Australian Government
National Health and Medical Research Council

BUILDING
A HEALTHY
AUSTRALIA

## EVALUATION REPORT

**CONFIDENTIAL**
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# A systemic review of exclusion measures in preventing the spread of infectious diseases in education and care settings

NHMRC

**PREPARED FOR**
The Commonwealth of Australia

**AS REPRESENTED BY**
National Health and Medical Research Council
Staying Healthy Advisory Committee

**PREPARED BY**
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# Report information

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## Dates

This technical report and accompanying evidence evaluation report received approval from the ONHMRC Staying Healthy Advisory Committee (SHAC) on 14 February 2023.

The protocol for the evidence evaluation was approval by the NHMRC SHAC on 14 September 2022.

## History

The ONHMRC is seeking to update the evidence underpinning the *2013 Staying Healthy – Preventing infectious diseases in early childhood education and care services* (Staying Healthy) resource. The NHRMC's SHAC has met twice to consider the information provided by the sector, through stakeholder surveys, email enquiries and preliminary scoping reviews of the literature. While there are many topics outlined in this resource, the SHAC has identified two key priority areas that require a systematic review of the literature to provide evidence-based guidance.

To support the ONHMRC in the conduct of the systematic review, **HT**ANALYSTS was engaged to conduct a systematic review for research question two, which focused on the exclusion of ill children, educators and other staff as a way of preventing infection.

The Research Protocol, developed by **HT**ANALYSTS in conjunction with the ONHMRC and SHAC, provided a framework that outlined the methodology to be used to review the evidence about exclusion measures in childhood education and care services. All associated materials were developed in a robust and transparent manner in accordance with relevant best practice standards (1-3).

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# List of abbreviations

| | |
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| AHPPC | Australian Health Principal Protection Principal Committee |
| CDC | Centre for Disease Control and Prevention |
| CDNA | Communicable Diseases Network Australia |
| CI | Confidence interval |
| GRADE | Grading of Recommendations Assessment, Development and Evaluation |
| HR | Hazard ratio |
| JBI | Joanna Briggs Institute |
| MD | Mean difference |
| MeSH | Medical Subject Headings |
| ONHMRC | The Office of National Health and Medical Research Council |
| NICE | The National Institute for Health and Care Excellence |
| OR | Odds ratios |
| PICO | Population, Intervention, Comparator, Outcome |
| PRISMA | Preferred Reporting Items for Systematic Reviews and Meta-Analyses |
| RCT | Randomised controlled trial |
| RoB | Risk of bias |
| RR | Risk ratio |
| SD | Standard deviation |
| SHAC | Staying Healthy Advisory Committee |
| SHIC | Staying Healthy in Childhood |
| SMD | Standardised mean difference |
| SoNGs | Series of National Guidelines |
| SR | Systematic review |
| WHO | World Health Organisation |

# Executive summary

## Background

In Australia, many children first enter education and care services at a time when their immune systems are still developing. They may not have been exposed to common pathogens and may be too young to be vaccinated against certain diseases. The spread of certain infectious diseases can be reduced by excluding a person, known to be infectious, from contact with others who are at risk of catching the infection.

Exclusion of ill children, educators or other staff from education and care services is the process of removing a person deemed unwell from a populated setting in an attempt to reduce the spread of infectious disease. Exclusion of ill children, educators and other staff is a proven method of protecting others from becoming ill at a variety of education and care services, including early childhood education centres and schools. The specified exclusion period is based on how long a child/educator with a specific disease is likely to be infectious and to be excluded from the service until they have passed the exclusion period and are well enough to return.

## Objectives

The overall objective of this review is to evaluate the effectiveness of exclusion measures in reducing the spread of infectious diseases in education and childcare settings.

Alongside various prevention and control strategies, the 2013 *Staying Healthy* guidelines identified exclusion periods for 43 conditions relating to both the infectious person and those who have been in contact with the infected. The evidence for these measures was largely based on studies conducted in community settings and included literature published before 2013. The purpose of this review is to update and enhance the evidence and guidance used to inform the 2013 guidelines. That is, to identify whether any high-quality studies have been published since, or were not included in, the 2013 review, and addressed the evidence gaps noted. This was to ensure recommendations relating to the use of exclusion periods remain relevant and up to date.

## Search methods

Literature searches were conducted in EMBASE, MEDLINE, COCHRANE, CINAHL and PUBMED to identify relevant studies published from database inception to 16 September 2022. In addition, simple text searches of databases including OpenGrey, Clinical trial registries, international and national agencies and guideline databases were searched. There were no limits on language of publication or date of publication in the search.

## Selection criteria

Systematic reviews, RCTs and observational studies that examined the effectiveness of exclusion measures in early childhood education and care services compared to control or an alternative intervention were eligible for inclusion. Any exclusion measures were eligible for inclusion. There were no restrictions on the duration of exclusion or period when the exclusion commenced. The main participants of interest were children aged 0 to 12 and adults who were defined either as symptomatic or non-symptomatic. There were no restrictions on comparators, noting that the review stratified the evidence into two comparisons: (i) no exclusion intervention and (ii) other 'active' alternative infection control measures.

Exclusion measures relating to respiratory diseases were screened and selected in a separate review that focused on nonpharmaceutical interventions for reducing the risk of transmission of respiratory infections in early childhood education.

## Data collection and analysis

Data collection was performed by two researchers, the first researcher collected data using data extraction forms and the second researcher checked the forms for completeness and accuracy. Critical appraisal of the eligible studies was conducted using the most appropriate risk of bias assessment tool recommended by the Cochrane Collaboration (according to study type).

It was intended that synthesis (meta-analysis) would be undertaken for studies that compare exclusion measures with 'no intervention', or alternative infection control interventions. For RCTs and nonrandomised studies, data synthesis was to be performed using RevMan 5.4 with combination of effect estimates across studies for each outcome using a random effects model. Due to the nature of the reported outcomes, many systematic reviews and primary studies did not include any quantitative measures of effect. As such, a narrative synthesis was presented. New evidence was assessed using the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) framework.

## Main results

A total of 26 studies were identified as eligible for inclusion in this review comprising 14 systematic reviews, six primary studies and six National Guidelines. All 26 studies were considered in the evidence evaluation and are included in the results. At the time of search, a further 95 studies were awaiting classification and an additional two studies were recorded as ongoing (registered protocols but not published at the time of search). Of the studies awaiting classification majority (93 studies) reported indirect evidence on the transmission and prevalence and/or incidence of eligible conditions, one of the studies was not published in English and the remaining study was not able to be retrieved and therefore not assessed. Of the two ongoing studies, one of the studies was a systematic review of which a protocol has been registered but the review had not yet been conducted and the remaining study was currently 'recruiting'.

Approximately three-fifths of the studies included in the synthesis (15 studies) compared the effectiveness of exclusion measures for preventing the spread of influenza-like illnesses, with the remaining synthesis comprised of two to three studies for other disease categories. Summary of findings tables were restricted to outcomes prioritised in the PICO. All included studies examined some type of exclusion measure (isolation, school and work closure, cohorting, quarantine) delivered in a manner that was applicable to the Australian context based on the description. Children in schools or childcare centres were the main participants for many of the studies.

Overall, the evidence found was consistent with the 2013 *Staying Healthy* guidelines. There were 11 common childhood diseases for which there was new evidence about the effect of exclusion measures on preventing the transmission of disease. The evidence provides:

- Low certainty that exclusion measures probably prevent transmission of:
    - influenza (from two studies and one National Guidelines)
    - COVID-19 (from one study and one National Guidelines)
- Very low certainty suggesting that exclusion measures may prevent transmission of:
    - giardiasis (from one study)
    - viral gastroenteritis (from one study)
    - pertussis (from one study and one National Guidelines)
    - measles (from one study)
    - meningococcal infection (from one National Guidelines)
    - mumps (from one study)
    - rubella (German measles) (from one study)
    - impetigo (Streptococcal) (from one study)
    - scarlet fever (from one study)

## Conclusions

The evidence provides low to very low certainty that exclusion measures are probably more effective than no exclusion measures for prevention or reducing transmission of some common childhood infectious diseases assessed in this review. However, for other childhood diseases the evidence provides moderate to low certainty that exclusion measures probably have little (to no) benefit.

The results of this review are generally consistent with *Staying Healthy* guidelines published in 2013, which conclude that there is an absence of high certainty evidence that exclusion measures are effective in. More research is needed to reach a definitive conclusion on the effectiveness of exclusion measures for preventing the spread of infectious diseases in childcare settings.

# 1 Background

The ONHMRC is updating the 2013 *Staying Healthy – preventing infectious disease in early childhood education and care services* resource to ensure that they reflect the best available evidence relevant to the current Australian context. This update will enable ONHMRC to provide up to date advice to the sector on the management of infectious diseases in early childhood education and care settings.

Many children first enter education and care services at a time when their immune systems are still developing. They may not have been exposed to common pathogens and may be too young to be vaccinated against certain diseases. The scope of the *Staying Healthy* resource is to provide advice on minimising spread of disease in early childhood education and care services for educators and other staff working in these settings. This includes providing advice on infection prevention and control practice and what to do in the presence of specific infections.

This review focussed on assessing what evidence was available on exclusion measures in early childhood education and care settings to reduce transmission of infectious disease and conditions.

The process for conducting the review was built upon the following framework:

1. source the clinical evidence by performing a systematic literature search,
2. identify the best available evidence published in English and indexed in English language databases,
3. incorporate additional literature identified through non-database sources including grey literature, reports and guidelines from reputable international and national agencies
4. critically appraise and present the evidence, and
5. determine the certainty in the evidence base for each question, using a structured assessment of the body of evidence in accordance with GRADE methodology (3).

## 1.1 Description of the condition and setting

Childcare regulations in each State and Territory in Australia require exclusion of children and employees from early childhood education and care settings whilst infectious with a significant, acute illness. The specified exclusion period is based on how long a child/educator with a specific disease is likely to be infectious and to be excluded from the service until they have passed the exclusion period and are well enough to return.

There are currently 43 infectious diseases listed in the 2013 *Staying healthy* guidelines with a specified exclusion period relating to both the infectious person and those who have been in contact with the infected. This includes (but is not limited to) the following:

- Candidiasis (thrush)
- Conjunctivitis
- Diarrhoea
- Hand, foot and mouth disease
- Head lice
- Influenza
- Measles
- Norovirus
- Pertussis (whooping cough)
- Rubella
- Streptococcal sore throat (including scarlet fever)
- Varicella (chickenpox)
- Viral gastroenteritis

Characteristics of the pathogen itself, the disease symptoms, and environmental factors all play a role in the risk of transmission and the duration of the illness. The current review was not limited to one disease or setting within early childhood education and care centres and therefore a concise description of each condition or problem addressed, was included after conduct of the full text review.

## 1.2 Description of the intervention

Exclusion of ill children, educators or other staff from education and care services is the process of removing a person deemed unwell from a populated setting in an attempt to reduce the spread of infectious disease. Exclusion of ill children, educators and other staff is a proven method of protecting others from becoming ill at a variety of education and care services, including early childhood education centres and schools. The less contact there is between people who have an infectious disease and people who are at risk of catching the disease, the less chance the disease has of spreading. Excluding ill children, educators and other staff is considered an effective way of limiting the spread of infection in education and care services and is essential in minimising the spread of infectious diseases with others who are at risk of catching the infection.

The need for exclusion and the length of time a person is excluded depend on:

- how easily the infection can spread
- how long the person is likely to be infectious
- how severe the disease can be.

Identification of whether the symptoms or a diagnosed illness have an exclusion period varies depending on the sickness experienced, with previous literature providing guidance into the minimum timeframe for exclusion. For example, children with giardiasis must be excluded until there has not been a loose bowel motion for 24 hours. Such recommended exclusion periods should not be influenced by letters from doctors with the ultimate decision residing with the education and care services with guidance from *Staying healthy*.

In addition, the recommended exclusion periods included in the guidelines are defined as minimum exclusion periods and the child/educator may need to stay home for longer until they are well enough to return to the service.

## 1.3 How the intervention might work

A key component of the exclusion procedure is implementation of a written policy that clearly states the exclusion criteria for parents and carers. This works to avoid conflict between parents who may find an exclusion ruling difficult, and their child's educators. Most parents will appreciate attempts to prevent illness in their children. As such, it is especially important that parents support the education and care service's policies on hygiene and infection control.

Separated by condition, a recommended exclusion period was provided for both the case and case contacts, whereby the definition of contacts varies according to the infection. For example, children presenting with varicella (chickenpox) must be excluded until all blisters have dried, which is typically 5 days from inception, alongside any children who have been in contact with the case that have an immune deficiency or receiving chemotherapy, otherwise there is no exclusion of contacts.

In addition, different exclusion periods will apply to people whose work involves food handling. If people whose work involves food handling have vomiting or diarrhoea, they should not return to work until they have been symptom-free for 48 hours and for children if the cause is unknown, there is possible exclusion for 48 hours until the cause is identified. Note that exclusion advice was consistent with the Communicable Diseases Network Australia Series of National Guidelines (SoNGs), where available.

## 1.4 Why it is important to do this review

In Australia, many children first enter education and care services at a time when their immune systems are still developing. They may not have been exposed to common pathogens and may be too young to be vaccinated against certain diseases. The spread of certain infectious diseases can be reduced by excluding a person, known to be infectious, from contact with others who are at risk of catching the infection.

Alongside various prevention and control strategies, the 2013 *Staying Healthy* guidelines identified exclusion periods for 43 conditions relating to both the infectious person and those who have been in contact with the infected. The evidence for these measures was largely based on studies conducted in community settings and limited to literature published before 2013. Although exclusion policies are time-honoured, they can have several drawbacks. For instance, parents may have difficulty in finding alternative care for mildly unwell children and may be tempted to place the children in other centres, thereby increasing the chance of the spread of infection into the wider community. Long-period of absence from a learning environment may also be an issue.

The purpose of this review was to update and enhance the evidence and guidance used to inform the 2013 *Staying Healthy* guidelines. That is, to identify whether any high-quality studies have been published since, or were not included in, the 2013 review, and addressed the evidence gaps noted. This was to ensure recommendations relating to the use of exclusion periods remain relevant and up to date.

# 2 Objectives

The overall objective of the systematic review was to identify what exclusion measures are effective in reducing the spread of infectious diseases in education and care settings.

Specifically, the aim of this review was to explore two key questions related to reducing the transmission of infectious diseases in child education and care settings:

1. does the addition of exclusion of a symptomatic child lead to lower transmission/disease rates than other infection control measures?
2. is there evidence for the effectiveness of exclusion for any period after the cessation of symptoms in reducing transmission/disease rates compared to exclusion whilst symptomatic?

The primary and secondary outcomes are outlined in the PICO framework below (see Figure 1) and focussed on the evidence for populations in community and care settings relevant to inform the 2013 *Staying Healthy* guidelines.

**Figure 1 PICOS framework for the research objective**

## POPULATION

1. **Children** aged 0-4 and 5012 years who are symptomatic
2. **Children** aged 0-4 and 5-12 years who are non-symptomatic

## INTERVENTION

**Exclusion period** (any time period)

*Notes*
*Exclusion period from observed/notified/confirmed symptoms of any infections including fever, diarrhea, vomiting, rash, respiratory symptoms*

## COMPARATOR

1. **No exclusion intervention**
2. **Alternative infection control intervention** *(no intervention/wait list/usual activities)*

*Exclusions – Pharmaceutical interventions and immunisations*

## OUTCOME

**Primary outcomes**
1. Transmission related outcomes (e.g., number of cases of any type of infectious disease)
2. Adverse events (including safety) related to exclusion or other interventions

**Secondary outcomes**
1. Absenteeism 2. Length of illness 3. Behaviour or practice change

## SETTING

**Community Settings**
(inclusive of early childhood education and care settings, out of hour school care, family day care, schools, household and home settings, other community settings)

*Exclusions*
*Settings such as aged care, tertiary, hospitals and other acute health care settings.*

# 3 Methods

Methods used in this SR were based on that described in the *Cochrane Handbook for Systematic Reviews of Interventions* (4) and relevant sections in the JBI Manual for Evidence Synthesis (5, 6). Covidence (www.covidence.org), a web-based platform for producing systematic reviews, was used for screening citations and recording decisions made. Covidence is compatible with EndNote and Microsoft Excel, which was used for managing citations and data extraction, respectively. Although stated in the protocol, RevMan (7) was not used in the main analyses as the included studies did not provide quantitative data suitable for meta-analysis. GRADE methodology (3) was used to derive an overall assessment of the certainty of evidence for each outcome yet similar to RevMan, the GRADEpro GDT software was not explicitly used to record decisions due to lack of evidence.

