ROYAL COLLEGE OF PHYSICIANS OF IRELAND

# National Immunisation Advisory Committee

RECOMMENDATIONS FOR COVID-19 BOOSTER VACCINATION OF THOSE AGED 12-15 YEARS

NIAC |18.02.2022

## 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 (DOH). The Department and the Minister for Health make policy decisions on vaccines which are implemented by the HSE.

## RECOMMENDATIONS FOR BOOSTER VACCINATION OF THOSE AGED 12-15 YEARS

1. All those who are unvaccinated or incompletely vaccinated are strongly recommended to complete a primary COVID-19 vaccination course. Priority continues to be completion of the primary vaccination course for all eligible and acceptance of a booster dose as recommended. Seasonal influenza vaccine can be given at the same time to those for whom it is recommended.
2. All should continue to observe recommended public health and social measures.
3. Comirnaty 30 micrograms booster vaccination is recommended for those aged 12-15 years:
    a) with underlying conditions as listed in Table 5a.2, Chapter 5a COVID-19
    b) living with a younger child with complex medical needs
    c) living with a person who is immunocompromised
4. Comirnaty 30 micrograms booster vaccination should be offered to all others aged 12-15 years for the following reasons:
    a) the favourable benefit risk profile of the vaccine
    b) waning immunity following the primary vaccine course
    c) to reduce the risks of asymptomatic, symptomatic, and severe COVID-19, and their complications, e.g., multisystem inflammatory syndrome in children (MIS-C), long COVID
    d) to minimise psychological, social and developmental impacts and to help normalise life for adolescents
    e) to increase the likelihood of protection against future variants
5. Comirnaty 30 micrograms should be given six months or longer following completion of the primary Comirnaty vaccine course.
6. Those who have a breakthrough infection following a primary vaccination course should defer booster vaccination for at least six months following infection onset.
7. Data are insufficient to recommend other COVID-19 vaccines as a booster for this age group if Comirnaty is contraindicated.

Prior to administration of the booster dose, adolescents along with their parents/guardians, should be informed of the benefits, risks and uncertainties of the booster dose of Comirnaty vaccine.

The decision to accept, defer or decline vaccination should be respected.

These recommendations reflect current evidence and will be reviewed when more information becomes available.

# 1. EXECUTIVE SUMMARY

- In July 2021, NIAC recommended COVID-19 primary vaccination of those aged 12-15 years with Comirnaty 30 micrograms, based on its favourable benefit risk profile. Primary vaccination of this age group commenced in August 2021. By 30 January 2022, 70% were fully vaccinated.

- Recommendations relating to primary vaccination of this age group aimed to reduce the risk of severe COVID-19 and its complications, and to mitigate the indirect psychological, social and educational impacts of COVID-19. Since then, waning immunity and the emergence of the highly transmissible, more immune evasive variant Omicron have decreased some of the benefits of the primary course with increased rates of breakthrough infection.

- While Omicron infection tends to be less severe than Delta, with lower rates of ICU admission, hospitalisation rates in those aged 12-15 years have increased compared to previous waves. From 19 December 2021 to 9 February 2022 (Omicron predominant), there were 58,253 SARS-CoV-2 PCR confirmed cases, 260 hospitalisations (some incidental to the presence of SARS-CoV-2 infection), six ICU admissions and no deaths in this age group.

- Breakthrough infection in those aged 12-15 years is usually asymptomatic or mild, but can be severe, particularly in those with underlying medical conditions. Asymptomatic and mild breakthrough infection can be associated with MIS-C and long COVID.

- In the UK, vaccine effectiveness (VE) in adults against symptomatic disease, and less so against severe disease, is reduced against Omicron compared to Alpha or Delta and wanes over time. There are limited VE data against Omicron for those aged 12-15 years.

- In Israel, in those aged 12-16 years, VE against Delta infection peaked at 85% by 2-12 weeks after vaccination and declined to 58% by five months.

- Effectiveness can be restored by booster vaccination. In US adults, three mRNA vaccine doses were necessary to achieve similar VE against Omicron compared to that following two doses against Delta and Alpha infection.

- In Israel, a significantly lower rate of infection was reported in those eligible for a booster (aged 16-18 years) compared to those eligible for a primary schedule (aged 12-14 years).

- A booster dose of Comirnaty 30 micrograms is licensed by the EMA for adults from six months after the second vaccine dose and by the FDA for all aged 12 years and older. An application to authorise Comirnaty 30 micrograms as a booster for adolescents from 12 years of age is under review by the EMA.

- Comirnaty is mainly associated with short lived, self-limited side effects. In those aged 16 years and older, the side effect profile following a Comirnaty booster is similar to those after the second vaccine dose. There are limited safety data on Comirnaty booster vaccine for those aged 12-15 years.

- Myocarditis and pericarditis are very rare risks of mRNA vaccination, mainly occurring in younger males aged 12-24 years after the second dose of the primary vaccination course. Preliminary evidence suggests that the risk of myocarditis may be lower in those aged 12-15 years compared to older adolescents. Preliminary data in those aged 16 and older indicate the reporting rate following a booster may be lower than that after the second dose. Based on short-term follow up, most myocarditis cases are of short duration and resolve with symptomatic treatment.

- Optimising protection against COVID-19 and its short and long-term complications by boosting those aged 12-15 years will reduce their risk of breakthrough infection and its consequences including severe disease, MIS-C, and long COVID. It should also help mitigate the indirect but very important impacts including school absences, social restrictions, and psychological consequences. It will likely enhance protection against future variants.

- Boosting young adolescents will also benefit their families. This is important where family members are vulnerable or too young to be vaccinated.

- Reducing the overall burden of breakthrough infections in young adolescents will contribute to the overall suppression of the virus in the community.

- The Omicron wave is slowly ebbing. However, *"it is too early to declare victory against the coronavirus*" (WHO). A number of SARS-CoV-2 variants, including Omicron sublineages, have been detected. This underlines the importance of maintaining optimal protection against SARS-CoV-2 and its variants.

- The issue of universal adolescent booster vaccination should be considered in the context of national and global vaccine supply issues. NIAC considers that every effort should be made to meet our ethical obligations in terms of global solidarity through equitable vaccine sharing at the earliest possible opportunity.

When formulating recommendations and advice, NIAC weighs the benefits and potential risks of vaccination against disease related risks, both to the individual and the community.

These recommendations reflect a dynamic vaccination programme strategy. Evidence about COVID-19 vaccines is continuously evolving and being refined. Recommendations may be updated when more information becomes available.

## 2. INTRODUCTION

NIAC recommends COVID-19 vaccination for all those aged 12 to 15 years with Comirnaty 30 micrograms, based on its favourable benefit risk profile. Primary vaccination of those aged 12-15 years commenced in August 2021. By 30 January 2022, 70% were fully vaccinated.[1]

Recommendations relating to the primary vaccination of this age group aimed to reduce the risk of severe COVID-19 and its complications, and to mitigate the indirect psychological, social and educational impacts of COVID-19.

Time has shown that even fully vaccinated healthy people can become quite ill with breakthrough infection and can develop MIS-C following breakthrough infection.

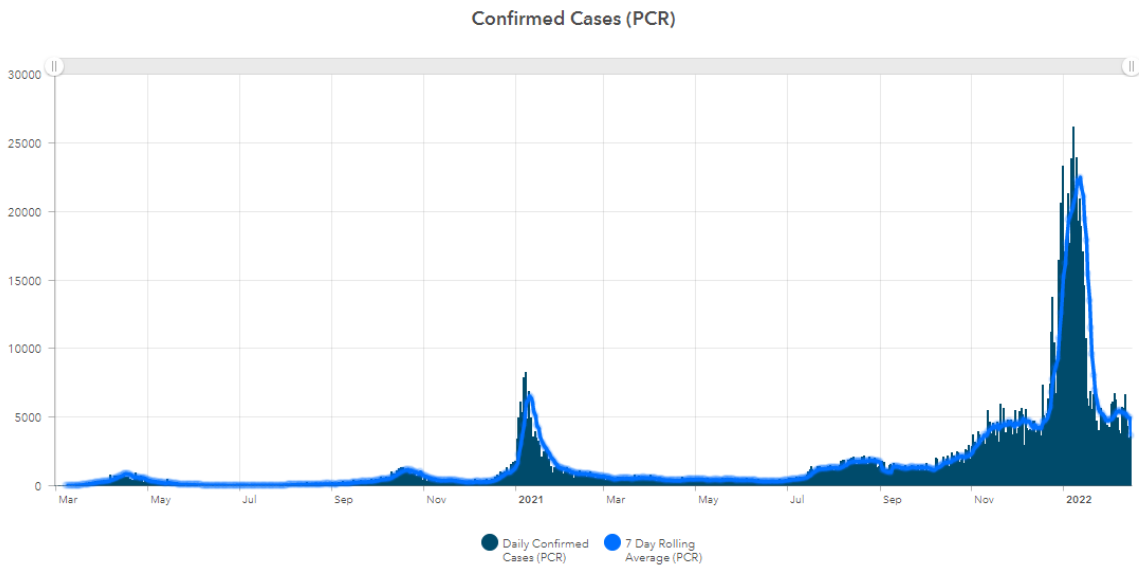
Since the initial recommendation, evidence on waning immunity and the emergence of the highly transmissible, more immune evasive variant Omicron has eroded some of the benefits of the primary vaccination course and increased rates of breakthrough infection. Providing a booster vaccine can optimise protection against severe COVID-19 and further reduce risk of MIS-C and long COVID. It should also help to reduce some of the indirect harms of breakthrough infection, those associated with repeat testing and isolation, school absences, and mitigate the psychological and social risks. It will help to facilitate a return to a more normal life for young adolescents.

## 3. COVID-19 EPIDEMIOLOGY IN IRELAND

In Ireland, 95% of those aged 18 and older are fully vaccinated and 70% have received a booster vaccine (HPSC COVID-19 Vaccination Uptake in Ireland Weekly Report, 10 February 2022). Vaccination has conferred significant benefits including a significant reduction in the proportion of infected cases with severe COVID-19.

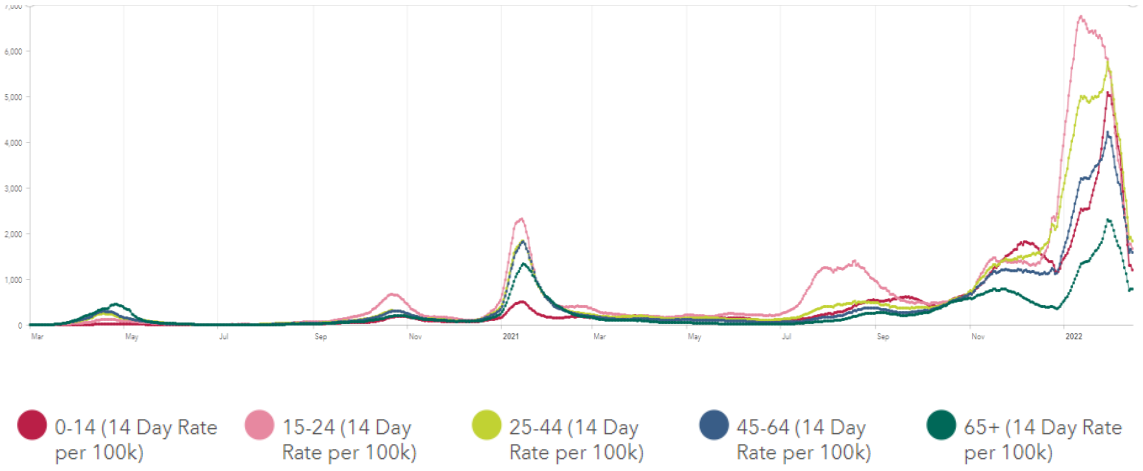
Although there has been a recent decline in overall case numbers, high levels of community transmission of SARS-CoV-2 persist. (Figure 1)

Figure 1: PCR-confirmed COVID-19 cases March 2020 to date. Source: COVID data hub accessed 20 February 2022.




Omicron remains the predominant variant. Having declined from a peak of over 20,000 new SARS-CoV-2 confirmed infections per day in early January 2022, community transmission remains high with 4,000-6,000 confirmed cases per day and an almost equal number registered a positive antigen test. Test positivity remains very high at 31%. In the week ending 14 February 2022, a total of 34,559 COVID-19 confirmed cases were reported, with a median age of 38 years (range 0 – 102 years). (HSPC.ie, covid19ireland-geohive.hub.arcgis.com, accessed 16.02.2022)

Figure 2: Rate of cases per 100,000 population by age. Source: HPSC.ie, Accessed 16 February 2022.



Despite the continuing high case numbers, the benefits of vaccination are evident. ICU admissions at 15.4/100,000 and 2.3/100,000 and deaths at 20.2/100,000 and 4.7/100,000 for waves four and five respectively are markedly less than in previous waves. (Source: CIDR, Accessed 10 February 2022)

### Epidemiology in those aged 12-15 years

Vaccination of those 12-15 years commenced August 2021. Despite its benefits, reflected in the lower hospitalisation rate, the arrival of Omicron coupled with waning immunity has resulted in higher infection rates in that age cohort than during any previous wave. (Table 1)

Table 1: SARS-CoV-2 incidence comparison for those aged 12-15 years across the waves. Adapted from CIDR data extract 10 February 2022.

| No./100,000 | Wave 1 up to 01.08.2021 | Wave 2 02.08.2021–21.11.2021 | Wave 3 22.22.2021–26.06.2021 | Wave 4 27.06.2021–18.12.2021 | Wave 5 19.12.2021–09.02.2022 |
|---|---|---|---|---|---|
| Cases | 70 | 697 | 2,780 | 7,143 | 10,291 |
| Hospitalisations | 1.8 | 4.68 | 21.97 | 26.65 | 38.54 |
| ICU admission | 0 | 0 | 0.36 | 1.44 | 0.38 |
| Deaths | 0 | 0 | 0 | 0.36 | 0 |

From 19 December 2021 to 09 February 2022, there were 58,253 confirmed and probable cases, 260 hospitalisations, six ICU admissions and no deaths in those aged 12-15 years. (Source: CIDR data extract 10.02.2022)

## 4. COVID-19 IN CHILDREN AND ADOLESCENTS

SARS-CoV-2 infections are generally milder in children than in adults. However, children can develop severe COVID-19. Complications such as MIS-C or long COVID can follow even asymptomatic or mild infection.

SARS-CoV-2 breakthrough infections in those aged 12-15 years are usually asymptomatic or mild but can also be severe, particularly in those with certain medical conditions. MIS-C can rarely occur following breakthrough infection. Data regarding long COVID following breakthrough infection is lacking. Uncertainty regarding their long-term outcomes of such infections remains.

In Ireland, from January 2020 to February 2022, there were 23 COVID-19 associated paediatric ICU admissions of children aged 10-15 years; eight with COVID-19 and 15 because of MIS-C. One additional child was admitted with post-vaccine myocarditis. The median length of stay was four days (range: 2-5 days).[2]

## Risk Factors for Moderate and Severe Disease

While children with comorbidities are not at increased risk of infection, their risk of hospitalisation is greater than those without an underlying condition.

In the US, 71% of those aged 12-17 years whose primary reason for hospitalisation was COVID-19 had at least one comorbidity (obesity, chronic lung disease including asthma, neurological disorder, chronic metabolic condition, blood disorder and cardiovascular disease). The number of comorbid conditions present is associated with increasing risk of ICU admission and death from COVID-19. Breakthrough infections are less likely to cause severe disease than infection in unvaccinated individuals, however the risk factors for severe outcome are similar to those for people who are not vaccinated.

## Multisystem Inflammatory Syndrome (MIS-C)

MIS-C is a rare but serious inflammatory disorder related to prior SARS-CoV-2 infection. MIS-C can rarely develop following breakthrough infection. It is too soon to reliably assess the risk of MIS-C following Omicron breakthrough infection. Optimising protection against infection thus reducing risk of breakthrough infection is likely to favourably impact the risk of MIS-C.

## Long COVID

Recognition and diagnosis of long COVID is difficult. Studies of the incidence and severity of long COVID have yielded very variable and conflicting results. A German case control study that included over 11,000 children and adolescents with confirmed infection found that the incidence of physical and psychological health problems was higher in children and adolescents following COVID-19 than in matched controls. (Table 2) The risks were lower for children and adolescents than for adults. All data were generated prior to Omicron.[3]

Table 2: Ten most common post COVID-19 outcomes in those under 18 years of age. Adapted from Roessler et al.

| Rank | Name | IRR* | 95% CI | IR COVID-19 | IR Control |
|---|---|---|---|---|---|
| 1 | Malaise/fatigue/exhaustion | 2.28 | [1.7-3.1] | 12.58 | 5.51 |
| 2 | Cough | 1.74 | [1.5-2.0] | 36.56 | 21.06 |
| 3 | Throat/chest pain | 1.72 | [1.4-2.1] | 20.01 | 11.66 |
| 4 | Adjustment disorder | 1.71 | [1.4-2.1] | 26.37 | 15.40 |
| 5 | Somatisation disorder | 1.62 | [1.3-2.0] | 17.90 | 11.06 |
| 6 | Headache | 1.58 | [1.4-1.8] | 36.67 | 23.24 |
| 7 | Fever | 1.56 | [1.3-1.9] | 27.84 | 17.84 |
| 8 | Anxiety disorder | 1.54 | [1.2-1.9] | 16.70 | 10.87 |
| 9 | Abdominal pain | 1.45 | [1.3-1.6] | 53.94 | 37.31 |
| 10 | Depression | 1.45 | [1.1-1.9] | 12.05 | 8.32 |

Significance level: *1%

In a UK study, participants aged 11-14 years had a significant higher rate of symptoms three months after COVID-19 that those who had tested negative. Twenty-three percent had at least one reported symptom and 11% had five or more symptoms compared to 5% of those who tested negative. While children and adolescents experienced the same range of symptoms whether they tested negative or positive, the frequency of symptoms was significantly higher in those who tested positive.[4]

The risk of long COVID following breakthrough infection has not been ascertained. Recent consensus has been reached on a definition for long COVID in children and adolescents that will facilitate further research in this area. Given the overall burden of SARS-CoV-2 infection in children and adolescents, development of long COVID, even if the risk is small, could result in substantial morbidity for children and adolescents in the coming months. Reduction in the incidence of primary and breakthrough infections could mitigate this.

### Other effects of COVID-19

In US data, children and adolescents aged 18 years and younger who have had COVID-19 are up to 2.5 times more likely to be diagnosed with diabetes 30 days or more following infection.[5]

Breakthrough infection in fully vaccinated children and adolescents, even when mild, can be extremely disruptive for families, interfere with school attendance, and other educational and social activities.

## 5. COVID-19 TRANSMISSION FOLLOWING BREAKTHROUGH INFECTION

In the Delta era, vaccination reduced the risk of infection and of transmission from those infected; however, protection waned over time.[6,7] Overall protection against onward transmission from those who received a booster was estimated to range from 40-60%.[8]

In a Danish study of household transmission, booster-vaccinated subjects had a reduced (OR: 0.72; 95% CI:0.56-0.92) and unvaccinated subjects had an increased (OR: 1.41; 95% CI: 1.27-1.57) likelihood of transmission for both Delta and Omicron (BA.1 and BA.2) compared to those following primary vaccination. The benefits of booster vaccination in reducing susceptibility to and transmissibility of Omicron were shown.[9] (Table 3)

Table 3: Vaccination effect on susceptibility and transmissibility of Omicron (BA.1 and BA.2) within households. Adapted from Lysngse et al.

| | Susceptibility | | Transmissibility | |
|---|---|---|---|---|
| | Omicron BA.2 households | Omicron BA.1 households | Omicron BA.2 households | Omicron BA.1 households |
| Unvaccinated | 1.10 (0.92-1.32) | 1.23 (1.09-1.40) | 1.21 (0.97-1.50) | 0.93 (0.80-1.08) |
| Fully vaccinated (ref) | 1 | 1 | 1 | 1 |
| Booster vaccinated | 0.80 (0.67-0.94) | 0.65 (0.58-0.73) | 0.79 (0.64-0.98) | 0.77 (0.70-0.88) |
| Number of observations | 17,945 | 17,945 | 17,945 | 17,945 |
| Number of households | 8,541 | 8,541 | 8,541 | 8,541 |

Continued circulation of SARS-CoV-2 in adolescents can contribute indirectly to the COVID-19 burden in those who are more vulnerable and those too young to be vaccinated. At a population level the additional benefit of booster vaccination of this age group is dependent on the levels of community virus circulation and vaccine uptake by adolescents.[8,10]

## 6. COVID-19 VACCINE SAFETY IN CHILDREN AND YOUNG ADULTS

Comirnaty is mainly associated with short lived, self-limited side effects. The safety of the Comirnaty primary vaccination series was evaluated in a clinical trial including 1,131 adolescents aged 12-15 years of age that received Comirnaty. The overall safety profile was similar to that in participants 16 years and older with studies ongoing to monitor long-term safety following vaccination. There are limited safety data on Comirnaty booster vaccine for those aged 12-15 years.

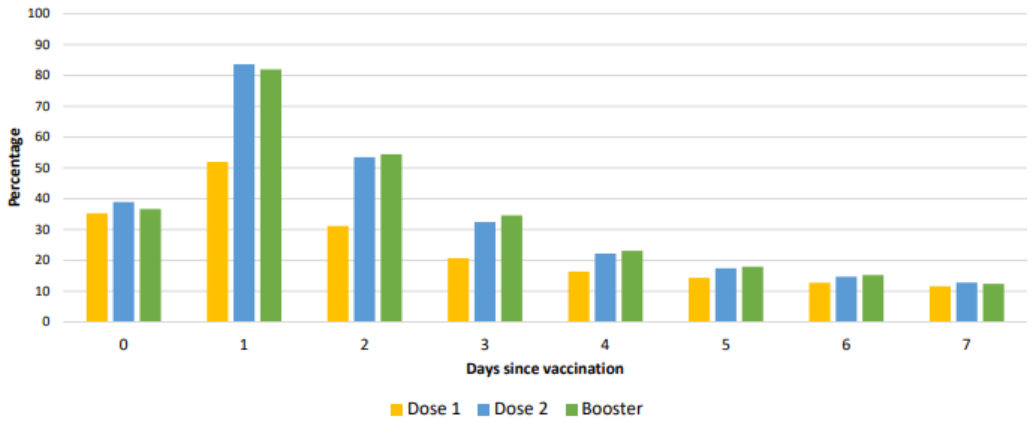
Myocarditis and pericarditis are very rare risks of mRNA vaccination, mainly seen in younger males after the second dose of the primary vaccination course. The highest rates observed following the primary vaccination series with Comirnaty are in males aged 12-17 years (US), 16-19 years (Israel) and 16-25 years (Europe-Nordic registry). Preliminary evidence suggests that the risk of myocarditis may be lower in those aged 12-15 years compared to older adolescents.

Based on short-term follow up, most vaccine associated myocarditis cases are of short duration and resolve with symptomatic treatment with studies ongoing to evaluate longer-term outcomes.

Safety data on Comirnaty booster vaccine for those aged 12-15 years is currently limited. In a placebo-controlled trial, 5,081 participants aged 16 years and older received a booster dose of

Comirnaty at least six months after the second dose. The safety profile of the booster was similar to that seen after two doses. In a recent US review of spontaneous reports, Comirnaty was associated with short lived, self-limited side effects. Local and systemic side effects in adolescents and young adults aged 16-24 were generally mild to moderate. They were more commonly reported after the second dose compared to the first and were less common after a booster dose than a second dose (Figure 3). In the US, 2.8 million adolescents aged 12-17 years have safely received a booster dose of Comirnaty vaccine.

Figure 3: Percentage of vaccine recipients aged 16-24 years reporting any systemic reaction at least once in 0-7 days after Comirnaty, by dose and days since vaccination.[11] Source: CDC.




Very rare cases of myocarditis have been reported following a booster, similar in nature to those after the first or second dose. Preliminary data in those aged 16 and older from Israel, US and UK indicate the reporting rate following a booster may be lower compared to that seen after the second dose.[12-14] (Table 4)

Table 4: Myocarditis in Israel reported after Comirnaty, as of December 15, 2021. Adapted from S Oliver-American Committee on Immunisation Practices (ACIP), 5 January 2022.[12]

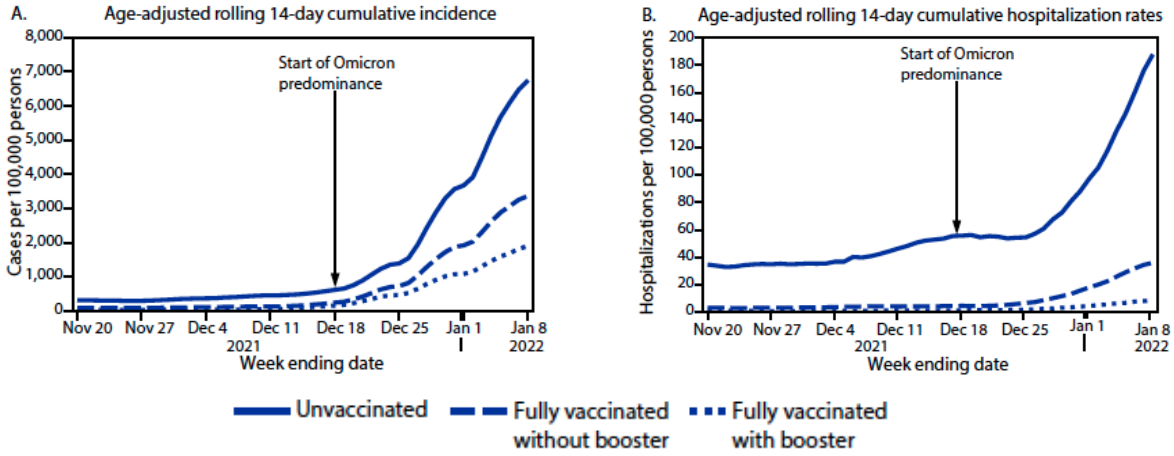
| | Age (years) | Rate/100,000 | | | Number of boosters |
|---|---|---|---|---|---|
| | | Dose 1 | Dose 2 | Booster | |
| Females | 12-15 | 0 | 0.6 | 0 | 3,156* |
| | 16-19 | 0 | 0.9 | 1.6 | 125,088 |
| | 20-24 | 0.4 | 2.0 | 0 | 171,870 |
| | 25-29 | 0 | 0.9 | 0 | 156,673 |
| | 30 and older | 0.1 | 0.4 | 0.1 | 1,658,035 |
| | | | | | |
| Males | 12-15 | 0.5 | 6.6 | 0 | 3,178 |
| | 16-19 | 1.2 | 15.3 | 6.5 | 123,355 |
| | 20-24 | 2.1 | 10.5 | 4.7 | 171,235 |
| | 25-29 | 1.1 | 8.3 | 0.6 | 162,360 |
| | 30 and older | 0.3 | 1.5 | 1.0 | 1,554,155 |

*In a subsequent update two cases in just over 44,000 vaccine recipients were reported

# 7. COVID-19 VACCINE EFFICACY AND EFFECTIVENESS

The benefits are greatest for adults who are both fully vaccinated and who have received a booster. (Figure 4)

Figure 4: Age adjusted rolling 14-day SARS-CoV-2 cumulative incidence (A) and hospitalisations (B) by vaccination status Los Angeles County, California. 7 November 2021-8 January 2022. Source: Danza et al. 2022.[15]




In Ireland, between 1 January and 16 February 2022, 20 children under 18 years of age were admitted to ICU, of whom 17 were unvaccinated.[16]

## Adolescents

In a randomised control trial, designed primarily to assess the safety and immunogenicity of Comirnaty in those aged 12-15 years, short term vaccine efficacy of 100% against COVID-19 was reported.[17] Vaccine efficacy was maintained at 100% up to six months following the second dose, with no cases in the 1,119 who received vaccine and 30 cases in 1,109 participants who received placebo.

Comirnaty vaccination has proven to be highly effective in protecting against severe disease outcomes in adolescents and adults. Unvaccinated adolescents 12-17 years of age have about a ten-fold higher risk of COVID-19 hospitalisation than those who are vaccinated.[18]

In a real world study in this age group, vaccine effectiveness (VE) of 90-95% against hospitalisation and 95-98% against ICU admission was reported for the initial period after the primary schedule and was similar to that for those aged 16-18 years. Vaccination reduced the risk of hospitalisation for those aged between 12 and 18 years by 94%.[19] There are no data yet on VE against Omicron for these age groups.

Primary vaccination is effective in preventing MIS-C, at least in the short term. A US test negative case control study with 102 MIS-C cases and hospitalised controls aged 12-18 years reported Comirnaty VE against MIS-C of 91%. The majority (95%) of the hospitalised children were unvaccinated and none of the five MIS-C cases in vaccinated children required respiratory or cardiovascular life support compared to 39% of the unvaccinated cases.

In a rapid evidence review, adults who were fully vaccinated were less likely than those unvaccinated to develop long-COVID and for those with long-COVID who are subsequently vaccinated have reduced COVID symptoms compared to those who remain unvaccinated. [20]

These studies were carried out prior to the emergence of the Omicron variant.

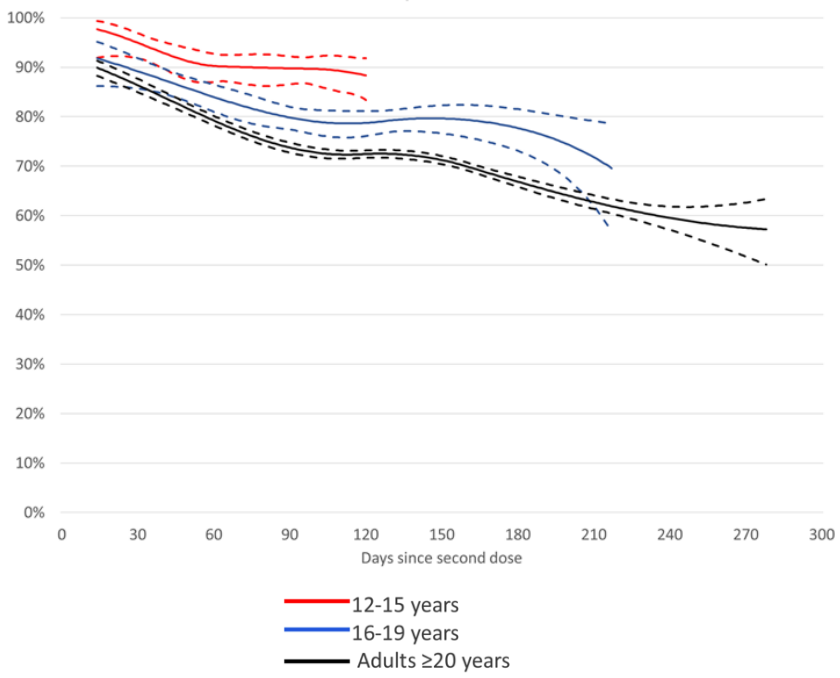
### Waning of immunity and impact of Omicron

In adults, VE wanes over time, is less effective against symptomatic disease than hospitalisation and, at all times points, is less effective against Omicron than Delta infection.

Effectiveness against symptomatic disease and hospitalisation at 25 or more weeks after the second vaccine dose drops to around 10% and 35% respectively.[21]

Similar to adults, waning of VE against symptomatic disease also occurs in adolescents. (Figure 5)

Figure 5: Waning of Comirnaty VE in those aged 12 – 15 years, 16-19 years and 20 years and older. Adapted from S Oliver, ACIP, 5 January 2022.[12]



However, as mRNA vaccines are generally more immunogenic in younger adolescents than in adults and the rate of decline somewhat less, the diminution in effectiveness may be more gradual.

In Israel, a matched case control study evaluated the association between time since vaccination and incidence of infection and COVID-19 in adolescents aged 12-16 years. VE against infection peaked at 85% by two weeks to three months after vaccination, declined to 75% by 3-5 months and to 58% after five months. VE against COVID-19 peaked at 90% by two weeks to three months after vaccination, declined to 78% by 3-5 months and to 65% after five months.[22]

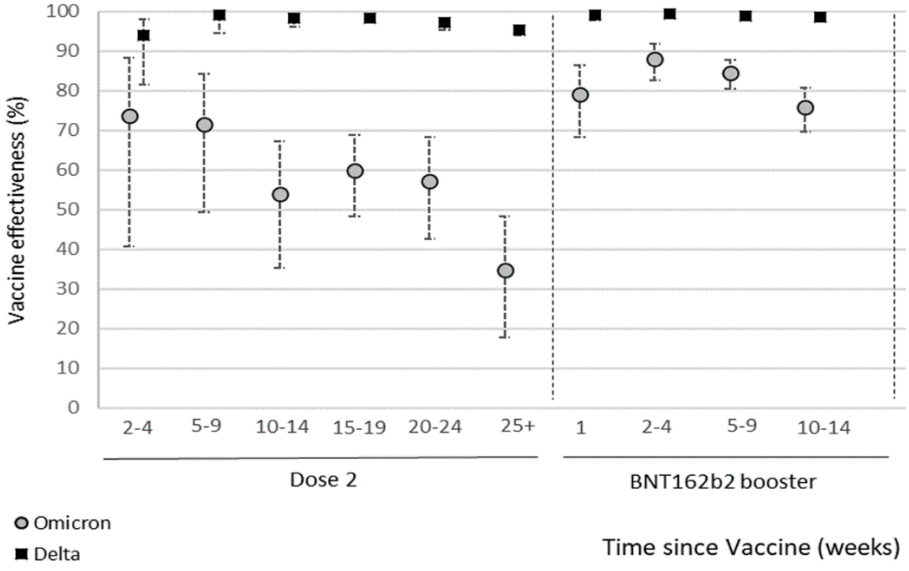
There are limited data on VE against Omicron for those aged 12-15 years but it is likely reduced compared to VE against Delta.

### Booster vaccine benefits

Protective benefits can be restored by booster vaccination in the short term, although the duration of protection is uncertain.[21,23]

In the UK, two to four weeks after a booster vaccine, VE against symptomatic infection was restored to around 60% to 75% but dropped to 25% to 40% from 15 or more weeks after the booster. VE against hospitalisation was restored to around 90% dropping to around 75% after 10 to 14 weeks. (Figure 6)[21,24]

Figure 6. VE of two doses of BNT162b2 (Comirnaty) and two doses and booster against Omicron compared with Delta infection. Adapted from UK HSA. COVID-19 vaccine surveillance report 10 February 2022.



In US adults, three mRNA vaccine doses were necessary to achieve similar VE against Omicron compared to that following two doses against Delta and Alpha infection.[25]

In Israel, a significantly lower rate of infection was reported in those eligible for a booster (aged 16-18 years) compared to those eligible for a primary schedule (aged 12-14 years).[26] However, no data are yet available on the duration of protection from a booster dose in adolescents.

Additional Israeli data presented to the ACIP showed that for those aged 12-15 years there was a significant reduction in the rate of infection following booster vaccination compared with those who had received the primary schedule some five months previously.

A third Israeli study reported that those aged 16-29 years who were not boosted were more than 17 times more likely to develop SARS-CoV-2 infection compared to those who had received a booster vaccine (Table 5).[23]

Table 5: Rate ratio for infection following a booster dose compared to a primary series, by age Israel, July 30-October 10, 2021. Source: Bar-On et al.[23]

| Age Group (years) | Rate ratio (95% CI) |
|---|---|
| 60 and older | 12.3<br>(11.8 – 12.8) |
| 50-59 | 12.2<br>(11.4 – 13.0) |
| 40-49 | 9.7<br>(9.2 – 10.3) |
| 30-39 | 9.0<br>(8.4 – 9.7) |
| 16-29 | 17.2<br>(15.4 -19.2) |

There are limited data available on benefits and risks of a booster dose for those aged 12-15 years. Preliminary findings suggest an increase of VE against documented SARS-CoV-2 infection in adolescents who received a booster compared to adolescents who have recently completed the primary vaccination course. No data are yet available on the duration of protection from a booster dose and on the additional effectiveness against severe disease of a booster dose in adolescents. While data are lacking it is reasonable to assume that prevention of infection will in turn protect against its complication, including MIS-C and long COVID.

# 8. INTERNATIONAL RECOMMENDATIONS FOR BOOSTERS

Recommendations for adolescent booster vaccination differ across countries. (Table 6)

Table 6: Recommendations for adolescent COVID-19 booster vaccination by country and age. Sources: ATAGI*, CDC, ECDC, JCVI** and NACI***

| Country | Age for booster vaccination (years) |
|---|---|
| Australia | 16-17 |
| Austria | 12-17 |
| Canada | 16-17 and at risk 12-15 |
| France | 12-17 |
| Germany | 12-17 |
| Hungary | 12-17 |
| Iceland | 16-17 |
| Ireland | 16-17 |
| Italy | 12-17 |
| Liechtenstein | 12-17 |
| Luxembourg | 12-17 |
| Romania | 12-17 |
| UK | 16-17 and at risk 12-15 |
| US | 12-17 |

*ATAGI: Australian Technical Advisory Group on Immunisation

**JCVI: Joint Committee on Vaccination and Immunisation (UK)

***NACI: National Advisory Committee on Immunization (Canada)

Some countries, e.g., Canada and the UK, have recommended booster vaccination for those in at risk groups but not for the general population aged 12 to 17 years. Other countries, such as Denmark, have recommended no adolescent booster at this time, because of vaccine and disease acquired immunity.

## 9. DISCUSSION

Comirnaty is licensed in the EU for primary vaccination of children and adolescents aged five years and older. All EU/EEA countries recommend primary vaccination of those aged 12-17 years. Many countries recommend a booster dose for those aged under 18 years. In Ireland a booster dose is recommended for all aged 16 years and over. An application to authorise Comirnaty as a booster for adolescents from 12 years of age is under review by the EMA.

In coming to its recommendations, NIAC considered a number of factors including the direct and indirect benefits and risks of booster vaccination for those aged 12-15 years, the risks of breakthrough infection, the short- and long-term side effects of infection, population benefits and equity considerations. The decision whether or not to recommend booster COVID-19 vaccine to all aged 12-15 years is a complex balance of benefits and risks, informed by ethical considerations.

Comirnaty is associated with short lived, self-limited side effects. Very rare cases of myocarditis and pericarditis have been reported, mainly following the second dose. Preliminary evidence suggests that the risk of myocarditis is lower in those aged 12-15 years. Most myocarditis cases are of short duration and resolve with symptomatic treatment.

There are limited safety data on Comirnaty booster vaccine for those aged 12-15 years. In those aged 16 and older, the side effect profile following a Comirnaty booster is similar to that following the second vaccine dose.

The benefits of booster vaccination are greater for those who have, or are living with someone, with a medical condition, that puts them at higher risk of a poor outcome should they contract the virus. However optimising protection confers direct benefit to all by reducing the risk of infection and its direct and indirect consequences. It could also help mitigate the very important adverse impacts of COVID-19 infection including school absences, social restrictions, and psychological consequences.

Additional benefits of boosting healthy 12-15 year olds are likely to include normalisation of life, less disruption to educational and social activities and reduced virus transmission to vulnerable contacts. Boosting young adolescents may also protect family members who are too young to be vaccinated.

Modelling of the impact of adolescent booster vaccination on the overall transmission of the virus suggests a modest benefit in the general population. Reduction of overall infection rates could also impact on the emergence of new variants of concern, variant that could be associated with an increase in severe disease in adolescents in which case the direct benefits of vaccination would increase.

The Omicron wave is slowly ebbing. However, “it is too early to declare victory against the coronavirus" (WHO). A number of SARS-CoV-2 variants, including Omicron sublineages, have been detected. This underlines the importance of maintaining optimal protection against SARS-CoV-2 and its variants.

NIAC recognises the significant benefits of the primary vaccination of adolescents, and the need for booster vaccination for those at risk i.e., those with underlying conditions, living with a younger child with complex medical needs, or living with a person who is immunocompromised. The evidence of the need for booster vaccination of other adolescents in terms of protection against severe COVID-19 at this time is less compelling. Universal access protects those most at risk of poor outcomes as a result of COVID-19, as well as offering direct and indirect benefits to other children and adolescents.

Before vaccination, those aged 12-15 years and their parents/guardians should be informed of the benefits and risks of booster vaccination, the risks of COVID-19 to their age group and the uncertainties e.g., frequency, duration and outcome of COVID-19, and vaccine side effects.

NIAC considers that every effort should be made to meet our ethical obligations in terms of global solidarity through equitable vaccine sharing at the earliest possible opportunity.

# 10. RECOMMENDATIONS

## BOOSTER VACCINATION FOR THOSE AGED 12-15 YEARS

1. All those who are unvaccinated or incompletely vaccinated are strongly recommended to complete a primary COVID-19 vaccination course. Priority continues to be completion of the primary vaccination course for all eligible and acceptance of a booster dose as recommended. Seasonal influenza vaccine can be given at the same time to those for whom it is recommended.
2. All should continue to observe recommended public health and social measures.
3. Comirnaty 30 micrograms booster vaccination is recommended for those aged 12-15 years:
    a) with underlying conditions as listed in Table 5a.2, Chapter 5a COVID-19
    b) living with a younger child with complex medical needs
    c) living with a person who is immunocompromised
4. Comirnaty 30 micrograms booster vaccination should be offered to all others aged 12-15 years for the following reasons:
    a) the favourable benefit risk profile of the vaccine
    b) waning immunity following the primary vaccine course
    c) to reduce the risks of asymptomatic, symptomatic, and severe COVID-19, and their complications, e.g., multisystem inflammatory syndrome in children (MIS-C), long COVID
    d) to minimise psychological, social and developmental impacts and to help normalise life for adolescents
    e) to increase the likelihood of protection against future variants
5. Comirnaty 30 micrograms should be given six months or longer following completion of the primary Comirnaty vaccine course.
6. Those who have a breakthrough infection following a primary vaccination course should defer booster vaccination for at least six months following infection onset.
7. Data are insufficient to recommend other COVID-19 vaccines as a booster for this age group if Comirnaty is contraindicated.

Prior to administration of the booster dose, adolescents along with their parents/guardians, should be informed of the benefits, risks and uncertainties of the booster dose of Comirnaty vaccine.

The decision to accept, defer or decline vaccination should be respected.

These recommendations reflect current evidence and will be reviewed when more information becomes available.

# REFERENCES


1. HPSC (2022). COVID-19 Vaccination Uptake in Ireland. Weekly Report Week 5 2022 (week ending Sunday 6th February 2022). https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/vaccination/covid-19vaccinationuptakereports/COVID-19%20Vaccination%20Uptake%20in%20Ireland%20Weekly%20Report%20Week%205%202022.pdf
2. Healy M et al (2022). PICANet data extract. *(personal communication)*
3. Roessler M, Tesch F, Batram M et al (2021). Post COVID-19 in children, adolescents, and adults: results of a matched cohort study including more than 150,000 individuals with COVID-19. *medRxiv*. doi:10.1101/2021.10.21.21265133
4. Stephenson T, Shafran R, De Stavola B et al (2021). Long COVID and the mental and physical health of children and young people: national matched cohort study protocol (the CLoCk study). *BMJ Open*.11(8):e052838. doi:10.1136/bmjopen-2021-052838
5. Barrett CE, Koyama AK, Alvarez P et al (2022). Risk for Newly Diagnosed Diabetes >30 Days After SARS-CoV-2 Infection Among Persons Aged <18 years , United States, March 1, 2020-June 28, 2021. *MMWR Morb Mortal Wkly Rep*. doi:http://dx.doi.org/10.15585/mmwr.mm7102e2
6. Prunas O, Warren JL, Crawford FW et al (2022). Vaccination with BNT162b2 reduces transmission of SARS-CoV-2 to household contacts in Israel. *Science*. 10.1126/science.ab14292. doi:10.1126/science.abl4292
7. Singanayagam A, Hakki S, Dunning J et al (2022). Community transmission and viral load kinetics of the SARS-CoV-2 delta (B.1.617.2) variant in vaccinated and unvaccinated individuals in the UK: a prospective, longitudinal, cohort study. *Lancet Infectious diseases*. 22:183-95. https://doi.org/10.1016/S1473-3099(21)00648-4
8. ECDC (2022). COVID-19 vaccine effectiveness in adolescents aged 12-17 years and interim public health considerations for administration of a booster dose. Technical report 2022. https://www.ecdc.europa.eu/en/publications-data/covid-19-vaccine-effectiveness-adolescents-and-interim-considerations-for-booster-dose
9. Lyngse FP, Kirkeby CT, Denwood M, et al (2022). Transmission of SARS-CoV-2 Omicron VOC subvariants BA.1 and BA.2: Evidence from Danish Households. *medRxiv*. 2022.01.28.22270044. doi:10.1101/2022.01.28.22270044
10. ECDC (2021). Assessment of the current SARS-CoV-2 epidemiological situation in the EU/EEA, projections for the end-of-year festive season and strategies for response, 17th update. https://www.ecdc.europa.eu/en/publications-data/rapid-risk-assessment-sars-cov-2-situation-november-2021
11. Hause AM (2022). Safety monitoring of COVID-19 vaccine among children and young adults in v-safe. https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2022-01-05/03-covid-hause-508.pdf
12. Oliver S (2021). CDC. Updates to the Evidence to Recommendation Framework: PfizerBioNTech and Moderna COVID19 vaccine booster doses. https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-11-19/06-COVID-Oliver-508.pdf

13. Hause A, Baggs J, Marquez P et al (2022). Safety Monitoring of COVID-19 Vaccine Booster Doses Among Adults —United States, September 22, 2021–February 6, 2022 *Morbidity and Mortality Weekly Report*. https://www.cdc.gov/mmwr/volumes/71/wr/mm7107e1.htm
14. MHRA (2022). Coronavirus vaccine - weekly summary of Yellow Card reporting. https://www.gov.uk/government/publications/coronavirus-covid-19-vaccine-adverse-reactions/coronavirus-vaccine-summary-of-yellow-card-reporting
15. Danza P, Koo T, Haddix M et al (2022). SARS-CoV-2 Infection and Hospitalization Among Adults Aged ≥18 Years, by Vaccination Status, Before and During SARS-CoV-2 B.1.1.529 (Omicron) Variant Predominance — Los Angeles County, California, November 7, 2021–January 8, 2022. *MMWR Morb Mortal Wkly Rep*. 71:177-181. https://www.cdc.gov/mmwr/volumes/71/wr/mm7105e1.htm
16. NOCA (2022). NOCA data extract. *(personal communication)*
17. Frenck RW, Klein NP, Kitchin N et al (2021). Safety, Immunogenicity, and Efficacy of the BNT162b2 Covid-19 Vaccine in Adolescents. *New England Journal of Medicine*. 385(3):239-250. doi:10.1056/NEJMoa2107456
18. Delahoy MJ UD, Whitaker M et al (2021). Hospitalizations Associated with COVID-19 Among Children and Adolescents — COVID-NET, 14 States, March 1, 2020–August 14, 2021. *MMWR Morb Mortal Wkly Rep*. 70:1255-1260. https://www.cdc.gov/mmwr/volumes/70/wr/mm7036e2.htm
19. Olson SM, Newhams MM, Halasa NB et al (2022). Effectiveness of BNT162b2 Vaccine against Critical Covid-19 in Adolescents. *New England Journal of Medicine*. doi:10.1056/NEJMoa2117995
20. UK Health Security Agency (2022). The effectiveness of vaccination against long COVID A rapid evidence briefing.
21. Andrews N, Stowe J, Kirsebom F et al (2021). Effectiveness of COVID-19 vaccines against the Omicron (B.1.1.529) variant of concern. *medRxiv*. 2021.12.14.21267615. doi:10.1101/2021.12.14.21267615
22. Prunas O, Weinberger DM, Pitzer VE, Gazit S, Patalon T (2022). Waning Effectiveness of the BNT162b2 Vaccine Against Infection in Adolescents. *medRxiv*. 2022.01.04.22268776. doi:10.1101/2022.01.04.22268776
23. Bar-On YM, Goldberg Y, Mandel M et al (2021). Protection Across Age Groups of BNT162b2 Vaccine Booster against Covid-19. *medRxiv*. 2021.10.07.21264626. doi:10.1101/2021.10.07.21264626
24. UK HSA (2022). COVID-19 vaccine surveillance report, week 6 2022
25. Lauring AS, Tenforde MW, Chappell JD et al (2022). Clinical Severity and mRNA Vaccine Effectiveness for Omicron, Delta, and Alpha SARS-CoV-2 Variants in the United States: A Prospective Observational Study. *medRxiv*. 2022.02.06.22270558. doi:10.1101/2022.02.06.22270558
26. Amir O, Goldberg Y, Mandel M et al (2021). Protection following BNT162b2 booster substantially exceeds that of a fresh 2-dose vaccine: a quasi-experimental study. *medRxiv*. 2021:2021.12.19.21267933. doi:10.1101/2021.12.19.21267933

## ACKNOWLEDGEMENTS

NIAC would like to thank all the individuals and organisations who provided data, time, advice, and information in support of this work, in particular the young people and parents who participated in the qualitative research.

- HPSC
- HSE Libraries Team
- NIAC SpR Research Panel
- NIAC members
- NPHET Modelling Team
- RCPI & DOH Communications Departments

## AMENDMENTS & CLARIFICATIONS