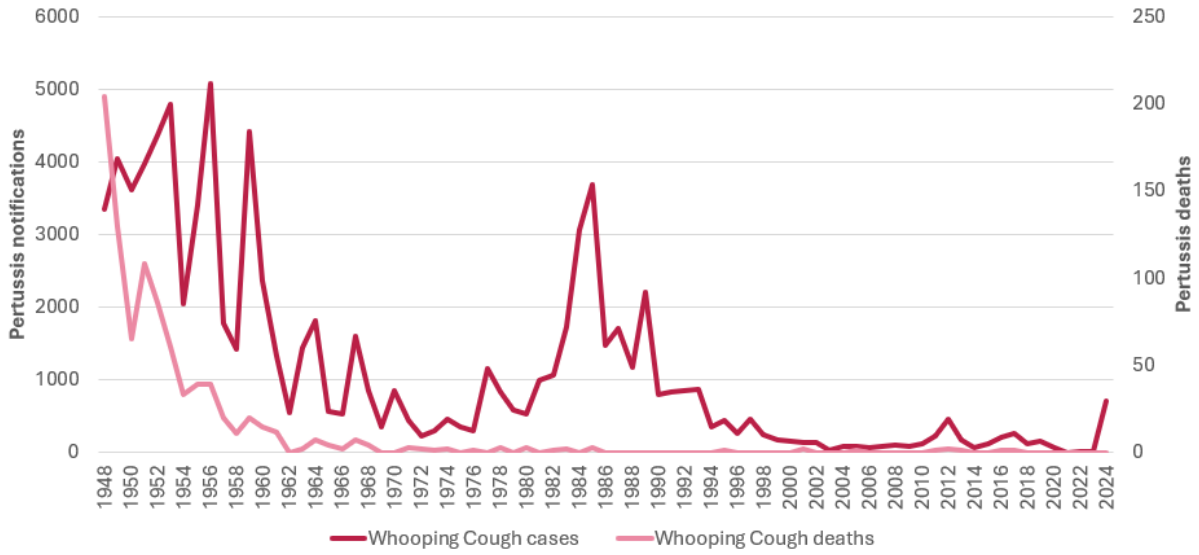

Figure 1. Number of pertussis cases and deaths notified 1948-2024. Please note the axes for notifications and deaths use different scales.

[a] Reproduced with permission from United Kingdom Health Security Agency (UKHSA). Contains public sector information licensed under the Open Government Licence v3.0.

In Ireland we continue to observe periodic cycles of increased pertussis activity, typically every 5 to 6 years (Figure 2). In recent years, we observed cycles in 2011-2013, 2016-2018, and in 2024.

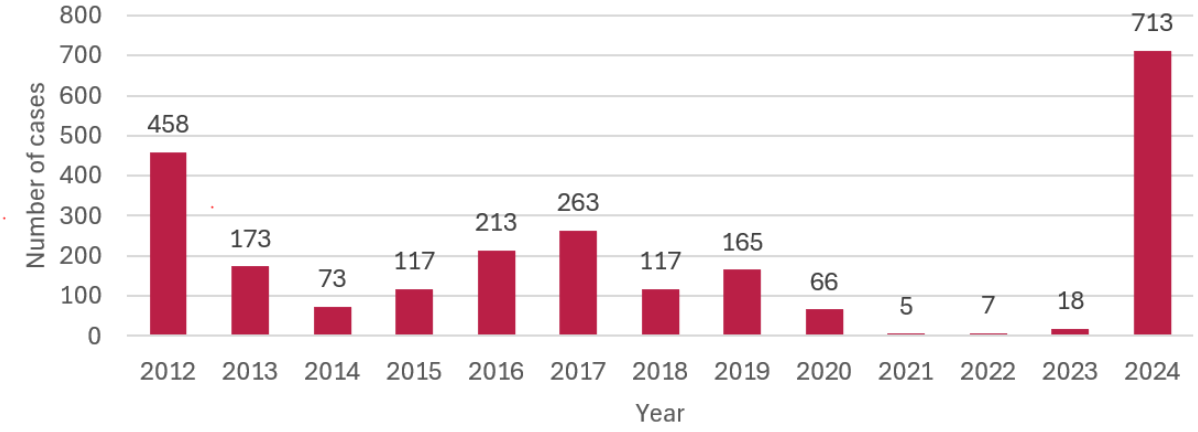

Figure 2. Pertussis notifications 2012-2024.

In 2024, 713 cases were notified, the highest since 1993. During the years of the COVID-19 pandemic very low numbers were notified (2021 – 5 cases, 2022 – 7 cases, 2023 – 18 cases). While the 2024 increase was not unexpected due to the cyclical nature of pertussis activity and low circulation during pandemic years, the magnitude was higher than expected, surpassing recent cyclical peaks. Similar high magnitude cycle years have been observed across Europe and the Americas since 2023 (11-14). This increase has continued into 2024, and some countries have reported pertussis-related deaths. The magnitude seen in several countries may be due to increase in the proportion of the population susceptible to pertussis due to a decline in the coverage of diphtheria, tetanus and pertussis vaccines (DTP) and waning natural immunity due to low circulating levels of pertussis during the COVID-19 pandemic. Improvements in diagnostic testing, including expansion of availability of PCR, may also be a factor.

The highest incidence is observed in infants, particularly those less than 6 months old (Figure 3). This may reflect the fact that infants are more likely to be hospitalised and tested, rather than true incidence.

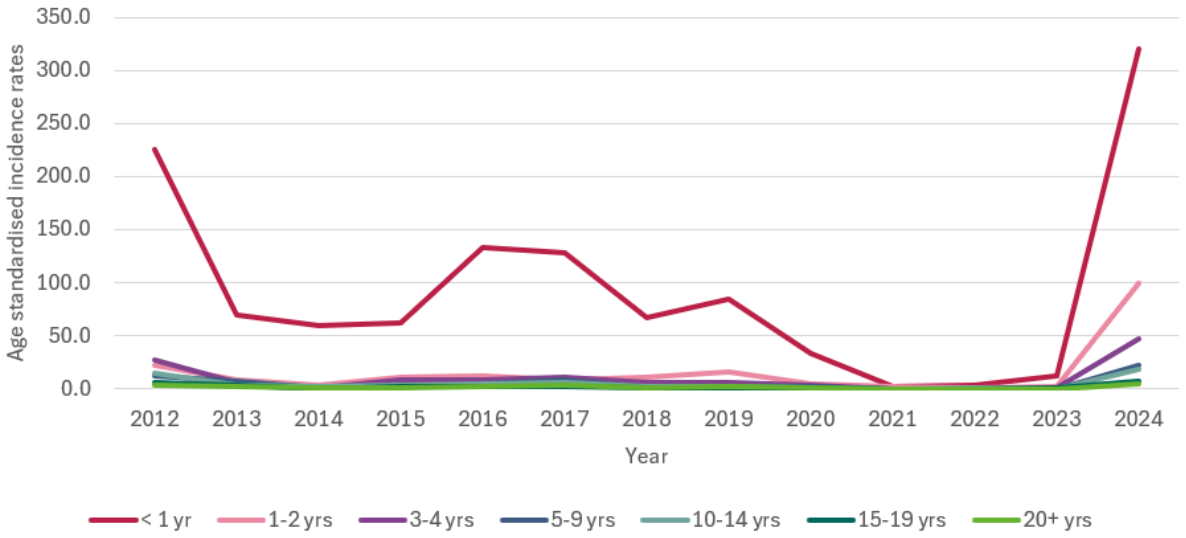

Figure 3. Age specific incidence rates of Pertussis 2012-2024

In recent years there has been an increase in cases among older children, adolescents and adults. This change may be partially due to increased recognition and testing. Waning immunity, that occurs after both disease and vaccination, and a reduction in natural boosting are also likely to be contributing factors. There may also be a change in the characteristics of the organism, although no vaccine-resistant mutants have been identified. Incidence of hospitalisations is highest in infants (Figure 4).

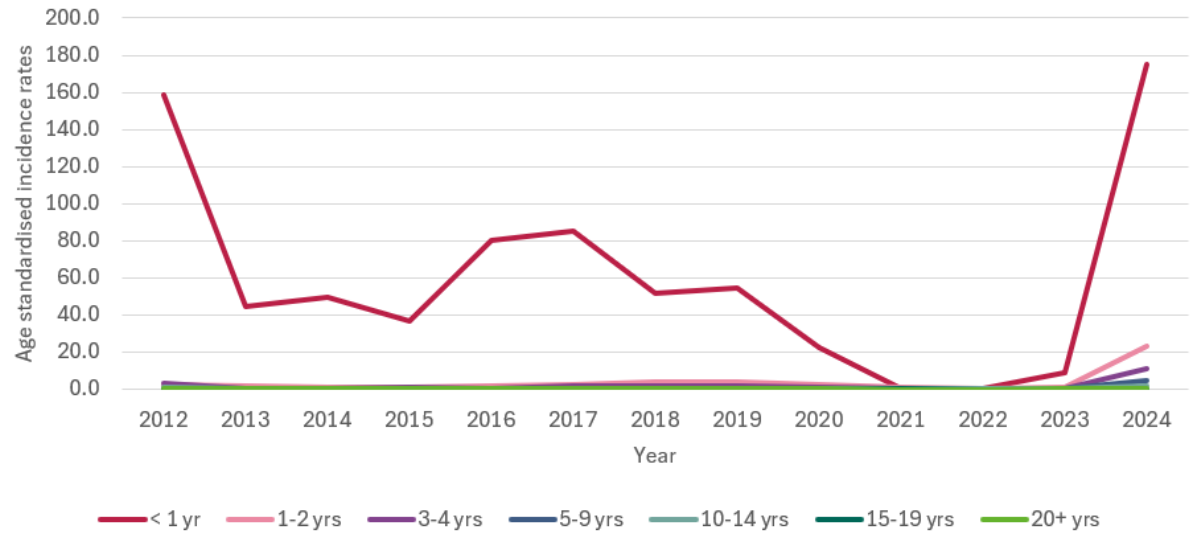

Figure 4. Age specific incidence rates of Pertussis hospitalisations 2012-2024

Amongst the 713 cases notified in Ireland in 2024, children predominated with:

- 125 cases (17.5%) in the 0–5-month age-group (i.e. too young to have received their full three dose primary immunisation course) and 60 cases (8.4%) in the aged 6-11-month age-group
- 115 cases (16.1%) aged 1-2 years, 57 cases (8.0%) aged 3-4 years, 77 cases (10.8%) aged 5-9 years and 70 cases (9.8%) aged 10-14 years
- In 2024, one hundred and eighty-five of the 713 cases (25.9%) were hospitalised including 82 of the 125 cases (65.6%) in infants aged 0-5 months.

Compared to the 2011-2013 cycle – cases and hospitalisation in infants <6 months is of a similar magnitude. However, cases and hospitalisations in those over 6 months is higher in 2024. The reason for this is unclear. Since 2012, five infant deaths have been reported in Ireland – one death in each of 2017, 2014 and 2013, and two deaths in 2012.

1.4 Routine/Pre-exposure vaccination recommendations and uptake

Detailed information on immunisation[b] recommendations and HSE vaccination services are available from the National Immunisation Advisory Committee (NIAC) and the National Immunisation Office (NIO) respectively.

Acellular pertussis containing vaccines can contain a full dose of pertussis toxin denoted as aP, or a low dose denoted as ap. Full dose pertussis vaccines (aP) are recommended for children up to 10 years of age. Low pertussis vaccines (ap) recommended for those aged 10 years and older. Available pertussis containing vaccines all include diphtheria and tetanus. Therefore, the acronyms DTaP and Tdap are used for the full dose and low dose containing vaccines respectively. Both DTaP and Tdap vaccines can include other antigens e.g. as part of the 4-in-1 (DTaP-IPV) and 6-in-1 vaccines (DTaP/IPV/Hib/Hep B).

An up-to-date list of vaccines available in Ireland can be found on the website of the Health Products Regulatory Authority. The vaccines used by the Primary Childhood Immunisation and School Programmes in Ireland are listed on the website of the NIO.

[b] Up to date data on immunisation uptake is available on the HPSC website. https://www.hpsc.ie/a-z/vaccinepreventable/vaccination/immunisationuptakestatistics/

1.4.1 Primary Childhood Immunisation and School Programme schedules

In Ireland, the whole cell pertussis vaccine (wP) was introduced in 1952/3 as part of the DTP vaccine. Since the 1950s the composition and the combination of the pertussis vaccine with other vaccines has changed. An acellular vaccine replaced the whole cell vaccine in the 3- in-1 (DTaP) vaccine in 1996. Further changes took place in 2001 with the introduction of a combined vaccine, the 5-in-1 vaccine, followed by the 6-in-1 vaccine in 2008. Figure 5 summarises the pertussis containing vaccination recommendations included in the Primary Childhood Immunisation (PCI) and School Programme since 1995. From 1st October 2024, children born on or after this date are vaccinated at 2, 4, 6, and 13 months. They are also offered booster doses at 4–5 years (administered by GPs in Sligo, Leitrim, and Donegal) and again in the first year of secondary school, where they receive the Tdap vaccine as part of the Schools Programme.

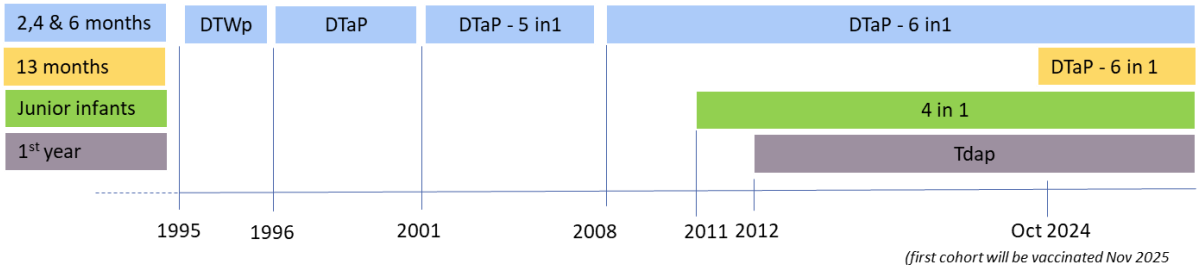

Figure 5. Pertussis containing vaccine offered as part of the Primary Childhood Immunisation and School Programme schedules since 1995.

1.4.1.1 Primary Childhood Immunisation uptake

National uptake of three doses of vaccines against pertussis (P3) at age 12 months has been persistently below the 95% target since the 2000s (Figure 6). After several years of national quarterly P3 uptake rates at 12 months >90% between 2011 and 2017, quarterly uptake rates have varied between 83.3% and 89.8% since Q4 2017 (except for one quarter which reached 90.8%). Uptake rates between Q1 2023 and Q4 2024 ranged between 84.6% and 87.2%.

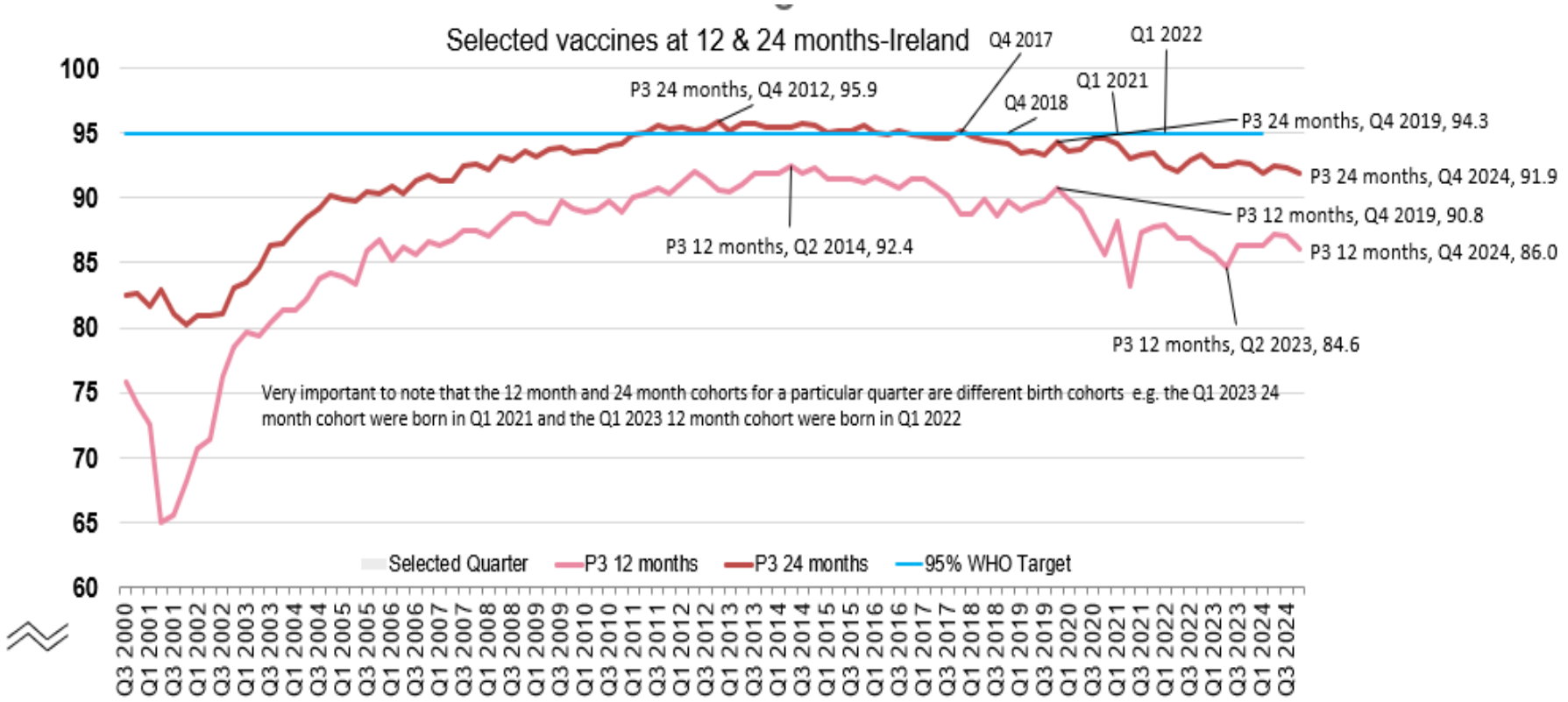

Figure 6. National quarterly uptake rates of 3 doses of pertussis vaccine at 12 and 24 months, Q3 2000 to Q4 2024.

While uptake of P3 at 24 months is higher, quarterly national uptake has been below the 95% target since 2017 with the exception of one quarter (Figure 6). Between Q1 2023 and Q4 2024, P3 uptake at 24 months ranged between 91.9% and 92.7%.

1.4.1.2 School based programme – junior infants/4 to 5-year-olds – vaccine coverage

Estimated national uptake of the 4-1 vaccine (DTaP-IPV) among Junior infants has remained below the 95% target threshold since its introduction (Figure 7). In 2022/2023, estimated national uptake was 89.5% and uptake was below 95% in all regions except one).

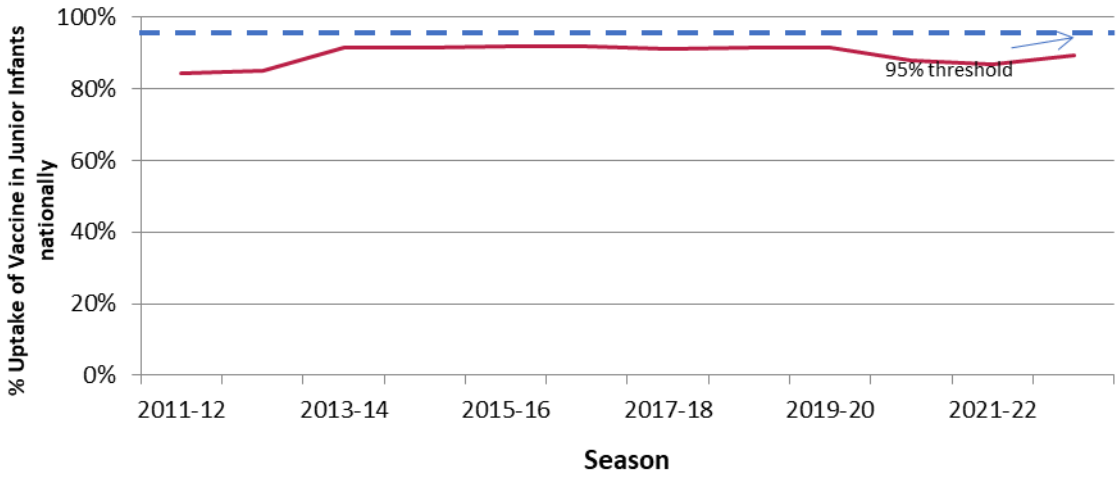

Figure 7. Estimated national uptake of the 4-in-1 vaccine in junior infants, 2011/12 to 2022/2023 school years.

1.4.1.3 School based programme – 1st year of second level

Between 2012/2013- 2022/2023 national uptake of Tdap among first years in second level schools and their age equivalents in special schools and home schooled ranged from 81.9% to 89.6% (Figure 8). In the 2022/2023 academic year, national uptake of Tdap was 82.6%.

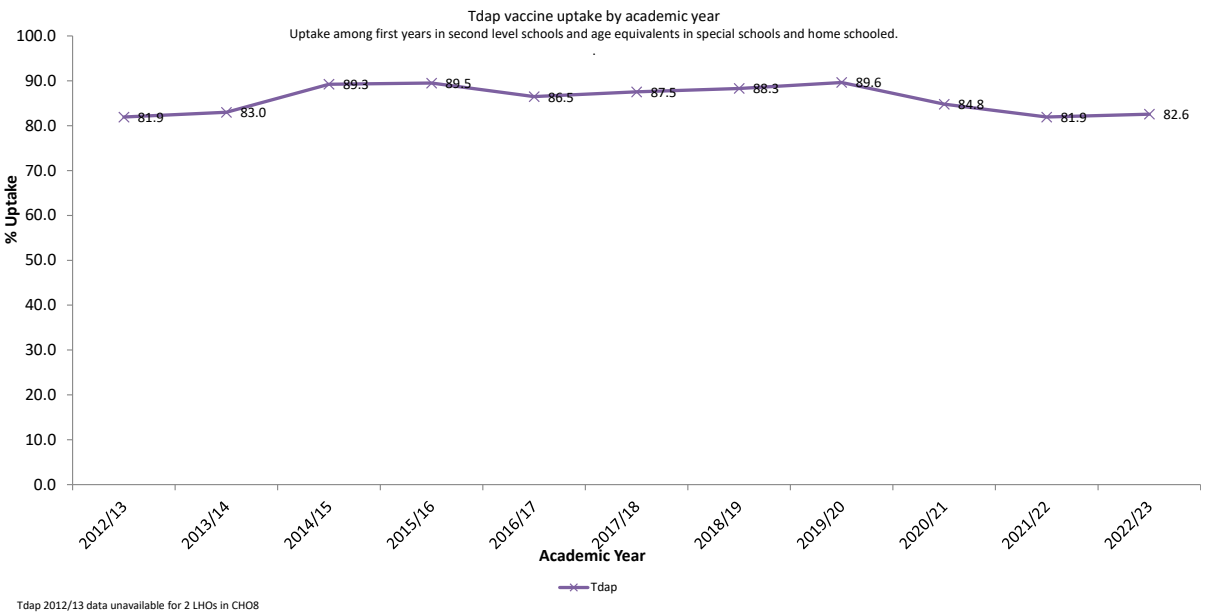

Figure 8. Uptake of Tdap among first years in second level school and their age equivalents in special schools and home schooled, 2012/13 to 2022/23 school years.

1.4.2 Maternal vaccination during pregnancy

Although pregnant women themselves are not thought to be at any greater risk of severe or complicated infection (15), the rationale for vaccination during pregnancy is to provide direct passive protection to vulnerable newborn infants through transplacental transfer of antibody.

Maternal vaccination has been recommended by NIAC since 2012. Since 2018, GPs can claim reimbursement for vaccination through PCRS using an outbreak code, if they have a GMS contract with the HSE. Vaccination is recommended between 16 and 36 weeks of pregnancy during each pregnancy. Further information is available from the National Immunisation Office.

There is no national information system to monitor uptake of maternal vaccination. One face-to-face omnibus survey of representative sample of 214 pregnant women in 2016/18 – reported uptake of 49.9% (16). A questionnaire to pregnant women attending two GP practices in the southeast of Ireland in 2016 reported an uptake of 67% (58/86 respondents) (17).

In 2024, data on maternal antenatal vaccination status was provided for 146 notified cases of pertussis among infants (79%, n=146/186). The mothers of 81% (n=118) of these infant pertussis cases were unvaccinated during the antenatal period (ref – HPSC).

1.4.3 Other groups recommended pertussis vaccination

NIAC also recommend booster doses of Tdap for health care workers (HCWs) who are in contact with infants and the immunocompromised (18). Boosters every 10 years may be considered. No information on adherence to this recommendation is available.

1.5 Laboratory confirmation of clinically suspected cases

The European Centre for Disease Prevention and Control (ECDC) has published a detailed technical report on the various laboratory techniques for the diagnosis of pertussis (19). A brief summary of laboratory techniques is provided below.

Diagnosis of pertussis is mainly based on direct detection of nucleic acids of *B. pertussis* (PCR), culture from nasopharyngeal samples, and specific antibody recognition (serology) from serum samples of patients with clinically suspected pertussis. Although the use of culture has been decreasing from year to year, it is still highly recommended as the isolates can be used for molecular surveillance of the changes in bacterial populations. Monitoring of the circulating isolate variants is important for evaluation of vaccine effectiveness and for future vaccine development.

1.5.1 Genome detection by real-time PCR

PCR has been shown to have improved sensitivity over culture and is a valuable confirmatory test, particularly in young infants. In the PCR assay two regions of the *B. pertussis* genome are targeted, the pertussis toxin S1 promoter region (ptxA-pr), and the insertion element IS481 which is present in multiple copies in *B. pertussis*, but is also present in some other *Bordetella* species i.e. *B. holmesii* and some, but not all, *B. bronchiseptica* (20, 21). The recommended interpretation is outlined in Table 1.

Table 1. Interpretation of PCR assay

IS481	ptxP	Final reported result
+	+	*B. pertussis* DNA detected by PCR
+	-	*Bordetella* spp. DNA detected by PCR*

A result of IS481 only is likely to be consistent with a low amount of *B. pertussis* in the specimen, however the cross-reactivity of the IS481 assay may represent the presence of other *Bordetella* species.

PCR is usually more sensitive than culture as the organism does not need to be viable, however, PCR is less likely to be positive in patients with symptom duration of 21 days or more. A UK pilot comparing the use of nasopharyngeal swab (NPS) and throat swabs in primary care for pertussis PCR found both swab types to be acceptable. While NPS are preferable for PCR testing, throat swabs may be used if NPS are not available, especially in community settings.

1.5.2 Culture

Laboratory confirmation is conventionally performed culture and isolation of *B. pertussis* from NPS/PNS. Culture from NPA is possible. However, NPS/PNS is the preferred specimen type.

Where local laboratory facilities are available, culture should be attempted as isolation of the causative organism is definitive and characterisation of isolates is important for further surveillance of circulating strains. Pure cultures of any putative isolates of *B. pertussis* should be referred to the *B. Pertussis* reference laboratory at CHI Crumlin for confirmation, serotyping and further characterisation.

It is important to note that *B. pertussis* is a delicate organism and therefore, processing delays may affect the likelihood of a positive culture. Sensitivity is also highly dependent on specimen quality and is affected by increasing patient age, vaccination status and length of illness. The likelihood of a positive culture also decreases with time after onset, from approximately 60% within 1 week of symptom onset to culture to 10% or less after 4 weeks (22, 23). Cultures are unlikely to be positive in adolescents and adults with more than 3 weeks of coughing (24).

It is also more difficult to recover the organism in vaccinated compared with unvaccinated children (25). Given the limitations of culture methods, it is important to emphasise that a negative culture does not exclude pertussis.

1.5.3 Serology

Detection of anti-pertussis toxin (PT) IgG antibody levels in serum taken at least fourteen days after the onset of cough using an enzyme linked immunosorbent-assay (ELISA) can provide confirmatory evidence of recent infection. Serology may be helpful to confirm the diagnosis of pertussis in patients with a cough duration of 21 days or more, when culture and PCR are unlikely to yield positive results. The anti-PT IgG serology test cannot, however, be used to determine immunity as there are currently no agreed correlates of protection.

This service is offered by CHI Crumlin, which defines a serologically confirmed case as an anti-PT IgG concentration >70 International Units per millilitre (IU/ml) in the absence of recent

vaccination (within the past year) (26). This serological assay is targeted towards older children and adults. Interpretation of anti-PT IgG levels among infants and younger children may be confounded by the presence of maternal antibodies or recent primary and booster vaccination or show an atypical response. Data from the UK suggests that the confounding period following vaccination may be up to 10 months after the primary vaccination and up to 3 years or more after an early childhood booster[c] (27). Therefore, serological testing should only be undertaken where there is a minimum of 1 year from primary or booster dose of pertussis containing vaccine and results should be interpreted with caution.

1.6 Priority groups for public health action

1.6.1 Groups at increased risk of severe or complicated pertussis ('vulnerable')

Young, unimmunised infants (particularly those prematurely born, under three months of age, or born to unimmunised mothers) (28) are at greatest risk of severe complications, hospitalisation and death following *B. pertussis* infection. Partially immunised infants are not fully protected, although disease severity may be reduced. In a study of 201 hospitalised infants (<6 months of age), the median duration of hospitalisation was significantly shorter (4 versus 11 days; p=0.03) for those who had received at least 1 dose of vaccine previously, when compared with those who were unimmunised (29). Maternal vaccination in pregnancy has demonstrated a more than 90% reduction in the risk of disease in infants up to 3 months of age when the mothers were vaccinated more than one week prior to delivery compared to infants of unvaccinated mothers, though the reduction between 2 to 3 months attributable to vaccination was unclear (30, 31).

We define any unimmunised or partially immunised (i.e. received less than 3 doses of a pertussis-containing vaccine) infants as 'vulnerable' to severe pertussis, regardless of maternal vaccination status. While we note the effectiveness of maternal vaccination in protecting infants under 3 months of age, for practical reasons and simplification of recommendations we have retained infants under 3 months whose mother was vaccinated during pregnancy as 'vulnerable'.

Serious complications such as pneumonia, syncope and rib fracture can occur in older individuals but there is little evidence to suggest that any specific clinical groups are at increased risk of pertussis or its complications (32, 33). Pregnant women are not considered

[c] In the UK the booster if offered to preschool children aged 3-4 years, while in Ireland it is offered to children aged 4-5 years in junior infants.

at increased risk of severe disease compared with non-pregnant women. The relative immunosuppression of pregnant women to viral disease in the third trimester does not appear to be replicated with bacterial infections such as *B. pertussis* (34), although symptoms in late pregnancy may be more intense due to constraints on pulmonary function.

Current evidence suggests that immunocompromised individuals are not at higher risk of complications from pertussis (35). Those with underlying immunosuppression may be less likely to mount a sufficient immune response to vaccination (36) but there is little evidence of increased severity of illness (single case reports only) (37-39). Several case studies have also described prolonged illness in patients with HIV infection (40-42) but pertussis infection among HIV infected individuals is again not thought to be particularly common (43). It might be expected that some underlying long-term conditions, such as asthma, congestive heart failure or chronic obstructive pulmonary disease, would exacerbate illness following pertussis infection, but there is little evidence to support this (44-46).

Given the lack of evidence to support an increased risk of severe pertussis infection among individuals with long-term disease or those who are immunosuppressed, the list of 'vulnerable' individuals at increased risk of severe or complicated disease has been updated.

1.6.2 Groups at increased risk of transmitting pertussis to those at risk of severe or complicated infection

a. Pregnant women

Parents and particularly mothers are found to be a frequent and important source of pertussis infection amongst young infants (47-51). In a US study of infants with reported pertussis, over 70% had been infected by their mother or another family member, the majority of whom were aged 20 years or more (52). A further study of infants admitted to a UK paediatric intensive care unit with respiratory complications, demonstrated that 20% had laboratory evidence of pertussis and half of these were infected from an adult family member (53). Women in the later stages of pregnancy may be at particular risk of transmitting pertussis to newborn infants. Although pertussis in pregnant women is not thought to be more severe than in other adults, and no obstetric or foetal adverse outcomes have been described (43), mother to infant transmission at the time of, or shortly after, birth has been described (54, 55) and is often associated with severe neonatal illness (56-58). In a Dutch study of 201 infants hospitalised with pertussis 46 (23%) of the index cases were mothers, of whom 14 (22%) had onset of symptoms during pregnancy (29).

Given the increased risk of ongoing transmission to newborn infants, women in the later stages of pregnancy are considered to be a priority group for public health action and post-exposure prophylaxis. Previous guidance recommended post exposure prophylaxis to any woman exposed in the last month of pregnancy. However, to allow for preterm delivery, the delay between exposure and outcome, and the protection conferred to the infant from maternal vaccination, this has been revised to be any pregnant woman exposed >32 weeks gestation who has not received a maternal pertussis vaccine at least one week prior to exposure (59).

b. Health and care workers

In addition to parents, other adults in close contact with vulnerable young infants including HCWs may be responsible for transmission (60). Serological studies suggest that infection in HCWs can be frequent, but often unrecognised (61). Outbreaks in healthcare settings may be prolonged due to waning immunity in adults, with multiple opportunities for secondary and tertiary transmission. Likely transmission from a HCW to a patient and vice versa has frequently been described (62-65) although the greatest risk of nosocomial transmission is likely to be from a health and care worker to a patient or other member of staff. A five-year analysis of clusters of pertussis infection in France revealed that the most frequent reports of healthcare associated clusters were from paediatric, maternity and neonatal units (66).

Due to the risk of ongoing transmission to individuals vulnerable to severe or complicated pertussis, healthcare staff and any other individuals working with infants or pregnant women are therefore considered a priority group for public health action in these guidelines.

Please refer to the National Clinical Guideline No. 30 – Infection Prevention and Control (IPC) for recommendations on appropriate IPC in healthcare settings (67).

1.7 Use of antibiotics in the treatment and prevention of pertussis

Prior to the widespread use of newer macrolides, erythromycin was recommended as the drug of choice for the prophylaxis and treatment of pertussis, except for infants below one month. However, erythromycin is poorly tolerated, causing gastrointestinal side-effects in up to 30% of patients (68, 69) which may lead to non-compliance with therapy (70).

Newer macrolides such as azithromycin and clarithromycin offer the advantages of improved absorption, a longer half-life, good in vitro activity against *B. pertussis* and a better side effect profile (59). In addition, these agents involve less frequent dosing and shorter duration of therapy. A number of studies have established the safety and efficacy of new macrolides for

eradicating *B. pertussis* (71, 72). The improved side effect profile has also been shown to improve compliance with treatment (73). Reports of macrolide resistant strains are appearing globally, particularly from China (74).

A 3-day course of azithromycin is the preferred choice in all age groups due to its:

- Efficacy
- Shorter treatment duration
- Fewer side effects and adverse events

For those patients where a macrolide is contraindicated or is not tolerated, co-trimoxazole is effective in eradicating *B. pertussis* from the nasopharynx and can serve as an alternative agent in certain groups (see Section 3.6 and Table 2), although it is unlicenced for chemoprophylaxis (75-77).

1.8 Treatment of cases and contacts

Antibiotics have a limited effect in improving the clinical course of the illness especially if administered beyond 2-3 weeks after the onset of symptoms. Treatment is therefore primarily aimed at eradicating *B. pertussis* from cases and preventing secondary transmission.

In a 2007 Cochrane systematic review of antibiotics for pertussis, the authors concluded that although antibiotic therapy for cases was effective in eliminating *B. pertussis*, it did not alter the subsequent clinical course of the illness (76). Short-term antibiotics (azithromycin for 3-5 days; clarithromycin or erythromycin for 7 days) were as effective as long term (erythromycin for 10-14 days) in eradicating *B. pertussis* from the nasopharynx (RR 1.02, 95% CI 0.98, 1.05) but had fewer side-effects (RR 0.66, 95% CI 0.52, 0.83). Since publication of the Cochrane review, more recent studies have demonstrated that early treatment of cases (within 7-14 days of onset) can prevent onward transmission (24, 78, 79).

1.8.1 Prophylaxis for close contacts

The Cochrane review concluded that there was insufficient evidence to determine the benefit of prophylactic treatment of pertussis contacts (76). In the two trials included in the review, which investigated the effectiveness of chemoprophylaxis with erythromycin, clinical symptoms in the treatment group were slightly less severe (not statistically significant) than the placebo group (69, 80). The number of contacts that became culture-positive were less in the erythromycin group (3/142, 2.1%) compared to placebo (8/158, 5.1%) but this difference was not statistically significant (RR 0.42; 95% CI 0.11, 1.54) (69). Although there have been

no specific studies of prevention of secondary transmission using these newer macrolides, their biological effect is considered to be similar to erythromycin.

In summary, post-exposure chemoprophylaxis for contacts over 6 months of age did not significantly improve clinical symptoms or the number of cases developing culture positive *B. pertussis*, although timing of prophylaxis was thought to be a critical factor. Whilst early administration may improve the efficacy of chemoprophylaxis in preventing secondary transmission, this requires a clinical diagnosis, which is likely to be a challenge given that adolescents and adults who are often the source of infection, generally do not seek timely health advice.

For these reasons, recommendations on the use of chemoprophylaxis are limited to contexts with vulnerable contacts where the risk of severe complications and/or ongoing transmission is high.

1.8.2. Use of antibiotics for pregnant women

For pregnant contacts, a risk assessment should be undertaken considering the risks and benefits of antibiotic therapy/prophylaxis. The aim of treatment/prophylaxis for women in pregnancy is to prevent transmission to the newborn infant and should be considered in those who have not received a pertussis containing vaccine more than one week and less than 5 years prior. Where possible, pregnant women should begin treatment at least 3 days prior to delivery.

Azithromycin is the preferred antibiotic in pregnancy. Please review the Medication Guidelines For Obstetrics and Gynaecology for information on the use of specified antibiotics in pregnant and breastfeeding women (81).

1.8.3 Post exposure vaccination

Differences between post-exposure vaccination recommendations in this guidance compared to UKHSA guidance reflect the difference in the infant and child immunisation schedules and the recommendations of NIAC.

NIAC advise that Tdap may be considered for adult contacts of a pertussis case who have not had a pertussis vaccine in the previous 10 years to decrease the risk of infection to themselves and infants (18).

The Guideline Development Group note the UKHSA revision of the time period for which previous doses of pertussis containing vaccine should be considered from 10 to 5 years, based on evidence that protection from booster doses lasts less than 10 years (2). The GDG have requested NIAC to review their guidance.

Based on NIAC guidance for routine/pre-exposure (section 1.4) and post exposure vaccination, pertussis vaccination should be recommended for cases and close contacts who are not up to date with routine vaccination recommendations, i.e.

- Infants and children who are not age appropriately vaccinated
- Pregnant women after 16 weeks gestation if not already vaccinated in this pregnancy
- HCWs providing close and personal care to infants and pregnant women if they have not received a booster in the previous 10 years

AND other adults in contexts with a higher risk of transmission (i.e. household settings) or where transmission to vulnerable infants is possible.

1.8.4 Use of post exposure vaccination for pregnant women

It is important that all pregnant women from 16 weeks gestation onwards **have been** vaccinated against pertussis in line with the routine recommendations for maternal vaccination.

If a pregnant woman who has not yet received the routine vaccination in this pregnancy, is exposed to a pertussis case, post exposure vaccination may be indicated. Post-exposure vaccination in pregnancy is important and specifically recommended in the following individuals who have not received a pertussis containing vaccine in the previous 10 years:

- for women exposed to pertussis after 36 weeks, **OR**
- for women exposed to pertussis at any stage of pregnancy if they are at risk of transmitting to 'vulnerable' individuals in (see section 2.2.3) e.g. a HCW caring for infants.

The main rationale for offering post exposure vaccination to pregnant women is different to the main rationale for offering vaccination routinely to all pregnant women. In the post-exposure situation, the vaccine is given to reduce the risk of the infant (prior to their own

routine pertussis immunisation) getting exposed to maternal pertussis infection, hence vaccination being given to those exposed late enough in pregnancy (>36 weeks).

If a woman has had confirmed, probable or possible whooping cough during pregnancy, she should still be offered the pertussis vaccine as not all women may make sufficiently high levels of antibodies following natural infection to ensure high levels can be passed across the placenta to the infant. As high levels of antibodies are made following vaccination, offering vaccine from 16 weeks of pregnancy should ensure that optimal antibody levels can be passed to her baby.

1.9 Principles governing public health action

The recommendations outlined in this document are given in accordance with a set of overarching principles governing public health action for pertussis, as follows:

- The key priorities for pertussis are to (i) prevent infant hospitalisations and deaths and (ii) highlight the importance of timely and complete vaccination in pregnancy, infants and children.
- The risk of severe outcomes from pertussis is greatest among infants less than 2 months of age who have not yet received their primary pertussis dose, and especially in those whose mothers were not vaccinated within the recommended window in pregnancy (16 to 36 weeks gestation).
- The decision to treat pertussis with antibiotics and the choice of treatment is a clinical decision. The benefits of treatment for possible pertussis are greatest where initiated as soon as possible after illness onset. Testing for pertussis is important for surveillance but should not delay management.
- Departments of Public Health (DPHs) should prioritise follow up of possible, probable and confirmed cases (per the definitions set out in section 2.1 below) who are in the early stages of illness as this will yield the greatest public health benefit.
- Interventions for contacts of pertussis are of limited effectiveness, in general. Evidence of benefits from chemoprophylaxis is limited to close, prolonged, household-type contact. Evidence of effectiveness outside these settings is limited. In all settings, chemoprophylaxis is more effective the earlier it is administered post-exposure.
- Where cases and outbreaks occur in settings where it is unlikely that those exposed will be members of a priority group (for example, school settings) investigation and active intervention are not routinely recommended.
- Public health actions should be proportionate to the additional level of risk in any given scenario, relative to background risk, and should be based on risk assessment as

appropriate. Recommendations regarding contact tracing in special settings (healthcare, education) should take into account the likely limited public health benefit achieved if broad contact definitions were to be applied.

- Vaccination in pregnancy remains key to passively protecting babies before they can be directly protected by the PCI infant vaccine programme. In addition, it is hugely important that babies are vaccinated on time at 2, 4, 6 and 13 months of age wherever possible and that those who miss vaccination are caught up at the earliest opportunity.

Chapter 2 Case definitions, management and investigation of clinically suspected cases of pertussis and their close contacts

2.0 Definitions

2.1 Case definitions

Please see the website of the **Health Protection Surveillance Centre** for the most up to date case definition.

General principles for the application of the case definitions are available on the HPSC website.

2.2 Contact definitions

This section outlines definitions of close contacts for pertussis cases (possible, probable or confirmed).

2.2.1 Households, healthcare and community settings

The objective of contact tracing in households, healthcare and community settings is to reduce risk of exposure to vulnerable individuals meeting priority group definitions (see section 2.2.3), by reducing transmission of the organism in the whole contact group. Prolonged and close contact with a case during their infectious period is typically required for significant risk of pertussis transmission to arise.

Close contact in most settings is defined by prolonged (for example, overnight) contact with a case. Family members or people living in the same household as a pertussis case are considered close contacts. Patients staying overnight in an inpatient setting with a pertussis case (for example, a hospital bay) would also be close contacts by this definition, as would people in institutional settings staying overnight in the same room as a case during their infectious period.

An exception to the contact definition in community settings given above concerns those working in school and childcare facilities providing close personal care to ‘vulnerable infants’ as defined in section 2.2.3 below, where a significant exposure would be defined as similar to HCWs (see section 2.2.2 below).

In most community settings, it is assumed that contact between a case and their contacts is continuous. Time since exposure would therefore be defined as the time since the onset of coughing in the index case, where the day of onset is set as day 0.

Other types of contact in the community or in healthcare settings (for example, at work or at school and childcare facilities, or in a hospital or GP surgery waiting room) would generally not be considered to constitute a close contact group where intervention would be effective.

2.2.2 Health and care workers

Special considerations apply to HCWs who provide close personal care to infants or pregnant women because of the nature of their interactions with potentially vulnerable individuals meeting priority group definitions (see section 2.2.3). For exposed Group 2 HCWs (see definition in section 2.2.3 below), the objective of contact tracing is to minimise the risk of further onward transmission to vulnerable individuals. For HCWs in this category, a significant exposure is defined as either:

1. Contact with a pertussis case within their own household.

Or

2a. Unprotected, direct, face-to-face contact in their place of work (a healthcare setting) for greater than a cumulative period of one hour with a pertussis case who is within 21 days of the onset of their cough.

Or

2b. Direct contact with respiratory secretions from a pertussis case within 21 days of onset of their cough (for example, when performing aerosol-generated procedures or examination of the nose and throat in a healthcare setting without appropriate personal protective equipment (PPE); or exposure to infectious respiratory particles from case with active coughing at less than 2 metre distance).

Prolonged contact at close proximity of the kind described in 2a above is more likely to occur in inpatient settings than in outpatient settings, primary or ambulatory care, but risk assessment may be required where vulnerable (unimmunised or partially immunised) infants are concerned. For HCWs in their place of work, close contact is likely to occur through either a single exposure, or on an intermittent basis. Time since exposure is therefore defined as the time that has elapsed since the most recent exposure to the index case, where the day of the most recent exposure is defined as day 0.

Of note, undertaking of a Point of Care Risk Assessment (PCRA) and ensuring appropriate IPC procedures during consultation and examination will minimise the likelihood of a HCW having sufficient exposure to be considered a close contact. Please refer to the National Clinical Guideline No. 30 – Infection Prevention and Control (IPC) for recommendations on appropriate IPC in healthcare settings (67).

2.2.3. High priority groups for public health action

The key priority groups for public health action are as follows:

Group 1: Individuals at increased risk of severe complications ('vulnerable infants')

Unimmunised (0 doses) or partially immunised (i.e. received less than 3 doses of a pertussis-containing vaccine) infants (< 12 months of age) regardless of maternal vaccine status.

Group 2: Individuals at increased risk of transmitting to 'vulnerable infants' in 'group 1' if they have pertussis, who have not received a pertussis-containing vaccine more than one week and less than 10[d] years ago

A. Pregnant women who have reached 32 weeks' gestation.

B. HCWs who provide close personal care to 'vulnerable infants' and pregnant women.

C. People whose work involves regular, close and prolonged contact with 'vulnerable infants' (for example, childcare workers in baby rooms).

D. People who share a household with a 'vulnerable infant' other than the index case.

2.3. The follow-up window

Pertussis cases are considered infectious from onset of coughing until 3 to 5 days after commencement of appropriate antibiotic treatment (depending on antibiotic used – see sections 1.6 and 1.7), or 21 days from onset of their cough if not receiving treatment. Pertussis testing for the majority of cases is unlikely to deliver results in a way that will influence timely case management.

In household settings the benefit of chemoprophylaxis declines over time following the onset of coughing in the index case. Current evidence suggests that gains from chemoprophylaxis beyond 14 days post-exposure to the index case are limited. Therefore, during periods of heightened transmission, or when DPHs need to prioritise actions due to concurrent events, priority should be given to follow up of cases within 14 days since onset of symptoms.

[d] The National Immunisation Advisory Committee has been requested to review the recommended interval for boosters of pertussis containing vaccine. This interval will be updated based on their advice.

When cases are reported to DPHs more than 21 days from cough onset, in general no public health action is required. Ensure the case has received an information letter (see Appendix B). If case attends/works in childcare setting, consider sending warn and inform letter to the class/room which case belonged to (see Appendix C).

The following algorithms are available on the HPSC website **here**:

- Laboratory Test Selection Algorithm for confirmation of clinically suspected cases of pertussis
- Identification and management of pertussis in primary care and other ambulatory care settings
- Algorithm for the management of close contacts of Pertussis
- Oral antibiotic treatment and chemoprophylaxis recommendations

Further details of case and contact management are provided in Chapter 3.

Chapter 3 Case Management

3.1 Risk assessment

The positive predictive value (PPV) of a clinical diagnosis of pertussis is not very high, particularly among adolescents and adults who may present with atypical features. However, the PPV will increase during periods of heightened pertussis activity and will vary with age. Risk assessment should be based on a combination of clinical and epidemiological factors such as clinical presentation, vaccination history and epidemiological links. Management of the index case and any vulnerable contacts should proceed based on this risk assessment without waiting for the results of laboratory testing and prompt public health actions to prevent onward transmission should be considered.

Actions outlined in this section focus on cases up to and including 21 days from the onset of coughing.

3.2 Use of Personal Protective Equipment (PPE) when assessing a patient

All HCWs should undertake a PCRA for Infection Prevention and Control BEFORE every patient interaction to allow them to accurately assess the risk of exposing themselves to infectious agents. This PCRA supports the selection of appropriate actions and PPE in addition to any IPC recommendations. Wearing appropriate PPE will mitigate against a HCW being exposed to infection and the risk of being classified as a close contact of a pertussis case.

Standard and droplet precautions should be employed when consulting a patient with a diagnosis of pertussis. Please refer to the National Clinical Guideline No. 30 – Infection Prevention and Control (IPC) for recommendations on appropriate IPC in healthcare settings (67).

Vaccination also reduces the risk of infection. A booster of a pertussis containing vaccine every 10 years is recommended for HCWs providing close and personal care to infants and pregnant women (see section 1.4.3).

3.3 Laboratory confirmation and public health action

Appropriate public health action should not wait for laboratory results as negative results cannot be used to exclude pertussis infection. In the event of a suspected or confirmed pertussis outbreak in any setting—such as hospitals, general practices, maternity units, schools and childcare facilities, or congregate settings—it is essential to promptly notify the

Regional Department of Public Health (RDPH). This ensures that diagnostic testing can be prioritised appropriately and that public health measures are implemented without delay.

Contact details for DPHs are available here.

Laboratories and DPHs should enter cases on the Computerised Infectious Disease Laboratory (CIDR) system as soon as possible. Enhanced surveillance should be undertaken on all confirmed cases and the enhanced surveillance form completed. Consideration should be given to undertaking enhanced surveillance on other cases, such as probable cases, cases with clinical presentation highly suspicious of pertussis (e.g. infant with cough and apnoea) or clusters of cases.

3.4 Recommendations for testing

Undertake a PCRA and use appropriate PPE (see section 3.2) before swabbing a patient.
An algorithm summarising testing procedures is available here.
Infants (before 1st birthday):

- PCR testing is recommended for infants with clinically suspected pertussis in the early stages of the illness and <21 days post cough onset.
- If local laboratory facilities permit, culture should also be performed.
- Serological testing is not usually recommended for infants as the antibody response of infants may not be typical of that seen in older children and adults.

Children aged from one year and adults:

- PCR is recommended in the early stages of illness (<21 days post cough onset).
- If local laboratory facilities permit, culture should also be performed.
- Where the onset of cough is greater than 14 days AND for those who have not been immunised against pertussis in the previous year, consider serological testing if a diagnosis is still required for clinical or public health purposes. Serological testing of community cases, in particular children, is generally not required and needs to be weighed against the harm and discomfort to the patient of testing.
- Positive samples should be sent to CHI at Crumlin for molecular typing.

3.5 Swab types and sampling for culture and PCR

The posterior nasopharynx should be sampled using an NPS/PNS [typically flexible ultrafine twisted wire shaft with nylon/Rayon swab]. The Copan style swab is also acceptable or an NPA.

For hospitalised cases NPS/PNS/NPA are the recommended specimens. For primary care cases if NPS/PNS are not available, throat swabs may be used (please check with laboratory for exact requirements for acceptable swab types).

3.6 Antibiotic therapy

The decision to offer antibiotics for pertussis cases, and the choice of treatment, is a clinical one. The benefit of antibiotics on the clinical course of the illness is limited to the early catarrhal phase and certainly within 14 days from onset of cough. However, treatment between 14 and 21 days may reduce transmission to close contacts. Therefore, antibiotic therapy can be considered up to 21 days after onset of cough. Recommended oral antibiotic treatment and chemoprophylaxis is provided in Table 2. For treatment of severely ill hospitalised cases, please consult local hospital guidelines.

Table 1: Oral Antibiotic Treatment and Chemoprophylaxis Recommendations

	Neonate (<1 month)	Infant (1-6 months)	Child (>6 months – 17 years)	Adult	Pregnant or breastfeeding*** Consult Medication Guidelines For Obstetrics and Gynaecology
Azithromycin *(macrolide)*	*Preferred choice*** 10mg/kg every 24 hours for 3 days.	*Preferred choice* 10mg/kg every 24 hours for 3 days.	*Preferred choice* 10mg/kg (max 500mg) every 24 hours for 3 days.	*Preferred choice* 500mg every 24 hours for 3 days.	*Preferred choice* 500mg every 24 hours for 3 days. Macrolides should be used with caution in pregnancy. Azithromycin suitable in all trimesters.
Clarithromycin *(macrolide)*	*Not preferred in this age group* *— use with caution* 7.5mg/kg every 12 hours for 7 days.	*Not preferred in this age group – use with caution* 7.5mg/kg every 12 hours for 7 days. [Maximum dose at 1 month (average weight of 4.3kg): 32.25mg every 12 hours].	6-11 months/under 8kg: 7.5mg/kg every 12 hours for 7 days [Maximum 60mg every 12 hours]. 1-2 years/8-11kg: 62.5mg every 12 hours for 7 days. 3-6 years/12-19kg: 125mg every 12 hours for 7 days. 7-9 years/20-29kg: 187.5mg every 12 hours for 7 days. 10-12 years/30-40kg: 250mg every 12 hours for 7 days. >12-17 years: 250 - 500mg every 12 hours for 7 days.	500mg every 12 hours for 7 days.	500mg every 12 hours for 7 days. Macrolides should be used with caution in pregnancy. Clarithromycin suitable only in 2nd and 3rd trimester in pregnancy.
Co-trimoxazole*	*Not recommended for infants below 6 weeks (risk of kernicterus).*	6 weeks to 5 months: 120mg every 12 hours for 7 days	6 months to 5 years: 240mg every 12 hours for 7 days. 6 -11 years: 480mg every 12 hours for 7 days. 12-17 years: 960mg every 12 hours for 7 days.	960mg every 12 hours for 7 days.	*Should not be used in pregnancy, particularly in the first trimester, unless no other antibiotic option available.*

For all antibiotic prescribing recommendations given above, please consult the Health Products Regulatory Authority for cautions, interactions and side-effects prior to prescribing. Additionally, further information can be obtained from the British National Formulary (BNF), or the BNF for Children.

*Consider if macrolides contra-indicated or not tolerated.

**Please note that macrolides should be used with caution in neonates. An association between azithromycin use and hypertrophic pyloric stenosis in infants has been reported, but it is judged that the risk of severe outcomes from pertussis in this age group outweigh the risk of developing this complication.

***For pregnant contacts, a risk assessment would need to be done to that looks at the risk and benefits of antibiotic therapy/prophylaxis. The aim of treatment/prophylaxis women in pregnancy is to prevent transmission to the newborn infant and should be considered in those who have not received a pertussis containing vaccine more than one week and less than 5 years prior. Where possible, pregnant women should begin treatment at least 3 days prior to delivery.

3.7 Exclusion

The risk of onward transmission, from an untreated case, declines over time. Recommendations for exclusion of cases are as follows:

Cases (possible, probable or confirmed) should be excluded from school and childcare facilities, or work, until they are no longer infectious.

The period of exclusion depends on the antibiotic treatment as follows:

- 72 hours following commencement of azithromycin
- 5 days following commencement of clarithromycin or co-trimoxazole
- 21 days following the onset of coughing if they are not being treated with an antibiotic

In addition, **HCWs should** inform their line manager so that contact tracing can be undertaken and the vaccination status of the case can be established (occupational health department and infection prevention control team may also be informed depending on local structures) as soon as possible – **and should do so** even if beyond 21 days from the onset of coughing as vulnerable contacts may still be within their incubation period.

If the case (possible, probable or confirmed) is **a hospitalised patient**, they should be placed in isolation with standard and droplet precautions for the following period of time:

- 72 hours following commencement of azithromycin

- 5 days following commencement of clarithromycin or co-trimoxazole
- 21 days following the onset of coughing if untreated.

Refer to the National Clinical Guideline No. 30 – Infection Prevention and Control (IPC) for further IPC advice (67).

3.8 Immunisation

It is important that unvaccinated and partially immunised infant and child cases complete their course of primary immunisation and booster vaccine once they have recovered from their acute illness.

Pregnant women who have been diagnosed with pertussis (at any stage of pregnancy) and have not been vaccinated after 16 weeks of pregnancy, should be offered a dose of pertussis containing vaccine in line with national recommendations.

HCWs providing close and personal care to vulnerable patients, who have recovered from a primary infection should be offered a booster dose of pertussis-containing vaccine (Tdap) if they have not received a dose of in the preceding 10 years.

3.9 Communication

It is advised that DPHs provide information to all patients with a possible, probable or confirmed diagnosis. An example information leaflet is available in Appendix B and can be modified by DPHs. Cases can also be directed to the HPSC website.

This information highlights the potential risk of spread to others, safety-netting and the importance of vaccination. It sets out:

- the priority groups for public health actions especially those at high risk of severe infection, that is unimmunised or partially immunised infants
- where a member of the household is a HCW, working with infants or pregnant women, it requests that they inform their occupational health department/contact point and seek early medical advice, from their general practitioner, if they develop symptoms
- general advice about ensuring children and pregnant women are fully immunised according to national recommendations

Chapter 4 Management of contacts

4.1 Chemoprophylaxis

4.1.1 Households, healthcare and relevant community settings

In households, healthcare and relevant community settings (see above), antibiotic prophylaxis should be offered to all close contacts in that setting where:

i. the onset of coughing in the index case was within the preceding 21 days
   And
ii. there is a close contact in one of the high priority groups outlined in section 2.2 (for example, a vulnerable infant in Group 1 (other than the index case) as set out in section 2.2.1 above).

The benefits of chemoprophylaxis for close contacts are greatest the sooner it is administered following exposure.

Where both these conditions are met, **ALL** close contacts in that setting of a confirmed case (regardless of age and previous immunisation history) should be offered chemoprophylaxis.

The dose of antibiotics for use as chemoprophylaxis is the same as for the treatment of cases (see Table 2). Chemoprophylaxis is **NOT** required where there are no close contacts in the priority groups defined in section 2.2.3.

For pregnant contacts who have received a pertussis containing vaccine within the past one week, chemoprophylaxis would still be indicated given the delay in antibody response. For pregnant women with possible, probable or confirmed pertussis, who are still infectious at delivery, the newborn infant should be offered chemoprophylaxis regardless of the mother's vaccination status.

4.1.2 Health and care worker

Chemoprophylaxis should be offered to contacts of a HCW case in the following groups where a significant exposure occurred within 21 days from onset of coughing in the index case:

i. vulnerable infants in as set out in section 2.2.1 above.
ii. pregnant women who have reached 36 weeks gestation but have not received a booster dose of pertussis-containing vaccine more than one week and less than 10 years ago.

iii. HCW contacts who provide close personal care to infants in Group 1 or pregnant women, and who have not received a booster dose of pertussis containing vaccine more than 1 week and less than 10 years ago.

Details of recommended antibiotic treatment and chemoprophylaxis are provided in Table 2.

4.2 Immunisation

Recommendations regarding immunisation of close contacts, are as follows. This section expands on the Algorithm for the Management of Close Contacts of Pertussis (V1.1) by distinguishing between:

- Routine immunisation catch-up for close contacts who are not up to date, which is recommended regardless of time since exposure, and
- Post-exposure vaccination, which is only recommended if within 21 days of symptom onset in the index case.

Regardless of time since onset of symptoms in the index case:

i. unimmunised and partially immunised infants and children should complete the schedule with the appropriate vaccine.
ii. any pregnant contacts who have reached the 16th week of their pregnancy, or post-partum women in the week after delivery, but have not yet received a pertussis-containing vaccine during their current pregnancy should be vaccinated
iii. for contacts who are health and care workers and provide close, personal care to infants in Group 1 or pregnant women, a booster dose of pertussis-containing vaccine (Tdap) is recommended if they have not received a dose in the preceding 10 years.

In addition, the following should be offered vaccination if still within 21 days of symptom onset of the case:

iv. for adult household close contact, offer a booster dose of pertussis-containing vaccine (Tdap) if they have not received a dose in the preceding 10 years.
v. for other adult close contacts not covered above AND when there is a close contact in a priority group offer a booster dose of pertussis-containing vaccine (Tdap) if they have not received a dose in the preceding 10 years.

4.3 Exclusion

Exclusion for contacts is not required.

HCWs who work with vulnerable patients (infants and pregnant women) should inform the occupational health department in their facility (or other relevant department or person based on local arrangements) of their status as a close contact of a pertussis case.

Chapter 5 Outbreaks

5.1 Escalation and convening of an Outbreak Control Team (OCT)

5.1.1 Purpose

An Outbreak Control Team (OCT) should be convened to coordinate the response to complex or high-risk outbreaks of pertussis, particularly in settings where transmission risk is elevated and standard control measures may be insufficient.

5.1.2 Criteria for convening an OCT

An OCT should be considered when one or more of the following apply:

- Multiple linked cases of pertussis are identified within a defined setting (e.g. prison, school or childcare facility, congregate setting), suggesting ongoing transmission.
- High-risk setting characteristics are present, such as:
    - High-density living or enclosed environments.
    - Frequent close contact among residents, staff, or attendees.
    - High turnover of individuals (e.g. admissions, transfers, discharges).
    - Vulnerable populations (e.g. immunocompromised individuals, those with chronic respiratory conditions).
    - Operational challenges limiting the implementation of standard infection prevention and control (IPC) measures.
- Barriers to isolation or cohorting, such as limited space, staffing, or infrastructure.
- Disruption to essential services (e.g. education, security) due to the outbreak or control measures.
- Need for coordinated multi-agency response, including public health, facility management, healthcare providers, and other stakeholders.

5.1.3 Steps for initiating an OCT

1. **Initial Notification**

Contact the local Public Health Department promptly upon identification of a suspected or confirmed outbreak meeting the above criteria.

2. **Information to Provide**

Include the following details where available:

- Number of symptomatic and confirmed cases.
- Onset dates and epidemiological links.
- Description of the setting and population affected.

- Control measures already implemented.
- Specific challenges encountered (e.g. isolation capacity, staffing, access to testing or treatment).

3. **OCT Composition**

The OCT should include representatives from (this is not an exhaustive list of participants and can be adapted to the setting):

- Public Health (Chair)
- Facility management
- Infection prevention and control (IPC)
- Clinical/healthcare services
- Communications (if required)
- Other relevant stakeholders (e.g. education, social care, prison services)

4. **OCT Objectives**
    - Confirm the outbreak and assess its scope.
    - Review and advise on testing strategy and case definitions.
    - Recommend proportionate IPC measures.
    - Support continuity of essential services.
    - Coordinate communication with staff, residents, families, and the public.
    - Determine criteria for declaring the outbreak over.
5. **Documentation and Follow-up**
    - Ensure minutes and action points are recorded.
    - Assign responsibilities and timelines.
    - Schedule follow-up meetings as needed.

5.2 Healthcare settings

Where 2 or more possible, probable or confirmed cases of pertussis occur in a healthcare setting, an outbreak control team (OCT) should be convened. This is likely to include:

- Assistant Director of Nursing (ADON) Infection Prevention and Control
- Site manager/CEO
- Hospital microbiologist (if different)
- Infection prevention and control nurse
- Consultants from relevant clinical specialties
- Occupational health physician or nurse
- DPH representative
- Communications team

Attempts should be made to confirm diagnosis. If additional expertise is required, this can be sought in addition to the personnel listed above.

5.3 Childcare settings

5.3.1 Outbreak definition in a childcare setting

An outbreak in a childcare setting is defined as 2 or more confirmed or at least one confirmed and one probable or possible case of pertussis within 42 days where transmission is likely to have occurred in the childcare setting.

If 2 or more confirmed and epidemiologically linked cases of pertussis occur within 42 days of each other in a childcare setting, an incident management team (IMT) or outbreak control team (OCT) may be considered, and where appropriate a risk assessment performed by the IMT/OCT to determine whether further public health action should be undertaken.

5.3.2 Chemoprophylaxis in a childcare setting

In a childcare setting, it may occasionally be appropriate, on the basis of PHRA, to consider more widespread chemoprophylaxis (for staff and children) than suggested in section 3.6 depending on the severity of illness among those affected, the number of cases and the number of potential contacts, in addition to the age and vaccination status of those exposed – with reference to the priority groups outlined in section 2.2.3.

In settings with a large proportion of incompletely vaccinated infants, the OCT may consider arranging chemoprophylaxis if a clearly defined group can be identified and it is practical and feasible. See section 3.6 and Table 2 for recommended antibiotic regimens for chemoprophylaxis or treatment.

Possible, probable or confirmed cases should be excluded from childcare as outlined in section 3.7. Asymptomatic contacts do NOT need to be excluded.

In certain circumstances, wider chemoprophylaxis and vaccination for a childcare outbreak may be considered by the outbreak control team and may be informed by a number of factors including:

- duration of the outbreak and thus the likely benefit of chemoprophylaxis and/or vaccination
- presence of a clearly defined group who can be identified for chemoprophylaxis and/or vaccination

- practicality and feasibility of widespread chemoprophylaxis and/or vaccination
- acceptability and compliance with antibiotics
- residential setting e.g. boarding school, children's respite care homes. Once a single case of pertussis has arisen in a boarding school setting it is highly likely that further cases will arise because of the enhanced opportunities for transmission.

Regardless of decisions on chemoprophylaxis or vaccination within the childcare setting, where there has been more than one case reported from a childcare setting, other parents should be informed in order to raise awareness including emphasising the groups at risk of severe infection and to encourage timely reporting of further cases to enhance case finding. Regardless of these control measures, this should be used as an opportunity to remind parents about routine immunisations and ensure children are up to date.

5.3.3 Vaccination in a childcare setting

The OCT should advise that all childcare attendees (and their siblings) and staff check that they are up to date with their pertussis vaccinations and if not, arrange an appointment with their GP promptly to catch up on missing doses. Given the age group, widespread booster vaccinations are unlikely to be required in this setting. Pregnant childcare staff should be advised to follow routine advice in relation to pertussis vaccination in pregnancy (advised from 16 weeks of pregnancy) and to discuss any specific concerns with their GP.

5.4 Schools and other educational settings

As noted in section 1.8, where outbreaks occur in settings where it is unlikely that those exposed will be members of a priority group (for example, school settings) investigation and active intervention are not routinely recommended. A warn and inform letter, providing advice on ensuring age-appropriate vaccinations are complete, may be considered.

5.5 Other non-healthcare workplace settings

In most non-healthcare workplace or congregate settings, individuals exposed to pertussis are unlikely to belong to a priority group for intervention. As such, routine public health investigation or active intervention is generally not indicated.

However, a Public Health Risk Assessment (PHRA) should be conducted to determine whether any action is warranted, particularly in high-risk or complex environments—such as those involving vulnerable populations (e.g. infants, pregnant individuals, or

immunocompromised persons), or where transmission could have significant operational or public health consequences.

5.5.1 Key risk considerations for prisons and places of detention (PPDs)

PPDs are considered higher risk for transmission due to:

- High-density living and frequent close contact among residents.
- Constant population turnover (receptions, transfers, releases).
- Higher prevalence of chronic respiratory illness, immunosuppression, and other comorbidities.
- Staff movement between the community and the facility, increasing risk of introduction and spread.

5.5.1.1 General principles

- Healthcare Access: Residents must receive healthcare equivalent to the community, including timely access to vaccination and treatments in line with HSE guidance.
- Vaccination Promotion: Encourage uptake among both residents and staff, especially those at higher risk of severe illness.
- Symptom Monitoring: Prompt identification and reporting of symptoms among residents and staff is essential.

5.5.1.2 Isolation and operational caveats

- Symptomatic Individuals: Those with symptoms and a high temperature or who feel unwell should be advised to limit contact with others, but full isolation may not be feasible in all settings.
- Outbreak Management: If multiple linked cases arise, contact the local Public Health Department for outbreak assessment and testing strategy.
- Operational Continuity: Infection prevention and control measures must be proportionate and site-specific, ensuring that essential services and security operations continue uninterrupted.
- Staffing Considerations: Staff with symptoms should follow public health advice but may be risk-assessed for return to work if asymptomatic or mildly symptomatic, depending on role and staffing levels.

5.5.1.3 Additional measures

- Ventilation and Hygiene: Maintain good ventilation and reinforce hand and respiratory hygiene practices.
- Communication: Ensure residents and staff are informed about symptoms, prevention, and what to do if unwell.
- Testing: Routine testing is not required unless individuals are eligible for treatment or an outbreak is suspected.

5.5.2 Key risk considerations for non-healthcare congregate settings

- Non-healthcare congregate settings are considered higher risk for transmission due to:
- Enclosed environments with frequent close contact between residents and staff.
- High levels of social interaction during shared activities and communal living.
- Higher prevalence of long-term conditions (e.g. asthma, diabetes) among residents.
- Staff movement between the community and the facility, increasing the risk of introducing infections.

5.5.2.1 General principles

- Healthcare Access: Residents should receive healthcare equivalent to their peers in the community, including access to vaccination and therapies such as antivirals, in line with HSE guidance.
- Vaccination Promotion: Encourage uptake among residents and staff, especially those at higher risk of severe illness.
- Symptom Monitoring: Early identification of symptoms is essential to reduce spread and protect vulnerable individuals.

5.5.2.2 Isolation and control measures

- Flexible Isolation Approaches: Isolation of symptomatic individuals should be proportionate and site-specific:
    - On-site isolation may be feasible in facilities with individual rooms and adequate staffing.
    - Off-site isolation (e.g. temporary accommodation, St Ita's) may be considered if on-site capacity is limited.

- Zoning and Targeted Measures: In facilities with multiple units or wings, control measures may only be required in affected areas, with increased vigilance elsewhere.
- Outbreak Management: If multiple linked cases arise, contact the local Public Health Department for outbreak assessment and tailored advice.

5.5.2.3 Operational caveats

- Continuity of Care and Support: Infection prevention and control measures must not unduly disrupt essential services. Risk assessments should balance infection prevention and control with the need to maintain safe, person-centred care.
- Staffing Considerations: Staff with mild symptoms may be risk-assessed for continued attendance, especially where absence would compromise safe operation.
- Visitor Policies: Visiting should continue with appropriate precautions unless advised otherwise during an outbreak.

5.5.2.4 Additional measures

- Ventilation and Hygiene: Ensure good ventilation and reinforce hand and respiratory hygiene practices.
- Education and Communication: Provide clear, accessible information to residents and staff about symptoms, prevention, and what to do if unwell.
- Testing: Routine testing is not required unless individuals are eligible for treatment or an outbreak is suspected.

Appendices

Appendix A: Pertussis Guideline Development Group membership

Name	Role	Organisation
Dr Eve Robinson (Chair)	Specialist in Public Health Medicine, RVU (Until June 2025)	HSE Health Protection Surveillance Centre
Dr Aidan Ryan	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Anthony Breslin	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Breda Cosgrove	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Ciara Martin	National Clinical Advisor and Group Lead for Children and Young People	Health Service Executive
Ms Claire Gilbourne	Health Protection Researcher	Research and Guideline Development Unit, HSE National Health Protection Office
Dr Diane Bredin	Senior Medical Officer (Until July 2024)	HSE Health Protection Surveillance Centre
Ms Emma Coughlan	Clinical Nurse Manager	HSE Health Protection Surveillance Centre
Dr Geraldine Casey	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Helena Murray	Specialist in Public Health Medicine (until 2024)	Health Service Executive, Public Health
Dr Jane Stapleton	Senior Medical Officer	Health Service Executive, Public Health
Dr Joan O Donnell	Specialist is Public Health Medicine	HSE Health Protection Surveillance Centre
Dr Keith Ian Quintyne	Consultant in Public Health Medicine,RGDU Lead	Research and Guideline Development Unit, HSE National Health Protection Office
Dr Lois O'Connor	Consultant in Public Health Medicine	HSE Public Health: National Health Protection Office
Ms Lorna Quigley	Specialist Antimicrobial Pharmacist	Programme Manager -National Clinical Programme for Infectious Diseases
Ms Marie Philbin	AMRIC Chief Pharmacist	Office of the Chief Clinical Officer, Health Service Executive
Dr Mary Ward	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Michael Carton	Principal Epidemiologist, SEU & VPD	HSE Health Protection Surveillance Centre
Prof Niall Conroy	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Niamh O'Sullivan	Consultant Microbiologist (Until May 2025)	Children's Health Ireland (CHI) at Crumlin
Mr Nigel Estick	Surveillance Assistant	HSE Health Protection Surveillance Centre
Dr Orla Cotter	Specialist Registrar in Public Health Medicine	Health Service Executive, Public Health
Dr Paul Mullane	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Randal Parlour	Research & Guideline Development Unit Coordinator	Research and Guideline Development Unit, HSE National Health Protection Office
Dr Ruth McDermott	Consultant in Public Health Medicine	Health Service Executive, Public Health
Dr Scott Walkin	Antimicrobial Resistance & Infection Control Clinical Lead	Irish College of General Practitioners
Dr Suzanne Cotter	Consultant in Public Health Medicine	Health Service Executive, Public Health

Appendix B: Information leaflet for cases of pertussis

Information for individuals who have whooping cough

What is Pertussis (Whooping cough)?

Pertussis, also known as whooping cough, is a highly infectious bacterial disease involving the respiratory tract. It is caused by a bacterium that is found in the mouth, nose and throat of an infected person. The symptoms often start like a cold, progressing to outbursts of coughing which can sometimes cause vomiting or choking. The cough sometimes has a characteristic 'whoop' sound.

Do I need treatment?

Your doctor may prescribe antibiotics to treat whooping cough if the illness started recently. Antibiotics are only likely to help your symptoms if taken within 2 weeks from the day your cough started. If it is more than 2 weeks since the start of your illness, starting antibiotics at this time is unlikely to help.

Do I need to stay at home?

You may be advised to stay off childcare, school or work and avoid contact with any young babies or pregnant women. You will be advised to do this until you are no longer infectious. If you are taking antibiotics you will need to stay off for between 3 and 5 days after starting the antibiotic. After this time, if you are well enough, you can go to school or work as normal.

If you are not taking an antibiotic, then you'll need to stay off for 3 weeks from the start of the cough.

Do I need to be vaccinated?

If you have not received all the recommended vaccines for your age – you will be offered vaccination. If you are pregnant, you will be advised to get vaccinated. If you are a HCW or work with infants and have not received a booster in the last 10 years, you will also be offered a vaccine.

When will I stop coughing?

The cough can last for up to 3 months or more in some people. If you become concerned, please discuss your symptoms with your doctor.

Are the people I live with at risk of getting pertussis?

Whooping cough can be a very serious illness in young babies less than one year of age, especially those who haven't had their first 3 vaccines against it (offered at 2, 4, 6 months of age). Therefore, if there are pregnant women or young babies in your household, they may be offered antibiotics and vaccination to help protect them (see here). Your local Public Health Team will contact you to discuss what if any follow up is needed for people you live with or others you have been in contact with.
We also recommend the following:

- if there is a baby under one year who is not fully vaccinated in your household, and you are concerned they may have symptoms of whooping cough, seek prompt advice from the baby's GP. Tell the GP that the baby has been contact with someone with pertussis.
- if anyone in your household is unwell with similar symptoms, they should also seek advice from their GP
- if anyone in your household is unwell with similar symptoms and is a health and care worker who provides close personal care to babies or pregnant women, ask them to inform their occupational health department promptly – the occupational health department can seek further advice from the local health protection team as required
- anyone in your household who is pregnant should be vaccinated with a pertussis-containing vaccine. Pregnant women are offered their whooping cough vaccine between weeks 16 and 36 of their pregnancy. You need to have the vaccine in every pregnancy
- ensure all babies and children are fully up to date with their vaccines – you can check this with your GP surgery if you are not sure

Do I need to tell my workplace?

If you are a health and care worker, inform your occupational health department and infection prevention control team as soon as possible. The local Public Health Team may need to contact your workplace if you work with infants and children at risk of severe disease.

Appendix C: Information for parents and staff in school or childcare facilities where a case of pertussis is identified

Information on whooping cough

A case of pertussis has been diagnosed in (insert name of facility and class/room if appropriate)

What is Pertussis (Whooping cough)?

Pertussis, also known as whooping cough, is a bacterial disease involving the respiratory tract. It is caused by a bacterium that is found in the mouth, nose and throat of an infected person. The symptoms often start like a cold, progressing to outbursts of coughing which can sometimes cause vomiting or choking. The cough sometimes has a characteristic 'whoop' sound.

Is there a risk of others getting pertussis?

Pertussis is very infectious. There is a risk of it spreading from person to person, particularly if you are not fully immunised.

What can I do now?

The best thing you can to is ensure everyone in your household is appropriately vaccinated. Immunisation is the most effective way to prevent infection and limit the spread of pertussis. Pertussis may be circulating in your community so everyone in your household should be immunised as per national recommendations.

- ensure all babies and children are fully up to date with their vaccines – you can check this with your GP surgery if you are not sure
- anyone in your household who is pregnant should be vaccinated with a pertussis-containing vaccine. Pregnant women are offered their whooping cough vaccine between weeks 16 and 36 of their pregnancy. You need to have the vaccine in every pregnancy
- Anyone if your household who is a health and care worker who works with infants or pregnant women and have not received a booster in the last 10 years, you will also be offered a vaccine.

What should I do if I develop symptoms?

If you develop symptoms contact your GP and let them know that you may have been in contact with someone with pertussis. Do not attend the facility if you have symptoms until after you have been assessed by your GP.

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