To identify the evidence base for the clinical question, a systematic search of published medical literature was conducted. All potentially relevant studies were identified after applying pre-specified inclusion and exclusion criteria as outlined in **Appendix A**. Systematic reviews, RCTs and observational studies as well as grey literature, reports and guidelines from reputable agencies were considered for inclusion.

Further details on the methods and approach used to conduct the evidence evaluation are provided in Appendix A (searching, selection criteria and screening results) and Appendix B (methods used for data appraisal, collection and reporting).

# 4 Results

## 4.1 Description of studies

### 4.1.1 Flow of studies

The literature was searched on 16 September 2022 to identify relevant studies published from database inception to the literature search date. The results of the literature search and the application of the study selection criteria are provided in **Appendix A1 – A5**.

A PRISMA flow summarising the screening results is provided in Figure 2. The PRISMA flow diagram shows the number of studies at each stage of search and screening process, including: the initial search; studies considered irrelevant based on the title and/or abstract; studies found not to be relevant when reviewed at full text; studies which met the eligibility criteria for inclusion in the review and the number of studies which were in considered in the analysis.

### 4.1.2 Excluded studies

Details of potentially eligible citations that were screened at full text but did not meet eligibility criteria are presented in **Appendix C1**, noting that some studies may have been out of scope for more than one reason, but only one reason is listed for each. Six studies were identified that met the prespecified eligibility criteria but were not included in the evidence evaluation due to duplication of data or lack of usable data for the evidence synthesis.

### 4.1.3 Studies awaiting classification

Completed studies identified as potentially eligible for inclusion that could not be retrieved, were not translated, or did not provide complete or adequate data are listed in the *Characteristics of studies awaiting classification* tables (see **Appendix C2**). This includes 58 studies on the transmission of eligible conditions, 46 studies exploring the prevalence and/or incidence of eligible conditions, 12 studies that include both incidence and transmission of eligible studies, one study published in a language other than English that are probably eligible for inclusion (pending translation into English) and one study that was not able to be retrieved.

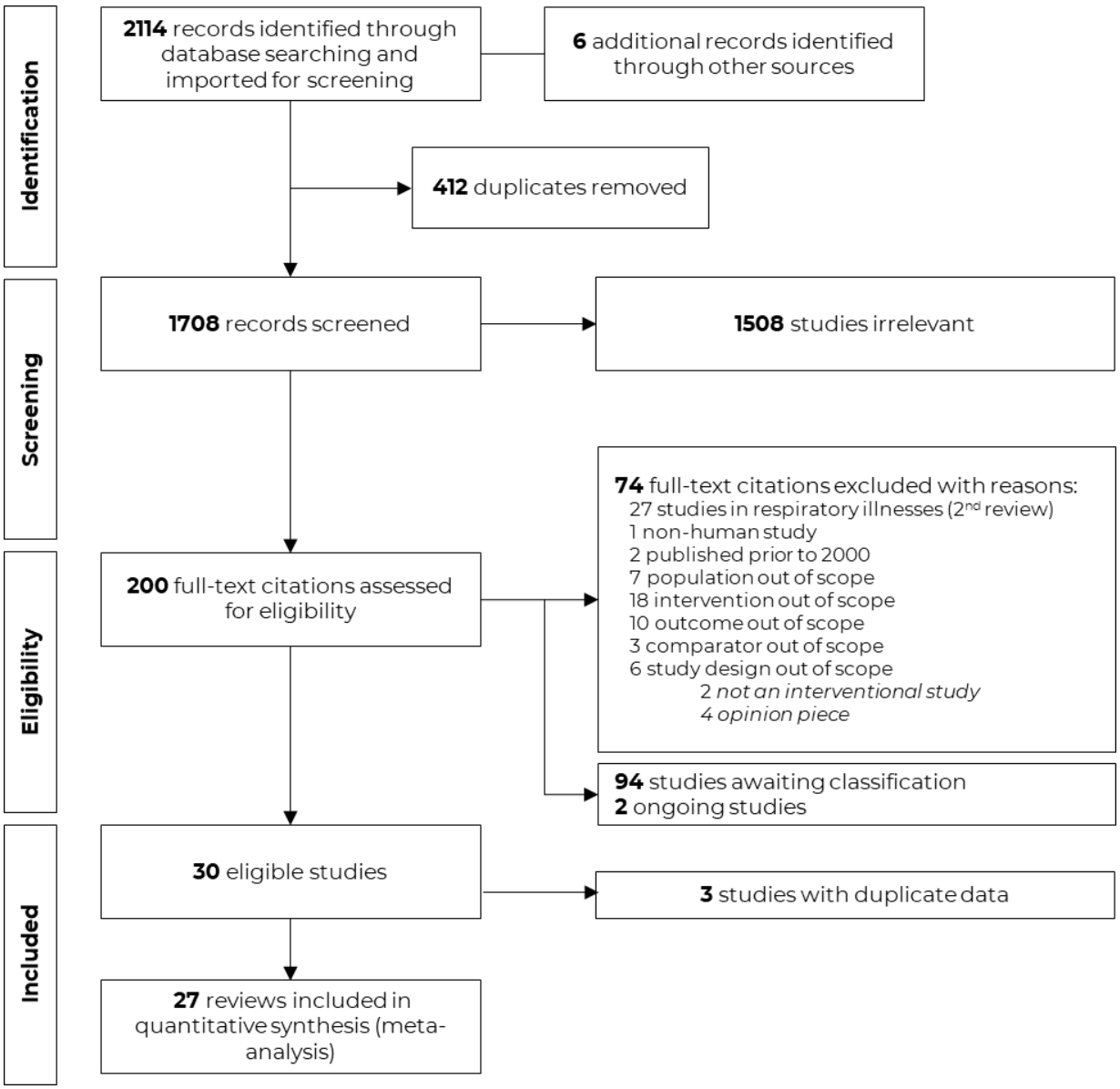
Among the 94 studies awaiting classification, all studies were conducted in common childhood infectious diseases with 14 of these comparing the effectiveness of exclusion measures including isolation, school closures and investigation into social contact patterns and their influence on disease transmission. The studies appeared to be comparable to those included in the evidence synthesis in terms of sample size, study duration, outcomes measured.

### 4.1.4 Ongoing studies

Ongoing studies that did not have published results at the time of the search are listed in the *Characteristics of ongoing studies* table (see **Appendix C3**). One of the studies was a systematic review of which a protocol has been registered but the review had not yet been conducted. The remaining study was currently ‘recruiting’.

Both studies were conducted in children with one study comparing the effect of public health measures on infectious diseases as a whole and the other investigating the prevalence of infectious intestinal diseases. The ongoing studies appeared to be comparable to those included in the evidence synthesis in terms of population analysed and outcomes measured. Both ongoing studies included a registered protocol number.

**Figure 2 Literature screening results**




### 4.1.5 Included studies

The search retrieved 27 citations corresponding to 26 studies that were identified for inclusion. Of the 27 citations corresponding to 26 studies, there were 14 SRs or modelling studies, six primary studies and six National Guidelines identified as eligible for inclusion in the review.

All 26 studies were included in the synthesis comparing exclusion measures versus an inactive control or alternative intervention. One study reported the effect of exclusion measures across various conditions across gastrointestinal diseases, influenza-like illness and rash symptomatic diseases (Czumbel 2018). Three additional studies reported information for gastrointestinal diseases (Chen 2016, Li 2021, CDNA SoNGs 2010). There were 16 additional studies reporting information for influenza-like illness (Bin Nafisah 2018, Burns 2021, CDNA SoNGs 2017a, CDNA SoNGs 2015, CDNA SoNGs 2022, Fong 2020, Fumanelli 2016, Jackson 2013, Jackson 2014, Murillo-Zamora 2020, Rashid 2015, Spielberger 2021, Stebbins 2010, Talic 2021, Uchida 2012, Viner 2020). Four additional studies reported information for rash symptomatic diseases (CDNA SoNGs 2017b, CDNA SoNGs 2019, Chan 2017, Getz 2016) and the remaining three studies reported information on other infectious diseases including *Streptococcus* (CDNA SoNGs 2018, Högberg 2004, McNeil 2021).

An overview of the conditions identified and included in this review is provided in Table 1. Descriptions of the included studies, including an overview of the PICO criteria, a summary of the risk of bias assessment and results of the data synthesis for the main comparison can be found in **Appendix D** and **Appendix E**.

**Table 1 List of conditions identified and considered in this review**

| Condition | Exclusion of case | Exclusion of contacts[a] | Updated evidence available? | REFER TO |
|---|---|---|---|---|
| Diarrhoea (no organism identified) | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes* | Section 4.2 |
| Campylobacter infection | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Cryptosporidium | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | No | Appendix C |
| Candidiasis (thrush) | Not excluded | Not excluded | No | Appendix C |
| Cytomegalovirus (CMV) infection | Not excluded | Not excluded | No | Appendix C |
| Conjunctivitis | Exclude until discharge from the eyes has stopped, unless a doctor has diagnosed non-infectious conjunctivitis | Not excluded | No | Appendix C |
| Fungal infections of the skin or nails (e.g. ringworm, tinea) | Exclude until the day after starting appropriate antifungal treatment | Not excluded | No | Appendix C |
| Giardiasis | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Glandular fever (mononucleosis, Epstein–Barr virus [EBV] infection) | Not excluded | Not excluded | Yes | Section 4.6 |
| Hand, foot and mouth disease | Exclude until all blisters have dried | Not excluded | Yes | Section 4.4 |
| Haemophilus influenzae type b (Hib) | Exclude until the person has received appropriate antibiotic treatment for at least 4 days | Not excluded<br>Contact a public health unit for specialist advice | No | Appendix C |
| Head lice (pediculosis) | Not excluded if effective treatment begins before the next day at the education and care service<br>The child does not need to be sent home immediately if head lice are detected | Not excluded | No | Appendix C |
| Hepatitis A | Exclude until a medical certificate of recovery is received and until at least 7 days after the onset of jaundice | Not excluded<br>Contact a public health unit for specialist advice about vaccinating or treating children in the same room or group | Yes | Section 4.6 |
| Hepatitis B | Not excluded | Not excluded | No | Appendix C |
| Hepatitis C | Not excluded | Not excluded | No | Appendix C |

| Condition | Exclusion of case | Exclusion of contacts[a] | Updated evidence available? | REFER TO |
|---|---|---|---|---|
| Herpes simplex (cold sores, fever blisters) | Not excluded if the person can maintain hygiene practices to minimise the risk of transmission<br>If the person cannot comply with these practices (e.g. because they are too young), they should be excluded until the sores are dry<br>Sores should be covered with a dressing, where possible | Not excluded | No | Appendix C |
| Human immunodeficiency virus (HIV) | Not excluded<br>If the person is severely immune compromised, they will be vulnerable to other people's illnesses | Not excluded | No | Appendix C |
| Human parvovirus B19 (fifth disease, erythema infectiosum, slapped cheek syndrome) | Not excluded | Not excluded | Yes | Section 4.6 |
| Hydatid disease | Not excluded | Not excluded | No | Appendix C |
| Impetigo | Exclude until appropriate antibiotic treatment has started<br>Any sores on exposed skin should be covered with a watertight dressing | Not excluded | Yes | Section 4.4 |
| Influenza and influenza-like illnesses | Exclude until person is well | Not excluded | Yes | Section 4.3 |
| Listeriosis | Not excluded | Not excluded | No | Appendix C |
| Measles | Exclude for 4 days after the onset of the rash | Immunised and immune contacts are not excluded<br>For non-immunised contacts, contact a public health unit for specialist advice<br>All immunocompromised children should be excluded until 14 days after the appearance of the rash in the last case | Yes | Section 4.4 |
| Meningitis (viral) | Exclude until person is well | Not excluded | No | Appendix C |
| Meningococcal infection | Exclude until appropriate antibiotic treatment has been completed | Not excluded<br>Contact a public health unit for specialist advice about antibiotics and/or vaccination for people who were in the same room as the case | Yes | Section 4.4 |
| Molluscum contagiosum | Not excluded | Not excluded | No | Appendix C |
| Mumps | Exclude for 9 days or until swelling goes down (whichever is sooner) | Not excluded | Yes | Section 4.4 |
| Norovirus | Exclude until there has not been a loose bowel motion or vomiting | Not excluded | Yes | Section 4.2 |

| Condition | Exclusion of case | Exclusion of contacts[a] | Updated evidence available? | REFER TO |
|---|---|---|---|---|
| | for 48 hours | | | |
| Pertussis (whooping cough) | Exclude until 5 days after starting appropriate antibiotic treatment, or for 21 days from the onset of coughing | Contact a public health unit for specialist advice about excluding non-vaccinated contacts, or antibiotics | Yes | Section 4.3 |
| Pneumococcal disease | Exclude until person is well | Not excluded | No | Appendix C |
| Roseola | Not excluded | Not excluded | Yes | Section 4.6 |
| Ross River virus | Not excluded | Not excluded | No | Appendix C |
| Rotavirus infection | Exclude until there has not been a loose bowel motion or vomiting for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Rubella (German measles) | Exclude until the person has fully recovered or for at least 4 days after the onset of the rash | Not excluded | Yes | Section 4.4 |
| Salmonellosis | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Scabies | Exclude until the day after starting appropriate treatment | Not excluded | No | Appendix C |
| Shigellosis | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Streptococcal sore throat (including scarlet fever) | Exclude until the person has received antibiotic treatment for at least 24 hours and feels well | Not excluded | Yes | Section 4.6 |
| Toxoplasmosis | Not excluded | Not excluded | No | Appendix C |
| Tuberculosis (TB) | Exclude until medical certificate is produced from the appropriate health authority | Not excluded<br>Contact a public health unit for specialist advice about screening, antibiotics or specialist TB clinics | No | Appendix C |
| Varicella (chickenpox) | Exclude until all blisters have dried—this is usually at least 5 days after the rash first appeared in non-immunised children, and less in immunised children | Any child with an immune deficiency (for example, leukaemia) or receiving chemotherapy should be excluded for their own protection as they are at high risk of developing severe disease<br>Otherwise, not excluded | Yes | Section 4.4 |
| Viral gastroenteritis (viral diarrhoea) | Exclude until there has not been a loose bowel motion for 24 hours[b] | Not excluded | Yes | Section 4.2 |
| Worms | Exclude if loose bowel motions are occurring<br>Exclusion is not necessary if treatment has occurred | Not excluded | No | Appendix C |

a. The definition of 'contacts' will vary according to the disease.
b. If the cause is unknown, possible exclusion for 48 hours until the cause is identified. However, educators and other staff who have a food handling role should always be excluded until there has not been a loose bowel motion for 48 hours.

## 4.2 Gastrointestinal diseases

### 4.2.1 Description of studies

Five citations (8-12) corresponding to one SR (Czumbel 2018), two studies (Chen 2016, Li 2021) and one National Guidelines (CDNA SoNGs 2010) were identified in the literature. No additional studies were identified through other sources. There were 28 studies awaiting classification and two ongoing studies. An overview of the PICO criteria of included studies is provided in Table 2.

Czumbel 2018 was a systematic review of observational studies and clinical trials that were carried out in community setting across 28 countries (United States, United Kingdom, Finland, Spain, Japan, China, Guinea–Bissau, Sweden, Republic of Guatemala, Australia, the Netherlands, Peru, Chile, Italy, Germany, India, Republic of the Union of Myanmar, Denmark, People's Republic of Bangladesh, Thailand, Norway, Taiwan, Canada, France, Malaysia, Trinidad, Kenya, Hong Kong) and focussed on children aged from 1 month to 18 years. The systematic review investigated four key prognostic factors (1) the incubation period, (2), the period of infectiousness, (3) the duration of shedding and (4) the setting specific exclusion period across the most common transmittable childhood infectious diseases including gastroenteritis, campylobacteriosis, E. coli, salmonellosis, shigellosis, and giardiasis. PubMed and Medline databases were searched for citations between 1980 and June 2015. CDC, WHO and the American Academy of Paediatricians Red Book were used to search for reference and relevant cited articles in October 2014.

The two additional studies were carried out in either schools (Chen 2016) or a community setting (Li 2021) in China. Chen 2016 is a modelling study with data concentrated on school children and staff from a single 1400 student school in Changsha. It compared both isolation and school closure against no intervention for students and teachers with Norovirus. Li 2021 is a retrospective cohort trial that considered healthcare records for children that reported to the Children's Hospital at Zhejiang University School of Medicine from January to December 2020 and compared against a historical cohort (2019). Li 2021 compared the impact of protective measures and isolation on intestinal infection in children before and after COVID-19. Intestinal infections included primary diagnosis of enteritis, diarrhea, indigestion, gastroenteritis, and vomiting. Data on outpatient visits and intestinal infections, number of completed tests for rotavirus and adenovirus antigen assays, and the confirmed positive cases from January–December 2020 were collected.

The National Guidelines was written on behalf of the Australian Government, Department of Health and Ageing by the Communicable Diseases Network Australia (CDNA). The Guidelines are provided to assist public health units investigating outbreaks of norovirus and suspected viral gastroenteritis. They capture the knowledge of experienced professionals, build on past research efforts, and provide advice on best practice based upon the best available evidence at the time of completion.

Results for exclusions measures versus inactive control (historical cohort) for gastrointestinal diseases are provided in the Summary of Findings table (see Section 4.2.3).

### 4.2.2 Critical appraisal

One systematic review (Czumbel 2018) was assessed to be of moderate quality. Limitations arose due to the lack of a satisfactory technique for assessing the risk of bias in individual studies included in the review. Given the limitations in the available evidence, the reviewers did not conduct a meta-analysis so appropriate methods for statistical combination of results and publication bias could not be assessed.

Two additional studies were judged to be of overall moderate risk of bias (Chen 2016, Li 2021). Both studies did not provide information relating to strategies used to deal with confounding factors and it was uncertain if participants were free of the outcome at the start of the study.

Details are provided in **Appendix D1.**

**Table 2 Characteristics and quality of included studies: Gastrointestinal disease**

| Review ID Quality | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| CDNA SoNGs 2010 (12) | National Guidelines | Community | Australia | Norovirus or suspected viral agents | NA | Incubation period<br>Period of infectiousness<br>Exclusion<br>Isolation and cohorting |
| Chen 2016 (11) | Modelling study | Schools | China | Norovirus | Isolation<br>School closure (7, 8, 9, 10 days)<br>Isolation plus school closure (7, 8, 9, 10 days)<br>none | Total attack rate<br>Cumulative cases<br>Duration of outbreak |
| Czumbel 2018 (ECDC 2016) (9, 10) | SR | Households, children's homes, hospital, schools, nurseries, day care centres, community parks | Various | Various childhood diseases | NA | Incubation period<br>Period of infectiousness or duration of shedding<br>Exclusion period |
| Li 2021 (8) | Retrospective cohort | Children in Hangzhou, China | Hangzhou, China | Rotavirus and Adenovirus | 2019 vs 2020 disease incidence (2020 during COVID outbreak) | Incidence of paediatric intestinal infection, rotavirus and adenovirus, and outpatient visits |

Abbreviations: CDNA SoNGs, Communicable Diseases Network Australia Series of National Guidelines; COVID-19, coronavirus 2019; NA, not applicable; SR, systematic review

## 4.2.3 Summary of findings

### 4.2.3.1 Exclusion period (vs no exclusion period)

Three citations corresponding to two studies reported new evidence on two gastrointestinal diseases including Giardiasis (Czumbel 2018) and viral gastroenteritis (Li 2021). A summary of the new evidence is presented in Table 3.

Results for all outcomes were assessed to be of overall very low certainty of evidence.

Across both studies presenting new evidence, results for outcomes were judged to have serious concerns of bias relating to limitations of the evidence from individual studies included in the systematic review (Czumbel 2018) and uncertainty in any strategies used to deal with confounding factors (Li 2021). As each condition corresponded to a single study, inconsistency was not assessed (Certainty of evidence not downgraded). Similarly, there was no serious indirectness for the available evidence of each disease. The available evidence is generalisable to the Australian healthcare context. Outcomes form both diseases were assessed to have serious imprecision relating to low patient numbers and a wide range of results across both the systematic review (Czumbel 2018) and retrospective cohort study (Li 2021). As such, the certainty of evidence was downgraded. Both included studies did not appear to have any publication bias and did not contribution to downgrading the certainty of evidence.

**Table 3 Summary of new evidence: Gastrointestinal diseases**

| Disease | Previous Guidelines | Summary of New Evidence | Certainty of evidence | Source |
|---|---|---|---|---|
| Giardiasis | Exclude until there has not been a loose bowel motion for 24 hours | At the end of the 6-month followup period, no control strategy was associated with significantly lower prevalence of Giardia | Very low ⊕⊖⊖⊖ | Czumbel 2018 (1 study) |
| Viral gastroenteritis (viral diarrhoea) | Exclude until there has not been a loose bowel motion for 24 hours | The number of positive cases of adenovirus decreased from 2.7% to 1.6% under COVID-19 measures (isolation)<br>The number of positive cases of intestinal infectious diseases decreased from 4-7% to 2-4% under COVID-19 measures (isolation) | Very low ⊕⊖⊖⊖ | Li 2021 |

Transmission related outcomes (e.g. number of cases)

A summary of the evidence relating to transmission in Gastrointestinal diseases is presented in Table 4.

**Table 4 Results for exclusion period vs no exclusion period: Transmission related outcomes (e.g. number of cases) in people with gastrointestinal diseases**

| Study ID | Study design (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| CDNA SoNGs 2010 | National Guidelines | Community | Australia | **Norovirus or suspected viral agents** | Ill people should be sent home immediately and excluded from childcare, preschool, school or work for 48 hours after all symptoms have stopped. It is a reasonable and accepted recommendation that workers be excluded for 48 hours after symptoms have stopped. | Viral shedding in stools coincided with onset of illness and did not extend more than 72 hours after the onset of the first symptom. | Maximum viral shedding probably occurs 24–48 hours after exposure | |
| Czumbel 2018 | SR<br>6 studies (1984 to 2012) | Children aged 1 month to 18 years. For exclusion measures: children attending a school or other childcare setting | Schools, day care centres, households, institutions and hospitals | **Viral gastroenteritis** | **R2001:** 24 h from last episode of diarrhea | Echovirus and coxsackievirus: Exposure 4 days before primary illness peak<br>Astrovirus: 2 to 13 days (mean 3 days) | | Adenovirus: Excretion 8 to 23 days after onset of disease (mean duration of total excretion = 4.2 ± 0.4 days)<br>Astrovirus: range 1 to 10 days after onset of diarrhea (median 3.5 days) |
| | SR<br>8 studies (1983 to 1996)<br>(CDC, Red Book advice etc.) | | | **Campylobacteriosis** | **RG:** Exclude under conditions*<br>**R2001:** 24 h from last episode of diarrhea | Range 2 to 10 days (median 2.75 to 4 days) | | Range 1 to 90 days after onset of diarrhoea/visit to clinic |
| | SR | | | **E. Coli** | All children excluded from | Range less than 1 to | | Range 2 to 62 days |

| Study ID | Study design (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | 7 (1994, 2014) | | | | nursery until 2 negative faecal stools (≥ 48 hours apart) effective in ending outbreak. Median duration of exclusion from childcare facilities 39.5 days (IQR 28 to 52 days); exclusion period ≥2 weeks longer than the duration of shedding in 34/150 cases (23% (95%CI 16, 30) where both duration of shedding and exclusion were known<br>**RB:** Until diarrhoea resolves and results of 2 stool cultures are negative<br>EHEC (0157): 2 negative stools | 21 days (median 4 to 4.5 days) | | (median 31 days) after onset of illness (IQR 17 to 41 days) |
| | SR<br><br>12 (1954 to 2012) | | | **Salmonellosis** | **RB:** Until diarrhoea resolves<br>**R2001**: < 5 y: at least one negative stool ≥ 5 y: 24 h from last episode of diarrhoea | Elementary and junior high schools: median ± SD: 80.9 ± 35.9 hours;<br>Nursery schools: median ± SD: 64.8 ± 21.6 hours;<br>Overall range: <24 hours to 16 days (median: 1-8 days) | | Range from 1 to more than 22 weeks from exposure<br>Age < 3months: mean 12.1 days from first positive sample<br>Age 3 months to 1 year: 81.3 days |
| | SR<br><br>5 (1967 to 1994)<br><br>(CDC, WHO advice) | | | **Shigellosis** | Daycare centre 1: allowed to return on appropriate antimicrobial therapy after diarrhea had ceased and were isolated in separate room until 2 negative successive stool cultures.<br>Daycare centre 2: closed until | median: 2 days, range 1 to 6 days (mean: 2.3 days) | | |

| Study ID | Study design (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | | | | | family running the centre had 2 negative successive negative stool culture after antimicrobial therapy. Transmission ceased within 2 d after interventions.<br><br>**RB:** Until diarrhoea resolves and results of 2 stool cultures are negative<br>**RG:** Exclude under conditions*<br>**R2001:** < 5 y: at least one negative stool ≥ 5 y: 24 h from last episode of diarrhoea | | | |
| | SR<br><br>1 (1991) | | | **Giardiasis** | At the end of the 6-month follow-up period, *no control strategy was associated with significantly lower prevalence of Giardia,* although the 6–month prevalence in all 3 groups were significantly lower than the prevalence at the time of intervention | | | |
| | SR<br><br>12 (1975 to 2013) | | | **Rotavirus** | | Less than 48 hours | | Range from 5 to 57 days after onset of diarrhoea. Some shedding up to 13 days prior.<br>2 to 8 days from hospital admission |
| | SR<br><br>13 (1982 to 2014) | | | **Norovirus** | Calicivirus: Ill children excluded from daycare centre until 24 hours after last episode of gastroenteritis and closure of | norovirus: range 7 to 72 hours (means 30 to 32 hours) | | Norovirus: 2 to 38 days after disease onset (median: 11.5 days) |

| Study ID | Study design (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | | | | | daycare centre for 11 ds (and additional hygiene measures). The outbreak subsided after 11 weeks, apparently independently of all the public health measures that had been taken.<br><br>Norwalk–like virus: School closure for 4 ds, from d 18 – 21 of outbreak (including cleaning using chlorine–based agents). Outbreak stopped<br>RG: Exclude under conditions*<br>CDC: Acute phase of illness, and a period following recovery while the person is still shedding virus at high levels (usually 24— 72 hours)<br>R2001: 24 h from last episode of diarrhea | Norwalk or Norwalk-like: 0 to 2 days | | Calicivirus: 0-12 days from onset of diarrhoea<br><br>Norwalk-like virus: up to 22 days after onset of symptoms |

| Study ID | Study design Sample size (no. of trials) | Patient population | Setting (Location) | Disease | Results | | |
|---|---|---|---|---|---|---|---|
| Chen 2016 | Modelling study | High school students and teachers | Changsha, China | Isolation or School Closure (7, 8, 9, 10 days) vs no intervention for norovirus | **Outcome** | **Intervention** | **Comparator (None)** |
| | | | | | Total attack rate (%, 95% CI) | Isolation: 2.36 (2.06, 2.22)<br>School closure (7 days): 67.23 (66.80, 67.66)<br>School closure (8 days): 67.22 (66.79, 67.65)<br>School closure (9 days): 67.21 (66.78, 67.64)<br>School closure (10 days): 2.26 (2.18, 2.34)<br>Isolation + School closure (7, 8, 9 or 10 days): | 67.45 (67.02, 67.88) |

| Study ID | Study design<br>Sample size (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2.26 (2.18 - 2.34) | | | |
| | | | | | Cumulative cases | Isolation: 32<br>School closure (7 days): 941<br>School closure (8 days): 941<br>School closure (9 days): 941<br>School closure (10 days): 32<br>Isolation + School closure (7, 8, 9 or 10 days): 32 | | 944 | |
| | | | | | Duration of outbreak | Isolation: 15<br>School closure (7 days): 50<br>School closure (8 days): 52<br>School closure (9 days): 54<br>School closure (10 days): 15<br>Isolation + School closure (7, 8, 9 or 10 days): 15 | | 39 | |
| Li 2021 | Retrospective cohort | Children that reported to the Children's Hospital at Zhejiang University School of Medicine | Hangzhou, China | Impact of protective measures and isolation on intestinal infection in children before and after COVID-19 | **Outcome** | **Protective measures (2020)**<br>**n/N (%)** | **No protective measures (2019)**<br>**n/N (%)** | **Risk estimate (95% CI)** | **Statistical significance *p*-value** |
| | | | | | Outpatient visits | 40690 – 269465 per month | 255932 – 425234 per month | NR | *p < 0.05* |
| | | | | | Paediatric intestinal infections incidence | 1602–10818 (2.92–4.01%) | 18065 to 28014 (4.17% to 7.09%) | NR | *p < 0.05* |
| | | | | | Positive rate of Adenovirus | 233/14097 (1.58%) | 815/30285 (2.69%) | NR | *p < 0.05* |
| | | | | | Positive rate of Rotavirus | 1008 (7.15%) | 4365/30285 (14.41%) | NR | *p < 0.05* |

Abbreviations: CDC: Centre for Disease Control and Prevention; CI, confidence interval; PHU, public health unit; R2001: Richardson 2001; RB: Red Book; RCT, randomised controlled trial; RG: Quick reference guide; RR, relative risk; SD, standard deviation; WHO: World Health Organisation

### Adverse events (including safety) related to the intervention

There were no studies found for adverse events thus the effect of exclusion measures compared with control in children or adults with gastrointestinal disease is unknown.

### Absenteeism

There were no studies found for absenteeism thus the effect of exclusion measures compared with control in children or adults with gastrointestinal disease is unknown.

### Length of illness

There were no studies found for the length of illness thus the effect of exclusion measures compared with control in children or adults with gastrointestinal disease is unknown.

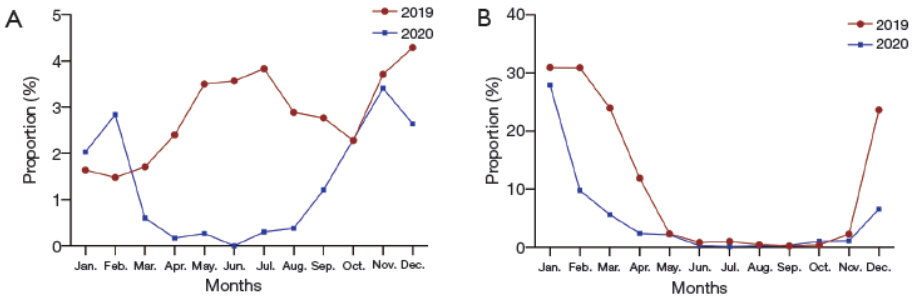
### Behaviour or practice change

There were no studies found for behaviour or practice change thus the effect of exclusion measures compared with control in children or adults with gastrointestinal disease is unknown.

#### 4.2.3.2 Figures

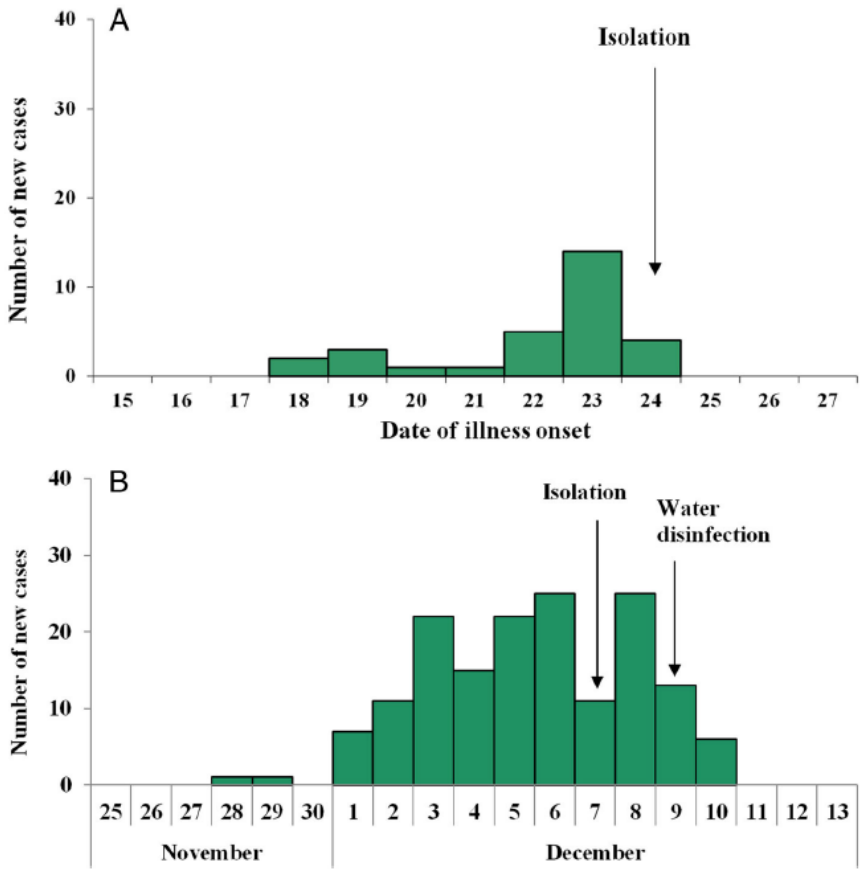
Outcome results related to protective measures for Gastrointestinal disease are presented in Figure 3 and Figure 4.

**Figure 3 Distribution of positive rate for adenovirus and rotavirus from January to December in 2019 and 2020. (A) Positive rate of adenovirus; (B) positive rate of rotavirus**




Source: Li 2021 (See Appendix E1.2)

**Figure 4 Distribution of cases by date of illness onset for (A) the school outbreak and (B) the village outbreak**




Source: Chen 2016 (See Appendix E1.2)

## 4.3 Influenza-like illness

### 4.3.1 Description of studies

16 citations (9, 10, 13-26) corresponding to 12 studies (Bin Nafisah 2018, Burns 2021, Czumbel 2018, Fong 2020, Fumanelli 2016, Jackson 2013, Jackson 2014, Murillo-Zamora 2020, Rashid 2015, Spielberger 2021, Stebbins 2010, Uchida 2012) and three National Guidelines (CDNA SoNGs 2017a, CDNA SoNGs 2015, CDNA SoNGs 2022) were identified in the literature. Two additional studies (27, 28) were identified through other sources (Talic 2021, Viner 2020). There were 26 studies awaiting classification and no ongoing studies. An overview of the PICO criteria of included studies is provided in Table 5.

Nine included studies were systematic reviews of observational or modelling studies (Bin Nafisah 2018, Czumbel 2018, Fong 2020, Jackson 2013, Jackson 2014, Rashid 2015, Spielberger 2021, Talic 2021, Viner 2020) and included a global cohort. Three studies were conducted in schools only (Jackson 2013, Jackson 2014, Viner 2020), one study (Fong 2020) was conducted in a school, workplace or general community setting and the remaining six studies were carried out in schools, households or community settings (Bin Nafisah 2018, Czumbel 2018, Rashid 2015, Spielberger 2021, Talic 2021). Three reviews included studies that recruited school-aged children only (Bin Nafisah 2108, Jackson 2013, Jackson 2014). Two studies (Spielberger 2021, Talic 2021) included studies with any child or adult diagnosed with COVID-19. The remaining four reviews (Czumbel 2018, Fong 2020, Rashid 2015, Viner 2020) did not place any restriction on the population of included studies with participants recruited from the wider population across Europe, Asia, America, Australia and the United Kingdom. Six out of nine included systematic reviews compared the effect of school closures against no intervention for influenza (Bin Nafisah 2018, Jackson 2013, Jackson 2014, Rashid 2015, Spielberger 2021) or COVID-19 (Viner 2020). The remaining three studies investigated the effectiveness of isolation and quarantine in reducing the incidence of either influenza (Czumbel 2018, Fong 2020) or COVID-19 (Talic 2021),

Two of the included studies were modelling studies with data concentrated on school children and staff in the United States (Burns 2021) or the United Kingdom (Fumanelli 2016). One study was conducted in a school setting only (Burns 2021) and the remaining study extended to a broader community setting (Fumanelli 2016). Both studies compared the effect of either isolation versus no isolation (Burns 2021) or school closure versus no school closure on influenza and COVID-19 (Fumanelli 2016).

The remaining three studies were primary studies conducted in either Mexico (Murillo-Zamora 2020), the United States (Stebbins 2010) or Japan (Uchida 2012). One RCT included school-aged children, their parents and staff and was conducted in a multi-centre setting across 10 elementary schools. One study was a retrospective cohort trial conducted in a community setting with no restriction on population age (Murillo-Zamora 2020) and the remaining prospective cohort study included school children that were attending one of four included elementary or junior high schools (Uchida 2012). Two studies compared the effect of physical distancing (Murillo-Zamora 2020) or school closures (Uchida 2012) on the incidence of influenza-like illness and infection. The remaining study recorded the behaviour change associated with nonpharmaceutical interventions on the prevalence of influenza (Stebbins 2010).

The National Guidelines were written on behalf of the Australian Government, Department of Health by the Communicable Diseases Network Australia (CDNA) in membership with the Australian Health Principal Protection Principal Committee (AHPPC). Each of the Guidelines are provided to assist public health units in responding to a notifiable seasonal influenza infection (CDNA SoNGs 2017a), pertussis (CDNA SoNGs 2015) or Australia's national minimum standard for surveillance, laboratory testing, case management and contact management for coronavirus disease 2019 (COVID-19) (CDNA SoNGs 2022). They capture the knowledge of experienced professionals, build on past research efforts, and provide advice on best practice based upon the best available evidence at the time of completion.

Results for exclusions measures versus inactive control (historical cohort) for influenza-like illnesses are provided in the Summary of Findings table (see 4.3.3).

**Table 5 Description of Studies: Influenza-like illness**

| Review ID | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| Bin Nafisah 2018 (22) | SR/MA | Community, schools, households | Japan, Mexico, USA, China, UK, Australia, France, Greece, Singapore, India, the Netherlands, Argentina | Novel influenza | School closure vs no school closure | Timing of closure<br>Delay of epidemic peak<br>Duration of closure<br>Effect of school closure on attack rate<br>Relation with infectiveness and school closure |
| Burns 2021 (23) | Modelling study | Schools | USA | Influenza COVID-19 | Isolation vs no isolation | The attack rate<br>The outbreak duration<br>The peak number of simultaneously infected |
| CDNA SoNGs 2017a (24) | National Guidelines | Community | Australia | Seasonal influenza infection | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| CDNA SoNGs 2015 (25) | National Guidelines | Community | Australia | Pertussis | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| CDNA SoNGs 2022 (26) | National Guidelines | Community | Australia | COVID-19 | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| Czumbel 2018 (ECDC 2016) (9, 10) | SR | Households, children's homes, hospital, schools, nurseries, day care centres, community parks | Various | Various childhood disease (comprehen sive) | NA | Incubation period<br>Period of infectiousness or duration of shedding<br>Exclusion period |
| Fumanelli 2016 (14) | Modelling study | Schools, households, and community | United Kingdom | Influenza COVID-19 | School Closure vs no school closure | Attack rate reduction<br>Peak incidence reduction<br>Peak delay |
| Fong 2020 (13) | SR | School, Workplace, General community | Asia, Europe, America, Africa, and Australia | Influenza | isolation of ill person, quarantine of exposed persons, contact tracing, School closure (planned holiday, reactive closure or pre-emptive closure), workplace measures and workplace closure, avoiding crowing | Reducing transmission of Influenza<br>Reducing time to peak of epidemic<br>Reducing height of peak |
| Jackson 2013 (15) | SR of epidemiol | Schools | Europe, North America, | Influenza | School Closure vs no school closure | Age specific effects of school closure |

| Review ID | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| | ogical studies | | Central America, South America, Asia, Africa, Australasia | | | Reversibility of the effects<br>Changes in transmission patterns from modelling analyses of epidemic data<br>Different school closure strategies<br>Use of multiple interventions |
| Jackson 2014 (16) | SR of modelling studies | Schools | Europe, North America, Central America, South America, Asia, Africa, Australasia | Influenza | School Closure vs no school closure | Predicted peak incidence and cumulative attack rates |
| Murillo–Zamora 2020 (17) | Retrospective cohort/ cross sectional | General population | Mexico | ILI and SARS | Physical distancing interventions | Average percent change in overall daily influenza and age stratified incidence rates |
| Rashid 2015 (18) | SR of modelling and observational studies | Schools, households and community | Canada, United States, Thailand, United Kingdom, Australia | Influenza | School closures | Effectiveness |
| Spielberger 2021 (19) | SR | General population | Global | COVID-19 | NA | Intra-Household and Close-Contact SARS-CoV-2 Transmission Among Children |
| Stebbins 2010 (20) | Cluster-RCT | K-5 Elementary Schools | Pittsburgh, United States | Influenza | Nonpharmaceutical interventions (hand hygiene, etiquette, hand sanitiser, home isolation) WHACK vs no NPI | Teacher observed behavioural change |
| Talic 2021 (27) | Systematic review | General population | Global | COVID-19 | Effectiveness of public health measures in reducing the incidence of COVID-19 | Incidence of COVID-19<br>SARS-CoV-2 transmission<br>COVID-19 mortality |
| Uchida 2012 (21) | Prospective cohort | Schools | Japan | H1N1 infection | School closure vs class closure | Transmission of H1N1 infection |
| Viner 2020 (28) | SR | Schools or nurseries | China, Hong Kong, Singapore | COVID-19 | School closures | Effectiveness |

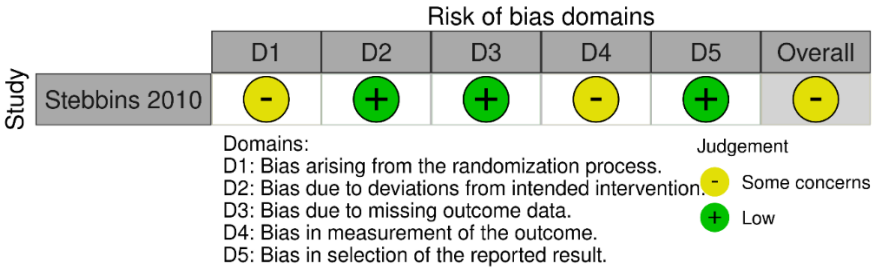
Abbreviations: CDNA SoNGs, Communicable Diseases Network Australia Series of National Guidelines; COVID-19, coronavirus 2019; ILI. Influenza-like illness; MA, meta-analysis; SARS, severe acute respiratory infection; SR, systematic review

### 4.3.2 Critical appraisal

One systematic review was judged to be of high quality as all information relating to review author's decisions when assessing individual studies and combining results across studies was available (Bin Nafisah 2018). Five systematic reviews were assessed to be of moderate quality (Czumbel 2018, Fong 2020, Jackson 2014, Spielberger 2021, Talic 2021). Limitations arose due to the lack of a satisfactory technique for assessing risk of bias in individual studies included in the review. Additionally, given the limited available evidence appropriate methods for statistical combination of results and publication bias could not be assessed (Czumbel 2018, Jackson 2014, Spielberger 2021). The remaining two systematic reviews were judged to be of overall low quality (Jackson 20213, Rashid 2915). In addition to the lack of risk of bias assessment, both studies also did not include components of the PICO in the research questions and inclusion criteria for the review and justify deviations from the protocol.

The risk of bias of the included RCT for influenza-like illness (Stebbins 2010) is summarised in Figure 5. The cluster-RCT was judged to have overall some concerns of bias arising due to the differences between groups at baseline and the use of subjective outcomes where participants were aware of their treatment allocation.

**Figure 5 Risk of bias summary: review authors' judgements about each risk of bias item for each included study: Influenza-like illness**




One cohort study was judged to be at overall low risk of bias (Uchida 2012). All required information relating to the recruitment of participants, methods for analysing outcomes and assessing confounding was available. Three additional primary studies were judged to be of overall moderate risk of bias (Burns 2021, Fumanelli 2016, Murillo-Zamora 2020). All three studies did not provide information relating to strategies used to deal with confounding factors and it was uncertain if participants were lost to follow up and no reasons or strategies to address incomplete follow up was reported.

Details are provided in **Appendix D2.**

### 4.3.3 Summary of findings

#### 4.3.3.1 Exclusion period (vs no exclusion period)

Three studies (Burns 2021, Talic 2021, Czumbel 2018) and three National Guidelines (CDNA SoNGs 2015, CDNA SoNGs 2017, CDNA SoNGs 2022) reported new evidence on three influenza-like illnesses. A summary of the new evidence is presented in Table 6.

Outcomes were assessed to be of overall low or very low certainty of evidence.

Results for outcomes from all included studies presenting new evidence were judged to have no serious concerns of bias. There was no serious inconsistency for the new evidence presented for influenza (8 studies) and inconsistency was not assessed for both Pertussis and COVID-19 because a single study contributed data. As such, the certainty of evidence was not downgraded. Across all studies, the available evidence was conducted in a school or community setting, therefore was directly generalisable to the Australian population and the certainty of evidence was not downgraded. Two studies did not show serious imprecision and were not downgraded (Burns, 2021, Talic 2021). The remaining study was assessed to have serious imprecision relating to the wide range of results reported across studies included in the systematic review (Czumbel 2018). The certainty of evidence was therefore downgraded. All included studies did not appear to have any publication bias.

**Table 6 Summary of new evidence: Influenza-like illness**

| Disease | Previous Guidelines | Summary of New Evidence | Certainty of evidence | Source |
|---|---|---|---|---|
| Influenza | Exclude until person is well | *Incubation period:* Around 1 to 4 days (average 2 days)<br>*Period of infectiousness:* 1 day before to 10 days after onset of symptom<br>*Duration of shedding:* Reported to persist for up to 21 days in young children from the onset of illness | Very low<br>⊕⊖⊖⊖ | Czumbel 2018 (8 studies) |
| | | For influenza outbreaks it is recommended that isolation is maintained for at least 2 days following the last day of fever. | Low<br>⊕⊕⊖⊖ | Burns 2021 |
| | | Isolation is not routinely required. In general, patients who have influenza should stay at home and keep away from work and school until symptoms have resolved | Low<br>⊕⊕⊖⊖ | CDNAs SoNGs 2017 |
| Pertussis (whooping cough) | Exclude until 5 days after starting appropriate antibiotic treatment, or for 21 days from the onset of coughing<br>Contact a public health unit for specialist advice about excluding non-vaccinated contacts | *Incubation period:* Range between 3 to 21 days, usually between 7-10 days<br>*Period of infectiousness:* Most contagious in the first two weeks after cough onset<br>*Duration of shedding:* Less than 7 days after onset of symptoms in those who were treated and 2–7 weeks in those who were untreated. | Very low<br>⊕⊖⊖⊖ | Czumbel 2018 (2 studies) |
| | | Exclude children for 5 days while on antibiotics or 14 days (from first exposure to infectious case) if they do not take antibiotics | Low<br>⊕⊕⊖⊖ | CDNAs SoNGs 2015 |
| COVID-19 | No advice provided | *Physical distancing:* associated with a 25% reduction in the incidence of COVID-19 and 12% decrease in the transmission of SARS-CoV-2 (5 studies)<br>*School closures:* 62% decrease in incidence of virus and 13% reduction in transmission but depended on early implementation (2 studies) | Low<br>⊕⊕⊖⊖ | Talic 2021 |
| | | *Incubation period:* Median is 5 to 6 days, with a range of 1 to 14 days<br>*Period of infectiousness:* 10 days after symptom onset; however, can vary based on individual factors. The commencement of the infectious period is generally 48 hours prior to symptom onset.<br>A quarantine period of 7 days reduces transmission, with majority of cases developing within 7 days from exposure | Low<br>⊕⊕⊖⊖ | CDNAs SoNGs 2022 |

Transmission related outcomes (e.g. number of cases)

A summary of the evidence relating to transmission in influenza-like illness is presented in Table 7.

**Table 7 Results for exclusion period vs no exclusion period: Transmission related outcomes in people with influenza-like illness**

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| CDNA SoNGs 2017a | National Guidelines | Community | Australia | **Influenza** | Isolation and restriction are not routinely required for single notifications. In general, health care providers should counsel patients who have influenza or ILI to stay at home and keep away from work, school and crowded areas or public gatherings until the symptoms have resolved.<br><br>Children or staff with ILI or confirmed influenza should not attend school or childcare while infectious. If a child or staff member becomes ill with an ILI, they should be sent home as soon as possible | The incubation period for infection with influenza is most commonly 2-3 days with a range from 1-7 days. | Patients may shed influenza virus and therefore be infectious for up to 24 hours prior to onset of symptoms and up to seven days after onset of symptoms. Children may shed virus for ten days or more, and adult influenza patients are considered no longer infectious 24 hours after the resolution of fever without anti-pyretic medication. | |
| CDNA SoNGs 2015 | National Guidelines | Community | Australia | **Pertussis** | Exclusion from work, school, preschool, and childcare, and restricted attendance from other settings, especially where there are infants, should be recommended for cases until they are no longer infectious, i.e. until:<br>21 days after the onset of any cough, or 14 days after the onset | The incubation period ranges from 4-21 days, usually 7 to 10 days. | Cases are infectious from the onset of catarrhal symptoms. Communicability gradually decreases and is negligible 3 weeks after onset of cough. Secondary attack rates of 80% among susceptible | |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | | | | | of paroxysmal cough (if the onset is known), or they have completed 5 days of a course of an appropriate antibiotic.<br>Childcare setting:<br>Children: exclude for 5 days while on antibiotics or 14 days (from first exposure to infectious case) if they do not take antibiotics<br>Staff: not excluded while taking 5 days of antibiotics or recommend exclusion for 14 days (from first exposure to infectious case) if they do not take antibiotics | | household contacts have been reported. | |
| CDNA SoNGs 2022 | National Guidelines | Community | Australia | **COVID-19** | Isolation of COVID-19 cases is recommended as an effective way to reduce the spread of infection. Cases should stay at home until their symptoms have resolved.<br>Cases should be educated about their potential to infect others for up to 10 days after onset of symptoms.<br>PHUs should strongly recommend cases avoid entering high-risk settings (such as residential aged care facilities, disability care facilities and hospitals) until at least 7 days following their positive test result and they are well. | The median incubation period of ancestral strains of SARS-CoV-2 is 5 to 6 days, with a range of 1 to 14 days (9-11). Studies have shown shorter incubation periods for both Delta and Omicron VOCs than ancestral SARS-CoV-2. | Transmission of SARS-CoV-2 can occur from pre-symptomatic and asymptomatic people and can continue as long as they shed whole live viruses. For the ancestral strains of SARS-CoV-2, people with mild-to-moderate illness were highly unlikely to be infectious more than 10 days after symptom onset. The infectious period, however, can vary based on individual factors and the VOC. | |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| Czumbel 2018 | SR<br><br>8 (1972 to 2013)<br><br>(CDC, Red Book advice) | Children aged 1 month to 18 years. For exclusion measures: children attending a school or other childcare setting | Schools, day care centres, households, institutions and hospitals | **Influenza** | School closure can reduce transmission of seasonal influenza among schoolchildren.<br><br><u>Standard class closure</u> (2 days, carried out the day following student absentee rates due to influenza or influenza–like illness reaching 10%) is effective for mitigating outbreaks in elementary schools.<br><br><u>Non–standard class closure*</u> relatively ineffective at mitigating an influenza outbreak with a class, but subgroup analyses revealed that "1 day class closure" effectively interrupted outbreaks within 1 week and resulted in outbreaks of shorter duration than those controlled by "standard class closures“<br>*different approaches (e.g. 1 day class closure carried out after 10% absentee rate, or class closures carried out ≥2 d after a 10% student absentee rate)<br><br>**RG:** No need to exclude, unless the child is unable to participate, meets other exclusion criteria such as fever with behaviour change | Around 1 to 4 days is described, on average 2 days | 1 day before to 10 days after onset of symptoms in children | Influenza A - a mean of around 7 days from onset of illness<br>Influenza B - a mean of around 6 days measured by viral culture and 4.6 days measured by antigen detection<br>Shedding reported to persist in young children for up to 21 days from the onset of illness |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| | SR<br><br>2 (1933, 1988)<br><br>(CDC, Red Book advice) | | | **Pertussis (whooping cough)** | The authors of the outbreak investigation study suggest that due to the long duration of shedding, exclusion from school for 3 weeks will not be effective. The other study suggested keep infected children at school until the first sign of catarrh or cough, to protect younger children<br>**RB:** Until 5 days of appropriate antimicrobial therapy course completed<br>**CDC:** Until 5 days of a full course of antimicrobial treatment; Untreated: 21 days from onset of cough<br>**R2001:** Treated: 5 days from starting antibiotics; Untreated: at least 3 weeks" | Range between 3 to 21 days, usually between 7 to 10 days<br>- within the same household: 3 days, most probably 7 days; unknown upper limit | Duration of shedding up to 4 to 7 weeks after illness onset<br>Most contagious in the first two weeks after cough onset | Between 2 to 7 weeks after illness onset in those who were untreated and less than 7 days after onset of symptoms in those who were treated |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Correlation coefficient | *Statistical significance* *p*-value |
| Bin Nafisah 2018 | SR<br><br>31 studies | NR, assumed school children and wider community | Community, schools, households (Japan, Mexico, USA, China, UK, Australia, France, Greece, Singapore, India, the | School closure before or after the epidemic reaches its peak to reduce overall influenza pandemic | Timing of closure | Timing of school closure in relation to the state of an epidemic is inversely correlated with reduction in the peak of the epidemic | r = –0.57 | p < 0.05 |
| | | | | | | Early closure of school in relation to start of an epidemic significantly predicted more reduction in the epidemic peak<br>The faster the epidemic reaches its peak; the more likely early school closure would influence the reduction of its peak | β = –0.501 | p < 0.05 |
| | | | | | Delay of the epidemic peak | The median time for school closure to delay the epidemic peak was 11 days. | | *p* > 0.05 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Correlation coefficient** | ***Statistical significance* *p*-value** |
| | | | Netherlands, Argentina) | | | Yet, delaying the epidemic peak did not correlate with the reduction of its peak. | | |
| | | | | | | A reduction in the overall infection: mean (SD) 1.33 (0.49) to 0.97 (0.50) | t(82) = −0.250 | $p < 0.05$ |
| | | | | | | The timing of school closures in relation to the start of the epidemic reveals no correlation with a peak delay. Hence, closure at any time during the epidemic will delay the peak | | $p > 0.05$ |
| | | | | | Duration of closure | The effect of school closure on delaying an epidemic peak positively correlated with the period of school closure. That is the longer the period of closure; the more likely the peak to be delayed | r = 0.51 | $p < 0.05$ |
| | | | | | | The longer the duration of the school closure the later the epidemic peak will be | β = 0.230 | $p < 0.05$ |
| | | | | | | The effect on the duration of school closure showed only correlation with delaying the peak and did not correlate with reduction of its peak | | $p > 0.05$ |
| | | | | | Closure after the epidemic reaches its peak | There is a significant relationship $X^2$ (2, N = 83) = 7.89, on the effect of school closure on the overall infection after the epidemic peak<br>More reduction in the overall infection was noted if schools were closed after the epidemic reaches its peak. | | $p < 0.05$ |
| | | | | | Effect of school closure on the attack rate | The reduction of the epidemic peak from school closure is positively correlated with the attack rate when implemented before the peak<br>The higher the attack rate, the more likely a reduction in the original epidemic peak will result from school closure. | r = 0.423 | $p < 0.05$ |
| | | | | | | The effect of school closure on delaying an epidemic peak negatively correlated with the attack rate. That is, the more school closure | r = −0.479 | $p < 0.05$ |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Correlation coefficient** | ***Statistical significance* *p*-value** |
| | | | | | | delayed the peak, the less attack rate would result. | | |
| | | | | | | The attack rate was lowered to a further extent when the closure implemented after the epidemic reaches its peak (M = 27.59, SD = 18.42) as compared to closure before the epidemic peak (M = 44.94, SD = 22.41) | t(73) = −3.48 | $p < 0.05$. |
| | | | | | Relationship between the duration of the infectiveness and school closure | The effect of school closure on delaying an epidemic peak positively correlated with the duration of the infectiveness | r = 0.54 | $p < 0.05$ |
| | | | | | | The longer the duration of infectiveness the more likely school closure will delay the epidemic peak | β = 0.461 | $p < 0.05$ |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Intervention**<br>**Attack rate % (interquartile range)** | **Comparator**<br>**Attack rate % (interquartile range)** |
| Burns 2021 | Modelling study | School children | Schools in the United States | Isolation policy (1 and 2 days) vs no isolation policy for influenza | Median attack rate simulation | 1 day isolation policy: 17.2 (range 9.9-21.4%)<br>2-day isolation policy: 7.4 (range 3.7–11.1%) | No isolation policy 24.5 (range 16.6-28.1%) |
| | | | | | Peak prevalence simulation | 2-day isolation policy:<br>5-day peak prevalence (range: 2-8) | No isolation policy:<br>30-day peak prevalence (range 13-25) |
| | | | | | Outbreak duration simulation | 2-day isolation policy:<br>67 days (range 28-77) | No isolation policy:<br>82 days (range 78-84) |
| | | | | Isolation policy (1, 2 and 14 days) vs no isolation policy for | Median attack rate simulation | 1 day of isolation: 9.4 (range 8.3–10.6)<br>2 days of isolation: 9.2 (range 8.0 – 10.6)<br>14 days of isolation: 8.5(range 7.4 – 9.7) | No days of isolation 10.0 (range 8.3–11.3) |
| | | | | | Outbreak duration | 1 day of isolation: 137 days (range 133 – 139) | No days of isolation: 138 days (range 135-140) |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Intervention**<br>**Attack rate % (interquartile range)** | **Comparator**<br>**Attack rate % (interquartile range)** |
| | | | | COVID-19 | simulation | 2 days of isolation: 136 days (range 132 – 139)<br>14 days of isolation: 132 days (range 128 – 134) | |
| | | | | Shortened school week vs 5–day school week for influenza | Attack rate<br>simulation | 4–days school week: 6.8 (range 3.3-8.8%) | 73% reduction from baseline |
| | | | | | | 3–day school week: 1.8 (range 0.9-2.3%) | 93% reduction from baseline |
| | | | | Shortened school week vs 5–day school week for COVID-19 | Median attack rate<br>simulation | 4–day school week: 4.4% (range 3.7 – 4.9%) | 57% reduction from baseline (range 52-64%) |
| | | | | | | 3–day school week: 2.0% (range 1.7 – 2.2%) | 46% reduction from baseline (range 33-52%) |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Intervention**<br>**Reduction range (%)** | **Comparator**<br>**Mean** | **Risk estimate (95% CI)** | **Statistical significance**<br>***p*-value** |
| Fumanelli 2016 | Prospective cohort modelling study<br><br>50 stochastic realisations | School children and staff | Schools, households, and community | National school closure vs no intervention | Infection attack rate | 5–10 % | 19.5% | 95% CI: 19.4–19.5 | *No significant difference* |
| | | | | | Peak incidence | 0–20 % | 6.8 cases per 1000 individuals | 95% CI: 5.8–7.1 | *No significant difference* |
| | | | | | Peak delay | 0–5 weeks | 13.8 weeks | 95% CI: 12.1–17.2 | *No significant difference* |
| | | | | County school closure vs no intervention | Infection attack rate | 5–20 % | 19.5% | 95% CI: 19.4–19.5 | *Favours intervention*<br>*p < 0.0001* |
| | | | | | Peak incidence | 20–70 % | 6.8 | 95% CI: 5.8–7.1 | *Favours intervention*<br>*p < 0.0001* |
| | | | | | Peak delay | –1–7 weeks | 13.8 weeks | 95% CI: 12.1–17.2 | *Favours intervention*<br>*p < 0.0001* |
| | | | | County school closure vs no | Infection attack rate | 5–30 % | 19.5% | 95% CI: 19.4–19.5 | *Favours intervention*<br>*p < 0.0001* |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Intervention Reduction range (%)** | **Comparator Mean** | **Risk estimate (95% CI)** | **Statistical significance *p*-value** |
| | | | | intervention | Peak incidence | 17–80 % | 6.8 | 95% CI: 5.8–7.1 | *Favours intervention* *p < 0.0001* |
| | | | | | Peak delay | 0–4 weeks | 13.8 weeks | 95% CI: 12.1–17.2 | *Favours intervention* *p < 0.0001* |
| | | | | County school closure vs no intervention | Infection attack rate | 8–20 % | 19.5% | 95% CI: 19.4–19.5 | *Favours intervention* *p < 0.0001* |
| | | | | | Peak incidence | 25–60% | 6.8 | 95% CI: 5.8–7.1 | *Favours intervention* *p < 0.0001* |
| | | | | | Peak delay | –1–6 weeks | 13.8 weeks | 95% CI: 12.1–17.2 | *Favours intervention* *p < 0.0001* |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Main findings/ authors conclusions** |
| Fong 2020 | SR<br><br>4 cohort studies<br>11 simulation studies | Community | School, workplace, general community | Isolating ill persons | Reduction of impact of influenza outbreak<br><br>Delay of epidemic peak<br><br>Reduction in transmissibility | <u>Reduction of impact:</u><br>8 studies suggested a decrease in attack rate brought by implementation of case isolation<br>4 studies suggest intervention is more impactful in combination with other interventions. Increase in isolation rate is quasi-linearly correlated with a decrease in attack rate of influenza.<br><u>Delay of the epidemic peak:</u><br>3 studies showed evidence isolating ill persons will delay the spread and peak of influenza epidemics<br><u>Reduction in transmissibility:</u><br>4 studies showed evidence isolating ill persons will reduce transmissibility of influenza and reduce reproduction numbers for influenza. | Isolation has moderate impact in reducing influenza transmission and impact |
| | 1 intervention study, 5 | | | Quarantine of exposed | Reduction of impact of | <u>Reduction of impact:</u><br>5 studies suggested reduction in attack rate with | Quarantine has in general a moderate |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | observational studies and 10 simulation studies | | | persons | influenza outbreak<br><br>Delay of epidemic peak<br><br>Reduction in transmissibility | implementation of household quarantine measures<br><u>Delay of epidemic peak:</u><br>4 studies found quarantine is effective at reducing peak and number of cases in a pandemic if compliance is high. One study found border quarantine causes minimal reduction in the number of cases.<br><u>Transmissibility:</u><br>3 studies found household and border quarantine reduce transmission of influenza.<br>Increased risk for household contacts:<br>2 studies reported increased risk of secondary cases of influenzas in households where people a concurrently quarantined with an isolated individual. | impact in reducing influenza transmission and impact |
| | 4 simulation studies | | | Contact tracing | Reduction of impact of influenza outbreak<br><br>Delay of epidemic peak<br><br>Reduction in transmissibility | None of the 4 studies examined contact tracing as a single intervention, this measure was studies in combination with other interventions e.g., quarantine.<br><u>Reduction of impact:</u><br>1 study suggested contact tracing (in combination with other interventions) will reduce the impact of influenza outbreak. Another study found it provides only modest benefit. And a third study found no effect.<br><u>Delay of epidemic peak:</u><br>1 study found contact tracing (in combination with other interventions) will delay epidemic peaks for up to 6 weeks.<br><u>Reduction in transmissibility:</u><br>1 study showed evidence for contact tracing and quarantine was more effective than symptom monitoring and quarantine to reduce influenzas transmissibility. | Combination of contract tracing with other measures (e.g., isolation and quarantine) can reduce influenza, transmission and impact; the addition of contact tracing to existing measures might provide only modest benefit but will need substantial resources |
| | 22 studies (since Jackson 2013) | | | School closure (planned holiday, reactive | | 16 studies demonstrated that reactive school closure could be a useful control measure during influenza epidemics or pandemics, with impacts that included reducing the incidence and reducing the peak size<br>7 studies reported a reduction in number of confirmed or | The transmission of influenza decreases during routine school holidays but might increase after schools |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | 13 pre-emptive school closure<br>16 reactive school closures<br>28 planned holidays | | | closures or pre-emptive closure) | | influenza like illness cases<br>2 studies reported a reduction in total infected cases/peak of epidemic curve<br>2 studies reported no significant difference b/w the attack rate in closed and not closed schools<br>2 studies showed absenteeism was lower after school reopening compared with before school closure<br>3 studies found school closure reduced transmission rate of influenza. 1 study found a reactive closure after 27% of students had symptoms was not effective.<br>13 studies found pre-emptive school closure could delay epidemic peak and reduce transmission<br>8 showed that planned holidays could reduce influenza transmission<br>17 observation studies also reported a reduction in incidence of influenza associated with planned school holidays | reopen. The effectiveness of reactive school closure varies. Pre-emptive school closures have moderate impact in reducing influenza transmission |
| | Update to Ahmed 2018 SR<br><br>Workplace measures: 18 intervention, observational or simulation studies<br><br>Workplace closures: 10 simulation studies | | | Workplace measures and workplace closures | | 6 studies showed working from home/ smaller work units/ staying home while sick (paid sick leave) reduces influenza transmission<br>12 simulation studies on workplace measures revied by Ahmed et al 2018 suggested that workplace measure alone reduced the cumulative attack rate by 23%, as well as delaying and reducing the peak influenza attack rate.<br><br><u>Workplace closures:</u><br>10 simulations studies suggested the reduction in attack rate, duration of infection or maximum case number. | Workplace measures are effective; combination with other interventions will further strengthen the effect<br>Workplace closures might have a modest impact in reducing influenza transmission |
| | 3 observational | | | Avoiding crowding | | Avoiding crowding refers to the measures to reduce influenza transmission in crowded areas (e.g., large meetings, | Timely and sustained application of |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Main findings/ authors conclusions** |
| | studies | | | | | conferences, and religious pilgrimages, national and international events).<br>Studies suggested early intervention of measures to avoid crowding will reduce the impact of the epidemic. | measures to avoid crowding might reduce influenza transmission |
| Jackson 2013 | SR of epidemiological studies | School children and general population | School settings | School closures | **Outcome** | **Narrative summary** | |
| | | | | | Age specific effects of school closure | The available age–specific data suggested that any benefits associated with school closure were greatest among school–aged children | |
| | | | | | Reversibility of the effect | Incidence sometimes rebounded when schools reopened, suggesting that school closure contributed to reducing incidence in some settings. | |
| | | | | | Changes in transmission patterns from modelling analyses of epidemic data | School holidays/closure reduced transmission of seasonal influenza amongst children (unless school closure occurs after peak of outbreak) | |
| | | | | | Different school closure strategies | The effects of these different strategies could not be compared, due to both late implementation and differences between the studies in other factors (such as the duration of closure). | |
| | | | | | Use of multiple interventions | In most of the pandemic influenza studies, other interventions were implemented alongside school closure and may have contributed to any reduction in incidence | |
| Jackson 2014 | SR/MA of modelling studies | No limitations | Community, schools, workplaces, pre–schools, playgroups, household, day care | *School closure vs. No school closure* | **Outcome** | **Narrative summary** | Study ID |
| | | | | | Predicted percentage reduction in the peak incidence of infection (28 studies) | Reduced by ~45% (permanent closure) or ~12% (13-day closure) | Yasuda 2005 |
| | | | | | | Decreased by 25–33%, depending on $R_0$. Duration of closure has little effect. | Ferguson 2006 |
| | | | | | | Decreased by ~30% if schools are closed for 14 days when prevalence reaches 10% | Haber 2007 |
| | | | | | | Decreased by 39–45% (47–52% in children). Reductions were smaller than this if schools closed at a higher threshold, e.g., 21% | Cauchemez 2008 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | | | | | | if threshold was 100 / 100,000 / day | |
| | | | | | | Decreased by ~23% if schools closed after 1–3 weeks, or by ~38% if schools closed after 4 weeks | Yasuda 2008 |
| | | | | | | First wave peak AR decreased by ~98%; second wave peak AR 50–100% smaller than the unmitigated single peak, depending on vaccine properties. | Mniszewsk 2008 |
| | | | | | | Reduced by 32–78%, depending on $R_0$ (greater reduction for lower $R_0$) | Milne 2008 |
| | | | | | | If $R_0$=1.5, decreased by ~80% if delay is up to 4 weeks. If $R_0$=2.5, decreased by ~33% for delays of 3 weeks or less | Kelso 2009 |
| | | | | | | Effects ranged from a decrease of 26% to an increase of 3%, depending on timing and duration of closure | Yasuda & Suzuki 2009 |
| | | | | | | Ranged from a reduction of 63.2% (if $R_0$ was 1.4) to an increase of 9.2% (if $R_0$ was 2.4) | Lee 2009 |
| | | | | | | Peak prevalence reduced by ~67% if schools closed permanently; if schools reopened after 60 days, epidemic was bimodal, with the first and second peaks in prevalence ~33% and 50% | Chao 2010 |
| | | | | | | Peak prevalence reduced by ~5% by county–wide closures or ~26% by local closures | Chao 2011 |
| | | | | | | Reduced by ~13% (school case isolation), ~23% (individual school closure) or ~7% (all school closure) if closed for 1 week; individual school closure resulted in greater reductions with longer periods of closure (e.g. ~63% with 4-week closure) | Halder 2010 |
| | | | | | | For each antiviral strategy, adding school closure reduced the peak incidence by up to 50% compared to using antivirals alone (assuming no delay in diagnosis; effects decreased as delay increased | Kelso 2010 |
| | | | | | | Maximum reduction of 73% ($R_0$ = 1.5) or 38% ($R_0$ = 2.5), depending on timing and duration of closure | Halder 2010 |
| | | | | | | Peak prevalence in children reduced by ~78% compared to the | Barrett 2011 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | | | | | | scenario with preventive behaviours only. No clear effect for adults or elderly. | |
| | | | | | | Reduced by 28.9% | Yang 2011 |
| | | | | | | Reduced by ~0–27% depending on threshold and duration of closure. Increasing duration of closure has little effect if it is 4 weeks or longer | Zhang 2011 |
| | | | | | | Reduced by 48% | Morimoto & Ishikawa 2010 |
| | | | | | | Decreased by up to 28% by school closure alone | Zhang 2012 |
| | | | | | | Decreased by ~90% if only schools closed, or by ~97% if schools and workplaces closed | Carrat 2006 |
| | | | | | | Reduction of 94% if children and teenagers were kept at home and compliance was 90% | Glass 2006 |
| | | | | | | Peak prevalence reduced by 38% if control measures relaxed or 67% if control measures not relaxed | Cruz–Pacheco 2009 |
| | | | | | | Decreased by ~0–60%, depending on $R_0$, baseline mixing patterns, reduction in contacts and closure threshold | Vynnycky & Edmunds 2008 |
| | | | | | | Reduced by 30–70%; size of reduction increased with increasing duration of closure and increasing $R_0$ | House 2011 |
| | | | | | | Peak prevalence reduced by ~80% (low transmission scenario) or ~88% (high transmission scenario) | Araz 2012 |
| | | | | | | First wave: reduced by ~38%. Second wave: reduced by ~95% | Ghosh & Hefferman 2010 |
| | | | | | | First wave, school aged children: reduced by ~70% in Alberta and Calgary, very little effect in Edmonton | Earn 2012 |
| | | | | | | Decreased by ~10–70% depending on age–specific attack rates and $R_0$ | Glass & Barnes 2007 |
| Jackson 2014 | SR/MA of modelling | No limitations | Community, schools, | *School closure vs. No* | Predicted percentage | Reduced by 90% if schools never opened, or by 20% with one week closure | Elyeback 1976 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Main findings/ authors conclusions** |
| (cont'd) | studies | | workplaces, pre–schools, playgroups, household, day care | *school closure* | reduction in the cumulative attack rate (28 studies) | >90% chance of eliminating epidemic if $R_0 \leq 1.7$ | Ferguson 2005 |
| | | | | | | Reduced by 12% (10% in adults, 17% in children, permanent closure) or essentially unchanged (13-day closure) | Yasuda 2005 |
| | | | | | | If $R_0$=2.0, decreased by 6–9%. If $R_0$=1.7, decreased by 11–15% Longer closures were associated with slightly increased reductions. | Ferguson 2006 |
| | | | | | | Predicted reduction ranged from 14% (if $R_0$ = 2.4) to 97% (if $R_0$ = 1.6) | Germann 2006 |
| | | | | | | Decreased by ~1–18%, depending on threshold and duration of closure: greater effect at lower thresholds; effect of duration of closure less clear | Haber 2007 |
| | | | | | | Decreased by 13–17% (18–23% in children); greater reduction if schools closed at lower threshold. Reductions were smaller than this if schools closed at a higher threshold, e.g., 10% if threshold was 100 / 100,000 / day | Cauchemez 2008 |
| | | | | | | Changed by <10% for all closure thresholds | Yasuda 2008 |
| | | | | | | Total AR (first and second waves) reduced by 28–96%, depending on vaccine properties | Mniszewsk 2008 |
| | | | | | | Decreased by 8–61%, depending on $R_0$ (greater reduction for lower $R_0$) | Milne 2008 |
| | | | | | | If $R_0$=1.5, reduced by ~60% if delay is up to 3 weeks. For $R_0$ = 1.5 and pre-emptive closure, reductions in cumulative AR were ~57% (0–5 years), 64% (6–12 years) 66% (13–17 years) | Kelso 2009 |
| | | | | | | Decreased by 22% (from 50% to 39%) | Sander 2009 |
| | | | | | | Reduced by 89% | Sypsa & Hatzakis 2009 |
| | | | | | | Ranged from an increase of 0.7% to a decrease of 17%, depending on timing and duration of closure | Yasuda & Suzuki 2009 |
| | | | | | | Ranged from a reduction of 44.7% (if $R_0$ was 1.4) to an increase of 1.7% (if $R_0$ was 1.7) | Lee 2009 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | | | | | | Both strategies “did not elicit any substantive decrease” (this is not quantified further). | Chao 2011 |
| | | | | | | Reduced by ~8% (school case isolation or individual school closure) or ~2% (all school closure) if closed for 1 week; individual school closure resulted in greater reductions with longer periods of closure (e.g. ~23% with 4-week closure) | Halder 2010 |
| | | | | | | For each antiviral strategy, adding school closure reduced the cumulative AR by ~20–30% compared to using antivirals alone (assuming no delay in diagnosis; effects decreased as delay increased) | Kelso 2010 |
| | | | | | | Maximum reduction of 42% ($R_0$ = 1.5), 18% ($R_0$ = 2.0), 8% ($R_0$ = 2.5) depending on timing and duration of closure.<br>Optimal threshold depended non-linearly on duration of closure. | Halder 2010 |
| | | | | | | Reduced by 40% compared to the scenario with preventive behaviours only | Barrett 2011 |
| | | | | | | Reduced by 30% overall. Effect largest in adults (40% reduction) and smallest in schoolchildren (22% reduction) | Andradittir 2011 |
| | | | | | | Reduced by 4.2% | Yang 2011 |
| | | | | | | Reduced by <10% for all combinations of closure threshold and duration | Zhang 2011 |
| | | | | | | Reduced by 14% | Morimoto & Ishikawa 2011 |
| | | | | | | Reduced by 35–75% if Rn = 1.2, ~28–64% if Rn = 1.5, or ~18–42% if Rn = 1.8. Larger reductions with longer duration of closure | Halder 2011 |
| | | | | | | Decreased by up to 9% by school closure alone | Zhang 2012 |
| | | | | | | Decreased by 79% if only schools closed, or by 98% if schools and workplaces closed | Carrat 2006 |
| | | | | | | Reduction of 93% if children and teenagers were kept at home and compliance was 90% | Glass 2006 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | | | | | | Reduced by 66% (if $R_0$ = 1.6) or 12% ($R_0$= 2.1) | Perlroth 2010 |
| | | | | | | If $R_0$ = 1.1, cumulative AR is close to zero (and R<1) if transmission in schools is reduced by 37% | Roberts 2007 |
| | | | | | | Decreased by <1% if intervention implemented 2 or 4 weeks after start of pandemic, or by 2.6% if after 8 weeks | Rizzo 2008 |
| | | | | | | Decreased by <1% to ~24%, depending on $R_0$, baseline mixing patterns, reduction in contacts and closure threshold | Vynnycky & Edmunds 2008 |
| | | | | | | For low transmission scenario, reduction in cumulative AR was 5–94% in children aged 5–18 years. For high transmission scenario, reduction in cumulative AR was –3 to 86% for children aged 5 to 18 years | Araz 2012 |
| | | | | | | First wave: reduced by ~45%. Second wave: reduced by ~77% | Ghosh & Hefferman 2010 |
| | | | | | | Calgary: reduced by ~28%; Edmonton: reduced by ~35%; Alberta: reduced by ~52% | Earn 2012 |
| | | | | | | Maximum reduction of ~11% (if schools closed for 4 weeks starting from week 5 and attack rate in children was 3 times that in adults) | Bolton 2012 |
| | | | | | | If schools are closed when prevalence in schoolchildren is 2%, decreased ~4–64% depending on age–specific attack rates and $R_0$ | Glass & Barnes 2007 |
| Jackson 2014 (cont'd) | SR/MA of modelling studies | No limitations | Community, schools, workplaces, pre–schools, playgroups, household, day care | *School closure vs. No school closure* | Predicted effect on time to the peak of the epidemic (28 studies) | Increased by ~25% from 20 to 25 days (permanent closure) or ~35% from 20 to 27 days (13-day closure) | Yasuda 2005 |
| | | | | | | Delayed by 9–16 days, depending on $R_0$ and the proportion of workplaces closing | Ferguson 2006 |
| | | | | | | Peak occurs 1 week earlier if schools are closed for 14 days when prevalence reaches 10%, compared to the no intervention scenario; no results presented for longer durations of closure. | Haber 2007 |
| | | | | | | Increased by 5–8 days (2.5–8.8%) depending on transmissibility (greater delay for higher $R_0$) | Ciofi degli Atti 2008 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Main findings/ authors conclusions** |
| | | | | | | If schools were closed 1–2 weeks after the start of the epidemic, peak delayed by 2–3 weeks; otherwise the epidemic curve became bimodal, with the larger peak occurring 3 weeks after (if schools closed after 3 weeks) or 1 week before (if closed after 4 weeks) the peak for the unmitigated epidemic | Yasuda 2008 |
| | | | | | | Reduced by ~1 week (for peak of first wave) | Mniszewski 2008 |
| | | | | | | If $R_0$=1.5, delayed by ~17 days for delays up to 4 weeks. If $R_0$=2.5, peak is delayed 5–12 days if closure is pre-emptive or within 2 weeks, otherwise little effect. | Kelso 2009 |
| | | | | | | Delayed by 1–2 weeks, depending on timing and duration of closure (compared to scenario with self–isolation alone) | Yasuda & Suzuki 2009 |
| | | | | | | Could be delayed by up to 28 days if $R_0$ = 1.4 and whole school system is closed for 8 weeks at a threshold prevalence of 1% or less | Lee 2009 |
| | | | | | | Peak prevalence delayed by ~24 days; the second peak occurs ~10 days later (when schools are closed for 60 days) | Chao 2010 |
| | | | | | | County–wide closures delayed the peak by ~1 week; local closures by ~4–5 weeks | Chao 2011 |
| | | | | | | No apparent effect of school case isolation; individual or all school closure delayed peak by ~10 days | Halder 2010 |
| | | | | | | Delayed by ~40 days for each antiviral strategy | Kelso 2010 |
| | | | | | | Maximum delay ~45 days (if $R_0$ = 1.5, schools closed for 8 weeks, and closure was optimally timed). Smaller delays were possible with higher values of $R_0$ | Halder 2010 |
| | | | | | | Epidemic becomes bimodal. For children, peaks with school closure occur ~14 days before and ~3 days after the peak in the scenario with preventive behaviours only | Barrett 2011 |
| Jackson 2014 (cont'd) | SR/MA of modelling studies | No limitations | Community, schools, workplaces, | *School closure vs. No school closure* | | Delayed by 8 days | Yang 2011 |
| | | | | | | Delayed by up to 5 days | Zhang 2011 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | **Main findings/ authors conclusions** |
| | | | pre–schools, playgroups, household, day care | | | Delayed by 45 days | Morimoto & Ishikawa 2010 |
| | | | | | | Peak delayed by 5 days by school closure alone | Zhang 2012 |
| | | | | | | No appreciable effect if only schools closed; peak is ~25 days earlier if schools and workplaces are closed | Carrat 2006 |
| | | | | | | Reduction of 19 days if children and teenagers were kept at home and compliance was 90% | Glass 2006 |
| | | | | | | Delayed by ~1 week | Cruz–Pacheco 2009 |
| | | | | | | Delayed by 1–2 weeks if $R_0$ = 1.8 or 2.5 | Vynnycky & Edmunds 2008 |
| | | | | | | Peak brought forward by ~60 days (low transmission scenario) or ~35 days (high transmission scenario) | Araz 2012 |
| | | | | | | First wave: no effect. Second wave: delayed by ~50–60 days | Ghosh & Hefferman 2010 |
| | | | | | | Delayed by ~1 month | Earn 2012 |
| | | | | | | Delayed by up to two weeks | Bolton 2012 |
| | | | | | | Delayed by 1–15 weeks, depending on age–specific attack rates and $R_0$ | Glass & Barnes 2007 |
| | | | | | Predicted effect on duration of the epidemic (28 studies) | Increased by ~40% from 50 to 70 days (permanent closure) or ~20% from 50 to 60 days (13-day closure) | Yasuda 2005 |
| | | | | | | Slight increase (~1 week) if schools are closed for 14 days when prevalence reaches 10% | Haber 2007 |
| | | | | | | Increased by ~4% weeks for all closure thresholds | Yasuda 2008 |
| | | | | | | First wave duration increased by ~40 days; second wave may begin ~6 months after the end of the first and last for ~90 days | Mniszewski 2008 |
| Jackson 2014 (cont'd) | SR/MA of modelling studies | No limitations | Community, schools, workplaces, | *School closure vs. No school closure* | | If $R_0$=1.5, increased by up to ~30 days; if $R_0$=2.5, increased by up to ~10 days | Kelso 2009 |
| | | | | | | Shortened by 11 days | Sypsa & Hatzakis 2009 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Narrative summary | Main findings/ authors conclusions |
| | | | pre–schools, playgroups, household, day care | | | Difficult to assess precisely from graphs presented, but suggests an increase is likely (~10–20 days) | Lee 2009 |
| | | | | | | County–wide closures had little effect on duration; local closures increased the duration of the epidemic, but it is not clear by how much. | Chao 2011 |
| | | | | | | Possible slight increase of ~10 days for all strategies. | Halder 2010 |
| | | | | | | Increased by up to 40 days, depending on antiviral strategy | Kelso 2010 |
| | | | | | | Markedly increased, particularly for low values of $R_0$ | Halder 2010 |
| | | | | | | Shortened by ~20 days in children | Barrett 2011 |
| | | | | | | Increased by 2 weeks | Yang 2011 |
| | | | | | | Increased by ~70 days | Morimoto & Ishikawa 2010 |
| | | | | | | Increased by ~30% if only schools are closed, or reduced by ~60% if schools and workplaces are closed | Carrat 2006 |
| | | | | | | Reduction of 20 days if children and teenagers were kept at home and compliance was 90 | Glass 2006 |
| | | | | | | Increased by 2–3 weeks if contact rate recovers instantaneously when controls are lifted | Cruz–Pacheco 2009 |
| | | | | | | Little or no effect for high $R_0$ or if reduction in contact is ≤50%. If $R_0$~1.8, increased by up to 70% and 40% if schools are closed early or late, respectively | Vynnycky & Edmunds 2008 |
| | | | | | | Reduced by ≥75 days (low transmission scenario) or increased by ≥25 days (high transmission scenario) | Araz 2012 |
| Jackson 2014 (cont'd) | SR/MA of modelling studies | No limitations | Community, schools, workplaces, pre–schools, playgroups, household, | *School closure vs. No school closure* | | First wave: no effect. Second wave: effect unclear | Ghosh & Hefferman 2010 |
| | | | | | | Duration of first wave increased by up to ~1 month | Earn 2012 |
| | | | | | | Increased by 20–75% (1–3 weeks) depending on age–specific attack rates and $R_0$ | Glass & Barnes 2007 |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | | **Main findings/ authors conclusions** |
| | | | day care | | | | | |
| Murillo–Zamora 2020 | Retrospective cohort | Subjects from all ages registered with ILI or severe acute respiratory infection (SARI) | Community in Mexico | Physical distancing interventions including school closures vs historical cohort | Average percentage of change in overall daily influenza for children aged 5-14<br><br>School closures implemented on March 16th | **Comparator** | **Intervention** | **Statistical significance** |
| | | | | | | Jan 21 – Mar 15:<br>1.8 (1.5, 2.1)<br><br>Mar 16 – Mar 30:<br>-1.3 (-1.8, -0.9) | Oct 1 – Jan 20:<br>-11.7 (-15.7, -7.6) | *NR* |
| Rashid 2015 | SR of modelling and observational studies | No restriction | Schools, households and community | | **Intervention** | **Narrative Summary** | | |
| | | | | | Proactive school closure | Reduction in influenza transmission from 1% to 50%.<br>Delays the peak of the epidemic by a week or two | | |
| | | | | | Reactive school closure | Reactive school closures may reduce the transmission of influenza by about 7–15%, rarely up to 90–100% | | |
| | | | | | Workplace closure | Modelling study suggests that 10% workplace closure has only modest impact while 33% workplace closure lessens the attack rate to less than 5% and delays the peak by 1 week. | | |
| | | | | | Home working | It is moderately effective in reducing transmission of influenza by about 20% to 30%. | | |
| | | | | | Self-isolation of cases | There are limited data, overall effectiveness of the measure is moderate; may delay the peak of influenza when combined with other measures. | | |
| | | | | | Quarantine of contacts | Modelling studies show that quarantine decreases peak case load, attack rate, and delays the peak. | | |
| | | | | | Mobility restrictions | Modelling studies suggest that a high travel restriction (50%) delays the peak of influenza. A minimal travel restriction is not helpful. | | |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Comparison | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Narrative summary** | | **Main findings/ authors conclusions** |
| | | | | | Cancellation of mass events | Effectiveness is not proven but may be of theoretical benefit if cancelled around the peak of the epidemic. | | |
| Speilburger 2021 | SR<br>18 studies | Any child or adult, with COVID-19 infection proven by serology or by RT-PCR | Household and community, schools, kindergarten | Transmission of COVID-19 by children vs adults | Pooled secondary attack rate | Children:<br>3.40% (95%CI 5.7-21.1) | Adults<br>*12.32% (95% CI 8.29-16.4)* | *NR* |
| | | | | | | Based on limited data and high heterogeneity, the analysis did not reveal evidence for significant differences regarding the contagiousness of children and adults with SARS-CoV2 infections | | |
| | 11 studies | | | | Seroprevalence | There is preliminary evidence from the seroprevalence studies and population-based PCR studies that children have a lower susceptibility to SARS-CoV-2 than adults. As all the studies were conducted when contact restrictions for children such as school closures were active, the lower seroprevalence is likely influenced by a reduction in exposure | | NR |

| Study ID | Study type (no. of trials) | Population | Setting (Location) | Intervention | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome (No. studies)** | **Narrative summary** | **Risk Estimate (95% CI)** | ***Statistical significance***<br>***Heterogeneity*** |
| Talic 2021 | SR/MA of empirical studies | Population at risk and affected by COVID-19 | Community | Physical distancing | COVID-19 incidence<br>(5 studies) | 25% reduction in incidence of covid-19 | RR: 0.75 (95% CI 0.59, 0.95) | $I^2$=87%<br>Heterogeneity among studies was substantial, and risk of bias ranged from moderate to serious or critical |
| | | | | | Transmission of SARS-CoV-2<br>(23 studies) | 12% decrease in SARS-CoV-2 transmission and 62% reduction in overall physical contacts | RR: 0.88, (95% CI 0.86, 0.89) | Both studies were rated at moderate risk of bias |
| | | | | | COVID-19 mortality<br>(1 study) | Reduction in covid-19 related mortality | β −0.07 (95% CI −0.05, −0.10) | $p < 0.001$<br><br>Study rated at serious or critical risk of bias |

| Study ID | Study type (no. of trials) | Population | Setting (Location) | Intervention | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome (No. studies)** | **Narrative summary** | **Risk Estimate (95% CI)** | ***Statistical significance Heterogeneity*** |
| | | | | *Stay at home or isolation* | COVID-19 incidence (4 studies) | All the studies that assessed stay at home or isolation measures reported reductions in transmission of SARS-CoV-2.<br>74% reduction in the average daily number of contacts observed for each participant and estimated a decrease in reproductive number: the reproductive number pre-intervention was 3.6 and post-intervention was 0.60 | 95% CI 0.37, 0.89 | |
| | | | | Quarantine | Transmission of SARS-CoV-2 (2 studies)<br>Al-Tawfiq 2020<br><br>Vanman 2021 | 4.9% decrease in the incidence of covid-19 at eight weeks after the implementation of quarantine<br><br>14 times higher risk of SARS-CoV-2 transmission associated with no quarantine compared with strict quarantine | <br><br><br><br>OR: 14.44 (95% CI 2.42 to 86.17) | Both studies rated low to moderate risk of bias |
| | | | | School closures | COVID-19 incidence (2 studies)<br>Iwata 2020<br>Auger 2020 | <br><br>One study reported 62% decrease<br>One study reported no effect of school closures on incidence of COVID-19 | <br><br>95% CI −49, −71<br><br>α coefficient 0.08, 95% CI −0.36 to 0.65 | Both studies were rated at moderate risk of bias |
| | | | | | COVID-19 mortality (1 study) | 58% decrease | 95% CI −46, −68 | Moderate risk of bias |
| | | | | | Transmission of SARS-CoV-2<br>Liu 2020<br>Guo 2021 | Reduction of 13%<br><br>Reduction of 10% | RR: 0.87 (95% CI 0.86 to 0.89)<br><br>RR: 0.9 (95% CI 0.86 to 0.93) | All studies were rated at moderate risk of bias |

| Study ID | Study type (no. of trials) | Population | Setting (Location) | Intervention | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome (No. studies)** | **Narrative summary** | **Risk Estimate (95% CI)** | ***Statistical significance Heterogeneity*** |
| Uchida 2012 | Prospective cohort | School children | 57 classes across two elementary schools and two junior high schools | School closure vs class closure | Cumulative rate of infection | 876/2141 (40.9%) | | |
| | | | | | Median duration of absence from school | 5 days (range 2 to 16) | | |
| | | | | | Duration of closure | 40 class closures a total of 53 times median duration of 4 days (range 1 to 10 days) | | |
| | | | | | Number of patients | Elementary Schools: School closures in district A and the class closures in district B had similar effects on subsequent peaks throughout the study period. | | *No significant difference* |
| | | | | | | Junior Schools: Infection peak in November followed by another large peak in December 2009 | | *Favours intervention*<br>Few subsequent infection peaks following school closure |
| Viner 2020 | SR<br>9 published studies | No restriction | Schools or nurseries | School closures | Effectiveness of school social distancing measures | Study found a remarkable dearth of policy–relevant data on the implementation of school social distancing during coronavirus outbreaks. | | |
| | 7 non–peer reviewed studies | | | | | Data from the SARS outbreak in mainland China, Hong Kong, and Singapore suggest that school transmission played no substantial role in the outbreak, and that school closures and other activities such as school temperature monitoring did not contribute to control of infection transmission. | | |
| | Modelling studies | | | | | One study concluded that the package of social distancing measures was effectiveness in reducing the final size and peak incidence of the outbreak while also | | |

| Study ID | Study type (no. of trials) | Population | Setting (Location) | Intervention | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome (No. studies)** | **Narrative summary** | **Risk Estimate (95% CI)** | ***Statistical significance Heterogeneity*** |
| | | | | | | delaying the peak. Another modelling study (not peer reviewed) concluded school closure is insufficient to mitigate the COVID–19 pandemic in isolation | | |

Abbreviations: CDC: Centre for Disease Control and Prevention; CI, confidence interval; COVID-19. Coronavirus Disease 2019; ILI, influenza-like illness; MA, meta-analysis; PHU, public health unit; R2001: Richardson 2001; RB: Red Book; RCT, randomised controlled trial; RG: Quick reference guide; RR, relative risk; SARS; severe acute respiratory syndrome; SD, standard deviation; SR, systematic review; WHO: World Health Organisation; VOC, variants of concern

### Adverse events (including safety) related to the intervention

There were no studies found for adverse events thus the effect of exclusion measures compared with control in children or adults with influenza-like illness is unknown.

### Absenteeism

There were no studies found for absenteeism thus the effect of exclusion measures compared with control in children or adults with influenza-like illness is unknown.

### Length of illness

There were no studies found for length of illness thus the effect of exclusion measures compared with control in children or adults with influenza-like illness is unknown.

### Behaviour or practice change

A summary of the evidence relating to transmission in influenza-like illness is presented in Table 8.

**Table 8 Results for exclusion period vs no exclusion period: Behaviour or practice change**

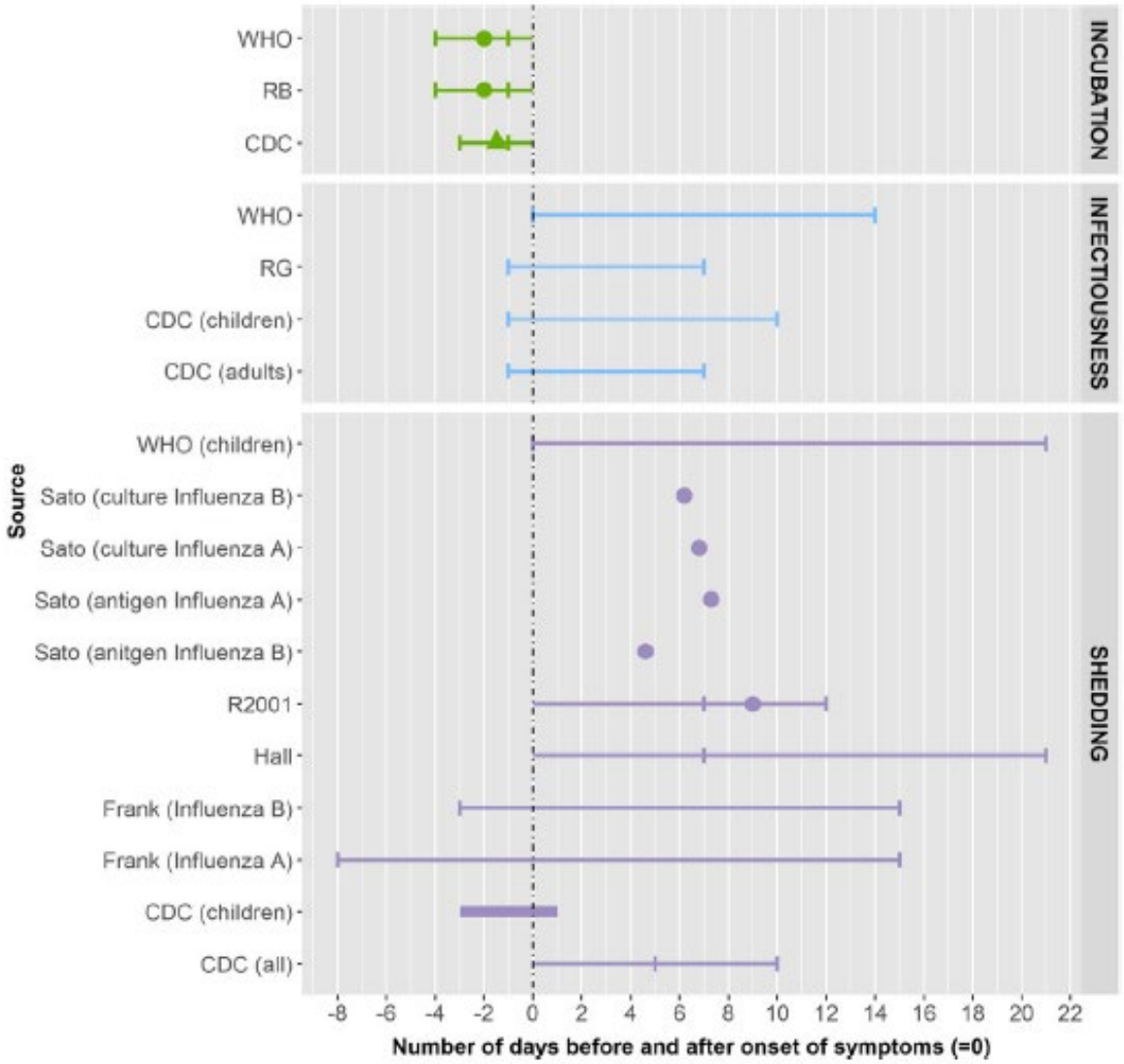
| Study ID | Study design [a] (Sample size) | Patient population | Setting (Location) | Comparison | Outcome | Results | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Intervention Mean | No intervention Mean | Risk estimate (95% CI) | *Statistical significance* *p*-value |
| Stebbins 2010 | RCT (cluster)<br><br>N = 151 | School–aged children, their parents, and the school staff | 10 K–5 elementary schools (USA) | Hygiene–based non–pharmaceutical interventions vs no intervention | Parents keep sick children home from school | 3.26 | 3.23 | NR | *p* = 0.8282 |
| | | | | | Ill student reports to class | 3.29 | 2.78 | NR | *p* = 0.0007 |
| | | | | | Send an ill student to nurse | 3.53 | 3.10 | NR | *p* = 0.0018 |

Abbreviations: CI, confidence interval; RCT, randomised controlled trial

#### 4.3.3.2 Figures

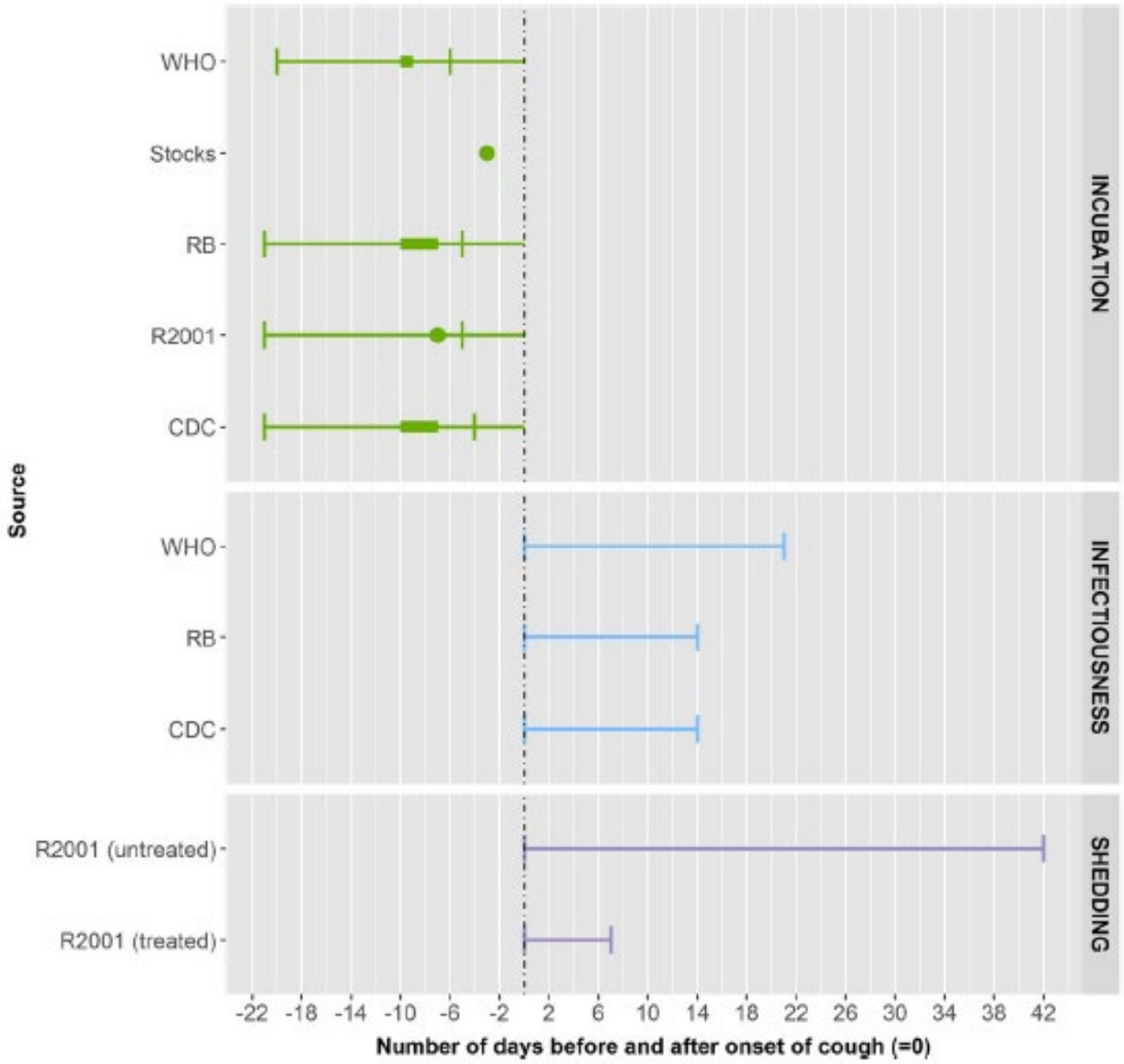
Outcome results related to protective measures for influenza-like illness is presented in Figure 6, Figure 7, and Figure 8.

**Figure 6 Summary measures for the incubation period, infectiousness and shedding period for influenza by source**



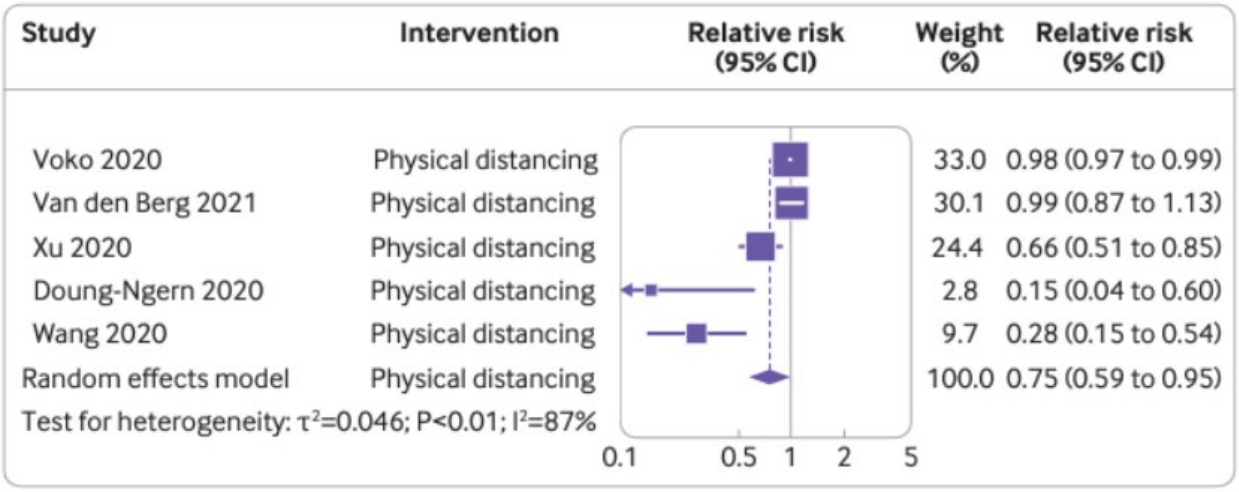

Source: Czumbel 2018; page 11 (Figure 9) [See Appendix E1.1]

**Figure 7 Summary measures for the incubation period, infectiousness and shedding period for pertussis by source**




Source: Czumbel 2018; page 9 (Figure 7) [See Appendix E1.1]

**Figure 8 Meta-analysis of evidence on association between physical distancing and incidence of covid-19 using unadjusted random effect model**




Source: Talic 2021, page 7 (Figure 6) [See Appendix E1.3]

## 4.5 Rash symptomatic diseases

### 4.5.1 Description of studies

Six citations (9, 10, 29-32) corresponding to three studies (Chan 2017, Czumbel 2018, Getz 2016) and two National Guidelines (CDNA SoNGs 2017b, CDNA SoNGs 2019) were identified in the literature. No additional studies were identified through other sources. There were 6 studies awaiting classification and one ongoing study. An overview of the PICO criteria of included studies is provided in Table 9.

Two included studies were systematic reviews of observational studies and clinical trials carried out in either China (Chan 2017) or a community setting across 28 countries (Czumbel 2018). One study included children aged 0-6 years in childcare facilities (Chan 2017) and the remaining systematic review focussed on children aged from 1 month to 18 years (Czumbel 2018). One study (Chan 2017) compared the impact and effectiveness of detection tools and public health preventive measures to interrupt transmission of hand, food, and mouth disease with 16 studies included in the meta-analysis. Czumbel 2018 investigated four key prognostic factors (1) the incubation period, (2), the period of infectiousness, (3) the duration of shedding and (4) the setting specific exclusion period across the most common transmittable childhood infectious diseases including measles, mumps, rubella, meningococcal infection and varicella. PubMed and Medline databases were searched for citations between 1980 and June 2015. CDC, WHO and the American Academy of Paediatricians Red Book were used to search for reference and relevant cited articles in October 2014.

The remaining study (Getz 2016) was carried out in schools where a measles outbreak has occurred. The modelling study compared the impact of stay-at-home regulations for children who are not vaccinated against measles against an inactive control on the number of measles cases. Getz 2016 used an individual–based SEIR model of measles outbreaks, under the assumption that the $R_0$ for measles is approximately 7, using two versions of the model – one with 85% vaccine coverage, and one with 95% vaccine coverage, at 400 student schools.

The National Guidelines were written on behalf of the Australian Government, Department of Health by the Communicable Diseases Network Australia (CDNA) in membership with the Australian Health Principal Protection Principal Committee (AHPPC). Each of the Guidelines are provided to assist public health units in responding to a notifiable invasive meningococcal disease (CDNA SoNGs 2017b) or measles (CDNA SoNGs 2019). They capture the knowledge of experienced professionals, build on past research efforts, and provide advice on best practice based upon the best available evidence at the time of completion.

Results for exclusions measures versus inactive control (historical cohort) for rash symptomatic disease are provided in the Summary of Findings table (see 4.5.3).

**Table 9 Characteristics and quality of included studies: Rash symptomatic disease**

| Review ID Quality | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| CDNA SoNGs 2017b (32) | National Guidelines | Community | Australia | Invasive Meningococcal Disease | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| CDNA SoNGs 2019 (31) | National Guidelines | Community | Australia | Measles | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| Chan 2017 (29) | SR | Childcare facilities | China | Hand, foot and mouth | Public health preventive measures to interrupt transmission | Outbreak characteristics<br>Methods for detection and diagnosis of EV71<br>Interventions applied<br>Recommendations for dealing with future |

| Review ID Quality | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| | | | | | | outbreaks |
| Czumbel 2018 (ECDC 2016) (9, 10) | SR | Households, children's homes, hospital, schools, nurseries, day care centres, community parks | Various | Various childhood disease (comprehensive) | NA | Incubation period<br>Period of infectiousness or duration of shedding<br>Exclusion period |
| Getz 2016 (30) | Modelling study | Schools | USA | Measles | Stay at home regulations for children who are not vaccinated | Number of cases |

Abbreviations: CDNA SoNGs, Communicable Diseases Network Australia Series of National Guidelines; NA, not applicable; SR, systematic review

### 4.5.2 Critical appraisal

One systematic review (Czumbel 2018) was assessed to be of moderate quality. Limitations arose due to the lack of a satisfactory technique for assessing the risk of bias in individual studies included in the review. Additionally, the review did not conduct a meta-analysis so appropriate methods for statistical combination of results and publication bias could not be assessed. An additional systematic review was judged to be of low overall quality (Chan 2017). Further to the lack of risk of bias assessment and meta-analysis, the study also did not include components of the PICO in the research questions and inclusion criteria for the review or justify deviations from the protocol.

One additional primary study was judged to be of overall moderate risk of bias by the JBI manual (Getz 2016) as it was uncertain if participants were free of the outcome at the start of the study and there was no information on participants lost to follow up with no reasons or strategies to address incomplete follow up reported.

Details are provided in **Appendix D3**

### 4.5.3 Summary of findings

#### 4.5.3.1 Exclusion period (vs no exclusion period)

Four citations corresponding to two studies (Czumbel 2018, Getz 2016) and one National Guidelines (CDNA SoNGs 2017) reported new evidence on four rash symptomatic diseases. A summary of the new evidence is presented in Table 10. All outcomes from both included studies presenting new evidence were assessed to be of overall very low certainty of evidence (Czumbel 2018, Getz 2016).

All studies presenting new evidence on rash symptomatic diseases were judged to have no serious concerns of bias. As outcomes for each condition corresponded to a single study, inconsistency was not assessed and did not downgrade the certainty of evidence. Similarly, there was no serious indirectness for the available evidence of each disease. The evidence is generalisable to the Australian population and both studies were conducted in a school or community setting which did not downgrade the certainty of evidence. Both studies were assessed to have serious imprecision due to the low patient numbers wide range of results across both the systematic review (Czumbel 2018) and modelling study (Getz 2016). As such, the certainty of evidence was downgraded. Both included studies did not appear to have any publication bias and did not contribution to downgrading the certainty of evidence.

**Table 10 Summary of new evidence: Rash symptomatic diseases**

| Disease | Previous Guidelines | Summary of New Evidence | Certainty of evidence | Source |
|---|---|---|---|---|
| Measles | Exclude for 4 days after the onset of the rash.<br>All immunocompromised children should be excluded until 14 days after the appearance of the rash in the last case | Unvaccinated students should be sent home during outbreak (model provides evidence for the considerable efficacy of MD: 345 fewer cases with 85% coverage) | Very low<br>⊕⊖⊖⊖ | Getz 2016 |
| Meningococcal infection | Exclude until appropriate antibiotic treatment has been completed. Contact a public health unit for specialist advice about antibiotics and/or vaccination for people who were in the same room as the case | *Period of infectiousness:* With effective antibiotic therapy meningococci usually disappear from the nasopharynx within 24 hours | Very low<br>⊕⊖⊖⊖ | CDNAs SoNGs 2017 |
| Mumps | Exclude for 9 days or until swelling goes down | *Incubation period:* Range from 16 to 18 days<br>*Period of infectiousness:* Range from 7 days before to between 11 to 14 days after parotitis onset<br>*Duration of shedding:* Range from 2 to 6 days prior up to 4 days after onset of parotitis<br>Exclude until 5 days after onset of parotid gland swelling | Very low<br>⊕⊖⊖⊖ | Czumbel 2018 (2 studies) |
| Rubella (German measles) | Exclude until the person has fully recovered or<br>for at least 4 days after the onset of the rash | *Incubation period:* Range 13 to 24 days<br>*Duration of shedding:* Range from 7 to 13 days before the onset of rash and persisting for between 6 and 14 days after onset of rash<br>Exclude until 6 days after onset of a rash | Very low<br>⊕⊖⊖⊖ | Czumbel 2018 (2 studies) |

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Transmission related outcomes (e.g. number of cases)

A summary of the evidence relating to transmission in rash symptomatic diseases is presented in Table 11.

**Table 11 Results for exclusion period vs no exclusion period: Transmission related outcomes in people with symptomatic rash diseases**

| Study ID | Study type (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| CDNA SoNGs 2017b | National Guidelines | Community | Australia | **Invasive Meningococcal Disease** | Droplets and nasopharyngeal secretions are thought to be infectious from the onset of the acute illness until completion of 24 hours treatment with effective systemic antibiotics. 9 Hence, during this period both standard and droplet precautions should be practised for suspected, probable or confirmed cases, especially while undertaking airway management during resuscitation. | Usually from 1 to 7 days (rarely up to 10 days). Individuals who become asymptomatic carriers of meningococci are very unlikely to develop IMD | Until the organisms are no longer present in discharges from the nose and throat. With effective antibiotic therapy meningococci usually disappear from the nasopharynx within 24 hours. | |
| CDNA SoNGs 2019 | National Guidelines | Community | Australia | **Measles** | Susceptible contacts in early childhood education and care services and primary schools should be excluded until 14 days after the onset of the rash in the last case occurring at the facility or 18 days after the last contact with an infectious case to whom they were exposed outside the facility. However, they may return if vaccinated within 3 days (72 hours) of | The incubation period is variable, averaging about 10 days (range from 7 to 18 days, occasionally longer) to the onset of fever and about 14 days to the onset of the rash. This period can be longer if immunoglobulin is given early in the incubation period. | Cases are thought to be infectious from 24 hours prior to onset of prodromal symptoms until 4 days after the onset of rash. Where the prodrome is undefined, the onset of the infectious period | |

| Study ID | Study type (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | | | | | first exposure to an infectious case or if they receive NHIG within 6 days (144 hours) following exposure.<br><br>Adults in normal work situations or tertiary education facilities who are susceptible contacts do not always need to be excluded from work, education or social settings, depending on an assessment of their likelihood of developing measles and the likely consequences of infecting others. | | should be considered as 4 days before the onset of the rash. | |
| Czumbel 2018 | SR<br>8 (1972 to 2013)<br><br>(CDC, Red Book advice) | Children aged 1 month to 18 years. For exclusion measures: children attending a school or other childcare setting | Schools, day care centres, households, institutions and hospitals | **Measles** | Information on exclusion was available mainly in the grey literature. It states an exclusion of 4–5 days from onset of rash. | Range of between 9 and 20 days, with a median value of around 13 days. Approx. 2 days shorter if vaccinated | 4 days before and 4 days after the onset of rash. | Ranged from between 2 days before to 6 days after the onset of rash |
| | SR<br><br>2 (1948, 1968)<br><br>(CDC, Red Book advice) | | | **Mumps** | Information on exclusion was found until 5 days of onset of parotitis. | 16–18 days | Range from between 7 days before to 11–14 days after parotitis onset. | Ranged from 2–6 days prior to the onset of symptoms and up to 4 days after the onset of parotitis |

| Study ID | Study type (no. of trials) | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Exclusion measures (case attack rate, reduction in peak)** | **Incubation period** | **Period of infectiousness** | **Duration of shedding** |
| | | | | | | | | |
| | SR<br>2 (1992, 1965)<br><br>(CDC, Red Book advice) | | | **Rubella** | Data sources suggest an exclusion period of 5–6 days after onset of rash | Ranged between 13 and 24 days | NR | 13 days before the onset of rash and persisted for up to 6 days after onset 7 days before up to 14 days after onset of rash |
| | SR<br>6 (1929 to 2006) | | | **Varicella** | Two studies reporting on exclusion were conducted in school outbreaks where children were excluded from school for 7 days after the onset of symptoms or until all lesions were crusted. The exclusion seemed not to have been effective since most transmission already occurred after exposure to prodromal cases. | Between 10 and 21 days with a mean/median of around 14–16 days depending on the contacts | Up to 5 days after the onset of symptoms | NR |
| | SR<br>0 studies<br><br>(CDC) | | | **Meningococcal Disease** | The literature revealed that the exclusion should start as soon as the disease is suspected and for at least 48 h from the start of treatment | Between 1 and 10 days, most often between 1 and 4 days. | 1–2 days after the start of treatment | 1–2 days after the start of treatment and in untreated patients the median duration of shedding was 9 months |

| Study ID | Study type (no. of trials) | Patient population | Setting (Location) | Comparison | Results | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Outcome | Number of cases (n/N) (Attack rate, %) | Facility closure duration | Isolation of HFMD cases until symptoms resolved | Other measures |
| Chan 2017 | SR/MA of case–series studies (1 study) | