National Immunisation Advisory Committee

SELECTIVE STRATEGY FOR BCG VACCINATION

NIAC | 10.10.2022, Version 1.2

About NIAC

NIAC membership includes nominees from the RCPI, its Faculties and Institutes, the RCSI, the ICGP, the National Immunisation Office, the Nursing and Midwifery Board of Ireland, the Infectious Diseases Society of Ireland, the Travel Medicine Society, the National Virus Reference Laboratory and lay members. Meetings are attended by representatives from the Department of Health and the HSE. Representatives of the Health Products Regulatory Agency attend to provide regulatory advice in relation to vaccines.

NIAC considers new evidence about vaccines and provides advice to the Chief Medical Officer and the Department of Health. The Department and the Minister for Health make policy decisions on vaccines which are implemented by the HSE.

Amendments and Updates

10.10.2022. Version 1.2: Includes elaboration that the WHO global list of high burden countries includes those with TB, HIV-associated TB and multi-drug resistant TB. (Changes highlighted).

18.08.2022. Version 1.1: Includes reference to WHO position paper on BCG vaccination with reference to low prevalence countries.

RECOMMENDATIONS

1. BCG vaccine is recommended for:

- Neonates born to parents (or with other regular close contacts[1]) with untreated sputum smear-positive pulmonary or laryngeal tuberculosis (TB)
- Neonates born in households with contacts[1] with countries with a high TB, TB/HIV, or multi-drug resistant TB (MDR-TB) burden[2]
- Neonates in any locally identified high risk group with TB, TB/HIV, or MDR-TB
- Unvaccinated TST- or IGRA-negative[3] children aged under five years born in a country with a high TB, TB/HIV, or MDR-TB burden[2] or living with a person who has been born in in a high burden country.

2. BCG vaccine should be considered for the following, after a risk-benefit assessment:

- Unvaccinated TST- or IGRA-negative[3] people aged five years and older moving or travelling to high TB, TB/HIV or MDR-TB incidence settings
- Unvaccinated TST- or IGRA-negative[3] persons at risk of unprotected occupational exposure (e.g., health-care workers, laboratory workers, medical students, prison workers and others with occupational exposure).

[1] Those who have cumulative close contact for eight hours or more in an indoor environment that is poorly ventilated, with patients diagnosed with TB, particularly MDR-TB

[2]WHO (2021). Global lists of high burden countries for tuberculosis (TB), HIV-associated TB and multidrug/rifampicin-resistant TB (MDR/RR-TB) for 2021-2025 https://www.who.int/news/item/17-06-2021-who-releases-new-global-lists-of-high-burden-countries-for-tb-hiv-associated-tb-and-drug-resistant-tb

[3]Either tuberculin skin testing (TST) or an IFN-γ release assay (IGRA) may be used. IGRA is the preferred immunodiagnostic test if:

- the person is aged two years or older
- the person has received the BCG vaccine
- the person is unlikely to return to have their TST evaluated
- the person is immunocompromised.

TST is preferred in children under two years of age. IGRAs can be used but the test sensitivity is reduced.

1. BACKGROUND

1.1

Bacillus Calmette-Guérin (BCG) vaccination was introduced in Ireland in the 1950s. Current NIAC recommendations, last updated in 2015, are for a universal BCG vaccination strategy (i.e., vaccinate all babies unless contraindicated). The absence of BCG in Ireland since 2015 (due to a global shortage of BCG) has not led to an increase in TB cases in young children, and the overall incidence of TB continues to decline.

In 2018, the World Health Organization (WHO) stated that countries with low incidence of TB may choose to vaccinate neonates selectively in groups at high risk of TB. Countries with low-incidence of TB are those with a TB notification rate of under 10 TB cases (all forms) per 100,000 population per year. WHO encouraged countries with a low prevalence to consider a selective risk group vaccination strategy, with recommendations that an effective disease surveillance system for bacteriologically confirmed pulmonary TB be in place.

Ireland is a low TB incidence country. The number of cases of TB decreased from 358 in 2012 to 218 in 2021. This corresponds to a decline in the crude incidence rate from 7.8 per 100,000 in 2012 to 4.6 per 100,000 in 2021.

In 2021, 17% of notified TB cases were in Irish-born people (38 cases). Cases born outside Ireland accounted for 49% of notified cases (107 cases).

1.2

The risks for TB transmission are greatest for:

i. Those who have cumulative close contact for eight hours or more in an indoor environment that is poorly ventilated, with patients diagnosed with TB, particularly multi drug resistant TB (MDR-TB)
ii. Healthcare workers (HCWs) who carry out high risk procedures while unprotected, including:
    - Cough inducing procedures (e.g., sputum induction, bronchoscopy)
    - Autopsy
    - Pathology examination
    - Bronchoscopy
    - Designated TB laboratory procedures, especially handling TB cultures.
iii. Those staying more than three months in a country with a high TB burden[2]
iv. Those in close contact with the local population in a country with a high TB burden[2]. Those visiting relatives or friends are at higher risk.

1.3

In children, TB is most common in those aged under five years. Infants and young children, especially those aged under two years, are at risk of developing severe disseminated disease with a short incubation period and acute onset.

1.4

It had been assumed that BCG vaccine was only effective at protecting against severe TB disease, particularly in young children. However, a meta-analysis showed that BCG vaccinated children

exposed to TB had 19% (CI 8-29) less TB infection than non-vaccinated children. This represents a significant additional benefit of BCG vaccination.

1.5

In 2015, the Health Information and Quality Authority (HIQA) published a health technology assessment (HTA) of a selective BCG vaccination programme. HIQA stated that, as Ireland met the International Union Against Tuberculosis and Lung Disease criteria for stopping or changing the BCG vaccination policy, it was appropriate to change to a programme of selective vaccination.

1.6

From 2015 to 2019, BCG vaccine was not available for procurement in Ireland, so by default a "no BCG vaccine" policy has been in place since 2015. BCG vaccine is now available for purchase.

1.7

In 2020, the National TB Advisory Committee recommended that universal vaccination of all newborn infants be discontinued but that recommendations for the use of a selective or a no vaccination policy would be requested from NIAC. A BCG subcommittee was formed by NIAC to examine evidence for indications for BCG vaccine. Their report was received by NIAC in February 2021 (see Appendix 1).

The report concluded that BCG vaccine should be made available on a case by case basis for those deemed at highest risk.

1.8

Of 30 countries in the EU/EEA, 13 have a selective BCG vaccination policy; nine recommend neonatal BCG vaccination, and eight do not recommend BCG vaccine. (ECDC 2022)

2. TB EPIDEMIOLOGY IRELAND (Source: HPSC)

- 211 TB cases were notified in 2021, corresponding to a crude incidence rate (CIR) of 4.1 per 100,000 population.
- The highest proportion and age specific incidence rate was in the 25-34 year age group (30%, CIR: 9.7/100,000).
- Of notified cases, 20% were born in Ireland (CIR:1.1/100,000), 56% were foreign born (CIR:14.7/100,000), 23% did not have country of birth reported.

Table 1: TB outbreaks (Ireland) summary 2019. Source: HPSC.

Outbreak type	Outbreak location	Number outbreaks	Number active TB	Number LTBI*	Number hospitalised	Number deaths
Family outbreak	Extended family	1	4	10	1	-
	Private house	2	4	3	2	0
General outbreak	Community outbreak	2	9	-	-	-
	Residential institution	1	2	-	1	-
Total		6	19	13	4	0

*LTBI: Latent tuberculosis infection

Figure 1: Annual TB notifications (Ireland), 3 year moving average and crude incidence rate 2010-2019. Source: HPSC.

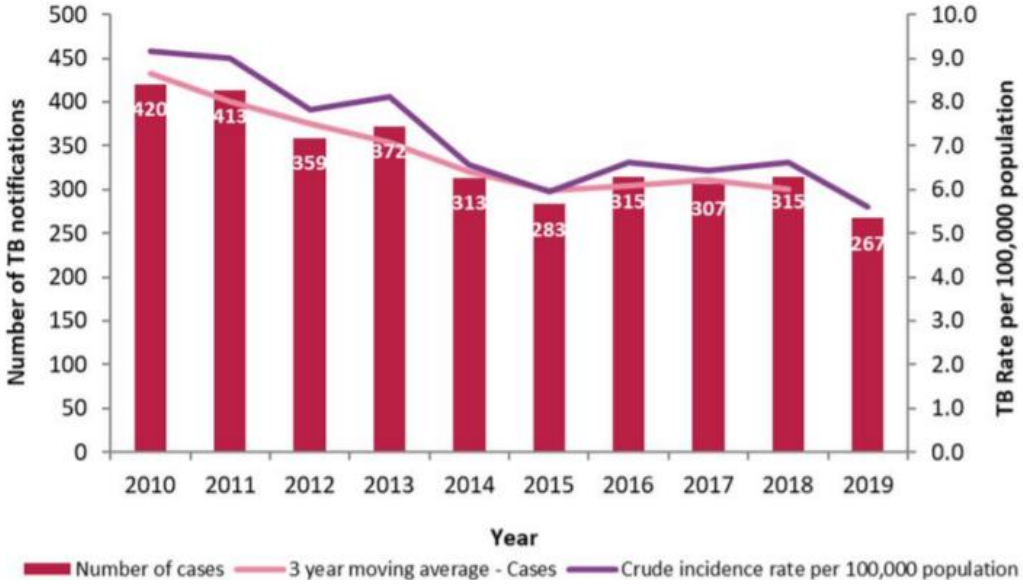


Figure 2: TB outbreaks summary by year 2010-2019. Source: HPSC.

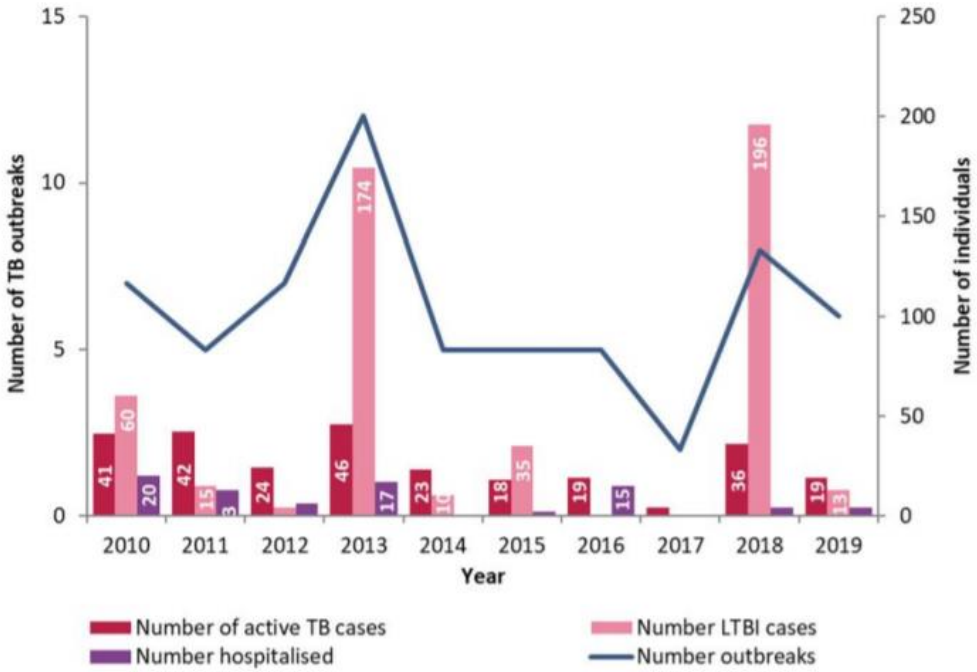


Figure 3: Annual number of TB notifications (Ireland) in children aged 0-14 years by quarter 2016-2019. Source: HPSC.

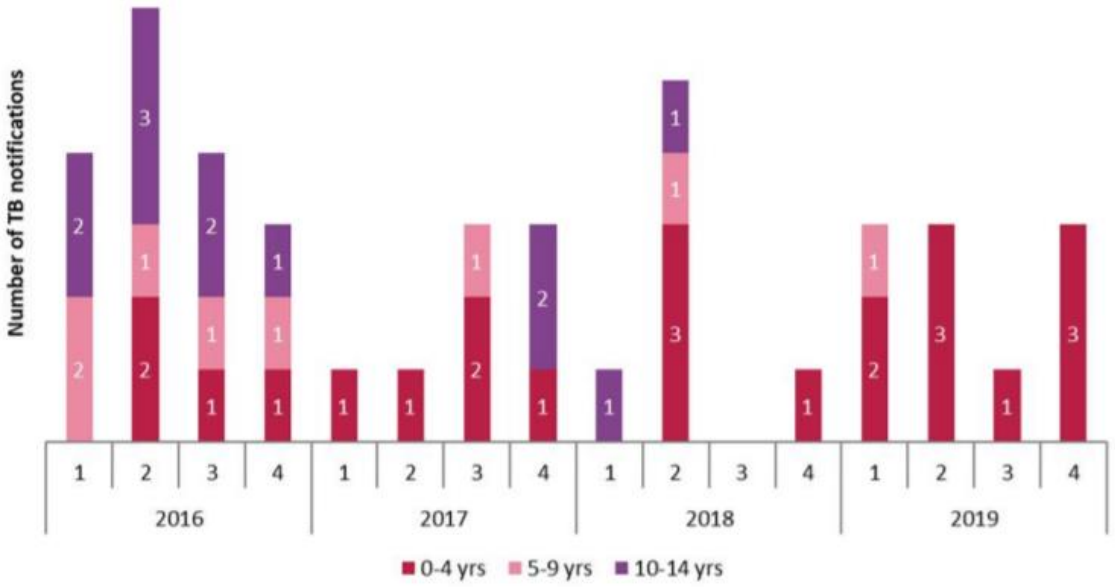


Table 2: Number and proportion of TB notifications by region of origin 2019. Source: HPSC.

Region of origin	Number	Percentage
Ireland	107	40.1
North Africa	1	0.4
Sub-Saharan Africa	27	10.1
Latin America	6	2.2
North America	1	0.4
Eastern Asia	4	1.5
South Asia	35	13.1
South East Asia	15	5.6
Western Asia	2	0.7
Eastern Europe	17	6.4
Northern Europe	7	2.6
Southern Europe	1	0.4
Western Europe	1	0.4
Oceania	1	0.4
Unk	42	15.7
Total	267	100.0

Figure 4: Number of TB notifications and crude incidence rate by geographic origin and age group (years) 2019. Source: HPSC.

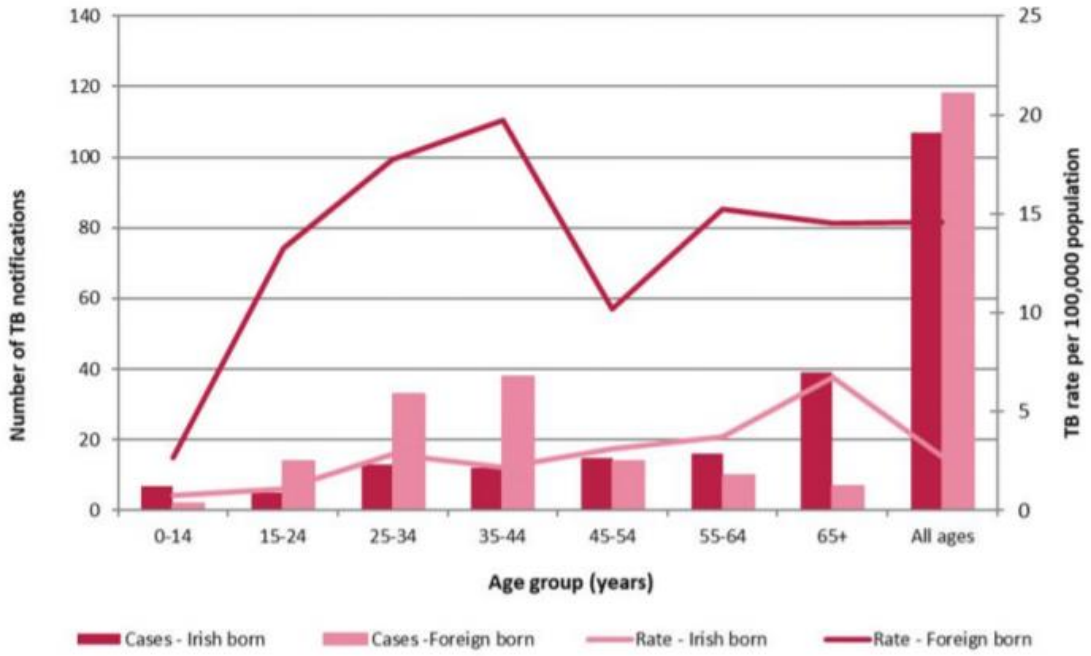
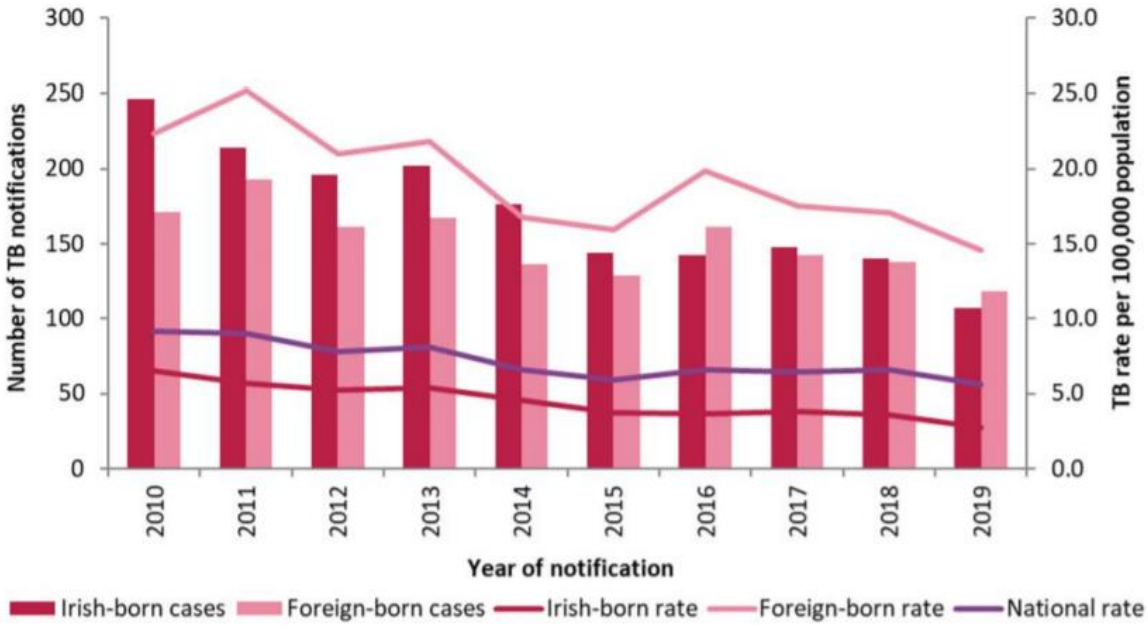


Figure 5: Annual number of TB notifications and crude incidence by geographic origin 2010 – 2019. Source: HPSC.



3. TB NOTIFICATIONS WHO EUROPEAN REGION

During the period 2015-2019, an overall downward trend of 20% was observed in the notification of incident TB cases, from 29 to 23/100,000 population. This trend reflects a genuine reduction in the

spread of the disease, significantly influenced by the decrease in notification rates in the Region's 18 high-priority countries (HPCs), from 56 to 44/100,000 population. The rate of new and relapse cases in the 18 HPCs is almost five times higher than the rate in the EU/EEA (9/100,000 population).

4. BCG VACCINE RECOMMENDATIONS IN OTHER COUNTRIES

4.1 Finland

BCG vaccine is offered to children aged under 7 who are at an increased risk of tuberculosis infection.

A BCG vaccination is recommended for a child:

- when tuberculosis has been diagnosed at any time in the child's mother, father, sibling or a person with whom the child lives
- who has been born in a country with significant levels of tuberculosis, or when the child's mother, father, sibling or a person with whom the child lives has been born in one of these countries
- who, within the next year, intends to move into a country with significant levels of tuberculosis for more than a month
- who have arrived in Finland from a refugee camp or possibly as smuggled asylum seekers
- who live at a reception centre or a unit for minors.

A BCG vaccination should be offered to a child if the child has some other regular and close contact with a person:

- who comes from a country with a high incidence of tuberculosis
- who has contracted tuberculosis
- who is known to have had significant exposure to tuberculosis
- who cares for pulmonary tuberculosis patients or otherwise has regular and significant exposure to tuberculosis in their profession.

4.2 Netherlands

- Children under 12 years of age of whom at least one parent is from a country with a high TB incidence (more than 50 per 100,000 inhabitants)
- Children under the age of 12 from countries with a high TB incidence (more than 50 per 100,000 inhabitants), who come to the Netherlands with their parents as immigrants or asylum seekers
- Travelers to countries with a high tuberculosis incidence (more than 50 per 100,000 inhabitants). The advice depends on the duration of travel, the age and health status of the traveller and the risk the traveller faces.

4.3 Sweden

BCG vaccination is recommended for children who are at increased risk of being infected with TB according to the following criteria:

- family origin from a country with increased or high TB incidence
- current TB in a close relative or household contact

- for planned longer (more than three months) stay in a country or area with high TB prevalence, if the child comes into close contact with the local population.

4.4 UK

BCG is recommended for:

- those travelling for more than three months to a country with a high TB burden* and/ or where the risk of Multi Drug Resistant-TB (MDR-TB) is high, e.g.,
    i. Children under 6 years of age who are travelling to stay with friends, family or local people in their home
    ii. HCWs in settings that are of high risk of exposure to patients diagnosed with TB, particularly MDR-TB.

BCG should be offered to:

- infants (aged 0 to 12 months) whose parent or grandparent was born in a country with a high TB burden
- children aged 1-15 years without evidence of BCG whose parent or grandparent was born in a country with a high TB burden. These aged under six years of age can normally be vaccinated without tuberculin testing. Those aged 6-<16 should be tuberculin tested and vaccinated if negative
- children aged under 16 years of age without evidence of BCG and are tuberculin negative, who:
    i. are close contacts (household or equivalent) of cases of sputum smear-positive pulmonary or laryngeal TB, or
    ii. were born in or lived for at least three months in a country with a high TB burden *.
- healthcare workers (HCW) or laboratory workers who have either direct contact with TB patients or with potentially infectious clinical materials or derived isolates
- veterinary staff and others, e.g., abattoir workers, who handle animals or animal materials which could be infected with TB, who have no evidence of BCG and who are tuberculin negative.

Although there is little data regarding BCG efficacy in those aged over 35 years, it is likely that benefits outweigh risks for vaccinating those aged over 35 years in the above groups with BCG.

BCG should be considered for:

- those who working with persons at higher risk of acquiring TB, e.g., staff working with prisoners, homeless persons, persons with drug and alcohol misuse and those who work with refugees and asylum seekers.

4.5 US CDC

The BCG vaccine **should be considered** only for very select persons who meet specific criteria and in consultation with a TB expert.

Recommendations:

Children

BCG vaccination should only be considered for children who have a negative tuberculin skin test and who are continually exposed, and cannot be separated from, adults who:

- are untreated or ineffectively treated for TB disease (if the child cannot be given long-term treatment for infection); or
- have TB caused by strains resistant to isoniazid and rifampicin.

Health Care Workers

BCG vaccination of health care workers should be considered on an individual basis in settings in which:

- a high percentage of TB patients are infected with *M. tuberculosis* strains resistant to both isoniazid and rifampicin;
- there is ongoing transmission of such drug-resistant *M. tuberculosis* strains to health care workers and subsequent infection is likely; or
- comprehensive TB infection-control precautions have been implemented, but have not been successful.

Health care workers considered for BCG vaccination should be counselled regarding the risks and benefits associated with both BCG vaccination and treatment of Latent TB Infection (LTBI)."

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APPENDIX 1

Report of the National Immunisation Advisory Committee BCG Vaccine Subcommittee, February 2021

Members
Prof Karina Butler
Prof Joseph Keane
Dr Zakiah Amir
Dr Mary O'Meara
Dr Tom O'Connell
Dr Cilian Ó Maoldomhnaigh

BCG Vaccine

The Bacille Calmette-Guerin (BCG) vaccine protects infants against tuberculosis and was introduced across Ireland in the 1950s. The National Immunisation Advisory Committee (NIAC) BCG subcommittee was formed in March 2020 to address the issue of BCG vaccination in the context of the return of vaccine supply after a 5 year absence. In 2015, the Chief Medical Officer of the Health Service Executive, on the recommendation of the National Tuberculosis Advisory Committee (NTBAC) and the NIAC, requested that the Health Information and Quality Authority (HIQA) perform a Healthcare Technology Assessment (HTA) of a selective BCG vaccination programme. This report was published in November 2015, however, due to a global shortage of BCG vaccine, there has been no BCG vaccination programme since April 2015 and no official changes in the guidelines were made.

The current recommendations in Chapter 22 of the National Immunisation Guidelines, which were last updated in 2015, are for a universal BCG vaccination strategy (i.e., to vaccinate all babies unless contra-indications). In 2016, Portugal, which, was the only other Western European country with a universal BCG strategy, moved to a selective vaccination strategy (i.e., only vaccinating infants deemed at high risk).

Indications as per 2015 recommendations:

1. Newborn infants.
2. All unvaccinated children aged 1 month to <16 years.
3. Unvaccinated TST negative individuals under 16 years of age who were born or lived for >3 months in a country with an annual incidence TB incidence of ≥40/100,000.
4. Unvaccinated new entrants aged 16-35 years from a country with a TB incidence of >500 per 100,000.
5. Unvaccinated persons aged <35 years who are contacts of cases with active respiratory tuberculosis. Children under 5 years of age in contact with smear positive tuberculosis should be referred to a contact tracing clinic for investigation and immunised with BCG as indicated.
6. Members of at risk groups e.g. the Traveller community (due to the logistical difficulties of providing alternative control measures and follow-up of contacts).
7. Unvaccinated persons under 16 years of age intending to live with local people in countries with an annual TB incidence of ≥40/100,000 for more than 3 months.
8. Unvaccinated TST negative persons aged <35 years in the following at risk occupations:
    - Veterinary laboratory staff who handle animals susceptible to TB
    - Abattoir workers who handle animal species, carcasses and products susceptible to tuberculosis.
    - Agricultural officers and veterinary inspectors may require BCG vaccination based on individual risk assessment

- Prison staff working directly with prisoners
- Staff of facilities for the elderly
- Staff of residences for homeless people, refugees and asylum seekers.

9. Unvaccinated health-care workers aged <35 who are TST negative and who will have contact with patients or with clinically contaminated material.
10. Not all HCWs are at equal risk of TB. A risk assessment should be carried out to see if BCG should be given to unvaccinated HCWs aged 35 and older, who are TST negative, taking into account their country of origin and the nature of their work.

In 2020 the NTBAC recommended that the universal vaccination of all newborn infants be discontinued but that recommendations for the use of a selective or a no vaccination policy would be requested from the NIAC. The BCG subcommittee was formed to examine the current evidence for indications for BCG vaccine.

Occupational Health Recommendations
Clear recommendation and consensus from the subcommittee that there is not compelling evidence for the routine use of BCG vaccine in occupational settings, with vaccination only on the basis of a risk assessment when all other methods of preventing infection have failed. Criteria for this are laid out in the attached document.

Neonatal Vaccination Policy
HIQA HTA
The 2015 HIQA HTA found that the recent incidence of TB in Ireland had met the International Union Against Tuberculosis and Lung Disease (IULTD) criteria for altering the BCG vaccination policy (Table 1).

Table 1. The IULTD Criteria for stopping or changing BCG vaccination policy.

Criteria
▪ There must be a well functioning TB programme. Criteria include having: ○ the structures and processes in place to ensure early detection of cases ○ institution of appropriate treatment in a timely manner ○ early identification of non-compliers, and ○ the capacity and facilities to institute supervised therapy, where appropriate. ▪ There has been a reliable reporting system over the previous five or more years that enables estimation of the annual incidence of active TB by age and risk group and in particular the incidence of TB meningitis and sputum smear-positive pulmonary TB. ▪ Due consideration has been given to the possibility of an increase in the incidence of TB resulting from the burden of HIV in that country With one of the following: ▪ Average annual notification rate of smear-positive pulmonary TB cases ≤ 5 per 100,000 during the previous three years; or ▪ Average annual notification rate of TB meningitis in children aged under five years < 1 per 10 million general population during the previous five years; or ▪ Average annual risk of TB infection ≤ 0.1%

Using epidemiological data on TB incidence and the incidence of BCG reactions a cost-effectiveness evidence analysis by the National Centre for Pharmacoeconomics found that "In terms of the risk:benefit ratio balancing the harms of BCG versus the benefit of TB avoided, selective vaccination was estimated to be more effective and less costly than universal vaccination."

The HTA recommended a change to a selective vaccination programme as this was felt to protect "children most at risk of contracting TB while avoiding adverse effects of the vaccine in children who are least likely to benefit from vaccination."

Although included in the analysis, a policy of no BCG vaccination was not considered a viable option as it afforded no protection to infants at increased risk of TB, despite the fact that a selective vaccination programme was found to be not cost-effective relative to a programme of no vaccination.

The report also notes that "if selective vaccination is adopted, the most efficient method of delivering the programme needs to be determined to ensure best use of resources." This is of particular relevance because BCG vaccine is administered intra-dermally which requires particular training and expertise of the vaccinators, many of whom have retired since the BCG stock shortage. The facilities for capturing at risk mothers to identify newborns who should receive the BCG vaccine are also not in place.

Current Irish Epidemiology

Ireland had a de facto no vaccination BCG strategy from 2015 due to global stock shortages. In order to examine the effect of this on TB incidence in Ireland the Health Protections Surveillance Centre (HPSC) performed an analysis of the epidemiology of TB in the four years preceding and following the BCG shortage (Table 2).

Table 2. Number and percentage of TB notifications by age group and year of notification

	2011-2014		2015-2018		2002-2018	
Age group (years)	n	%	n	%	n	%
0-4 years	15	1.0	15	1.2	124	1.9
5-14 years	31	2.1	31	2.5	164	2.5
≥15 years	1409	96.7	1171	96.0	6385	95.5
Age unknown	2	0.1	3	0.2	11	0.2
Total	1457	100.0	1220	100.0	6684	100.0

This report found that no major increase was observed over the time period analysed in the 0-4 year age group, who are the only cohort born after the vaccine was not being delivered. The same number of cases were notified in this age group during 2015-2018 compared to the previous four year period from 2011 to 2014. The analysis also states that these results should be interpreted with caution as the case numbers are small in both time periods.

An increase in the number of TB cases notified in the 0-4 year age group, with 9 cases, was reported in the HPSC annual TB epidemiology analysis in 2019. It is important to note that the HIQA HTA predicted that the number of new cases "under selective vaccination would reach a maximum of 10.7 cases per annum three years after introduction, compared with 8.0 cases under universal vaccination at the same point in time." The number of cases in the last three years of complete data (2017-2019) has been 7.6 cases per annum in a no vaccination system. It remains to be seen

whether the increase seen in 2019 persists in 2020, though the interpretation of all public health data in this year must be taken in the context of the Covid-19 pandemic.

The HIQA report also examined the mortality if the TB incidence was half of what was predicted based on the 2005-2014 data and concluded that "reducing the risk of TB has a marked impact on estimated mortality. The estimated total mortality in the single birth cohort was 0.26 for universal vaccination, 0.21 for selective vaccination, and 0.22 for a programme of no vaccination. Therefore, based on recent rates of TB incidence, both selective vaccination and no vaccination would be associated with lower total mortality than universal vaccination."

NIAC Recommendation

Following deliberation by the subcommittee it was felt that there was inadequate data to make an evidence based recommendation as to whether a selective or no vaccination policy should be implemented. The above data was presented to the NIAC on November 30th 2020 for discussion amongst the full committee. As the 5 year period since the de facto no vaccination policy had not led to the predicted increase in TB cases as per the HTA, and the incidence of TB continued to decline, there was consensus that there would not be a recommendation at present for a selective vaccination program. However the increase in cases in 2019 warrants ongoing monitoring as if cases in the younger age groups, who have not been vaccinated, continues to rise then a selective vaccination policy would warrant further consideration. It was the recommendation that the BCG vaccine should be made available on a case by case basis for those deemed at highest risk, for example in a neonate born to a mother with active TB.

There was clear consensus from the NIAC that as per the HIQA HTA and other previous reports, an adequately resourced TB control programme that would ensure prompt screening, contact tracing and treatment of TB cases, should be the primary method of controlling TB in Ireland.

BCG vaccination recommendations will remain under active review and consideration by the NIAC pending further epidemiological data on the effect of the current no vaccination schedule.

APPENDIX 2: RECOMMENDATIONS/ CONSIDERATIONS FOR BCG VACCINE BY COUNTRY

	Recommendations/ considerations for Ireland	Finland	UK	US
TB contact	Recommended for those • under 16 years of age who are regular close contacts (household or equivalent) of cases of sputum smear-positive pulmonary or laryngeal TB	Under 7 • when TB has been diagnosed at any time in a person with whom the child lives	Under 16 • who are close contacts (household or equivalent) of cases of sputum smear-positive pulmonary or laryngeal TB	Children who have a negative tuberculin skin test and who are continually exposed, and cannot be separated from, adults who • are untreated or ineffectively treated for TB disease (if the child cannot be given long-term treatment for infection); or • have TB caused by strains resistant to isoniazid and rifampicin
		Children with regular and close contact with a person • who has contracted tuberculosis • who is known to have had significant TB exposure		
Children	Recommended for those • under 16 years of age born in or living with a person who was born in a country with a high TB burden*	Under 7 • born in a country with significant levels of TB, or when a person with whom the child lives has been born in one of these countries	Under 16 • whose parent or grandparent was born in a country with a high TB burden*	
	Should be considered for those • under 16 years of age with at least one parent from a country with a high TB burden* (because of expected regular visits to the country of origin of the parent(s) and possible increased risk of transmission within their own ethnic group) • under 12/16 years of age from countries with a high TB burden, who come to Ireland with their parents as immigrants or asylum seekers.	Under 7 • arrived from a refugee camp or possibly as smuggled asylum seekers • live at a reception centre or a unit for minors	Under 16 • born in or lived for at least three months in a country with a high TB burden*	
		Children with regular and close contact with a person • who comes from a country with a high TB burden* • who cares for pulmonary TB patients or otherwise has regular and significant exposure to TB in their profession		
Travellers	Recommended for those • under 35 years of age planning to stay longer than three months in a country with a high TB burden*, and who may come into close contact with the local population.	Under 7 • within the next year, intend to move into a country/region with a high TB burden* for more than a month.	Those travelling for more than three months to a country with a high TB burden* and/ or where the risk of MDR-TB is high, e.g., o Under 16 years, who are travelling to stay with friends / family or local people o HCWs in settings that are of high risk of exposure to patients diagnosed with TB, particularly MDR-TB	
	May be considered for those • aged 35 and older (although there is little data regarding vaccine efficacy in this age group).	Over 5 years • who will be travelling or living in countries or areas with a high TB burden* for extended periods		

Healthcare workers	Should be considered for those • health-care workers under 35 years of age who are TST/IGRA negative and who have contact with patients or with clinically contaminated material. May be considered for • HCWs aged 35 years and older, although there is little evidence for efficacy in this age group. Not all are at equal risk of TB.	• HCWs who may be at high risk of exposure to drug resistant cases.	• HCW or laboratory workers who have either direct contact with TB patients or with potentially infectious clinical materials or derived isolates.** • Veterinary staff and others, e.g., abattoir workers, who handle animals or animal materials which could be infected with TB, and who have no evidence of BCG and who are tuberculin negative.**	On an individual basis in settings in which • a high percentage of TB patients are infected with M. tuberculosis strains resistant to both isoniazid and rifampin; • there is ongoing transmission of such drug-resistant M. tuberculosis strains to health care workers and subsequent infection is likely; or • comprehensive TB infection-control precautions have been implemented, but have not been successful
Occupational health			• Working with persons at higher risk of acquiring TB, e.g., staff working with prisoners, homeless persons, persons with drug and alcohol misuse and those who work with refugees and asylum seekers	
	Recommended	**Recommended**	**Recommended**	
	Should be considered	**Should be offered**	**Should be offered to**	
	May be considered	**May be considered**	**Should be considered for**	**Should be considered**
			** Although there is little data regarding BCG efficacy in those aged >35 years, it is likely that benefits outweigh risks for vaccinating those aged >35 years in these groups with BCG.	Health care workers considered for BCG vaccination should be counseled regarding the risks and benefits associated with both BCG vaccination and treatment of Latent TB Infection (LTBI).

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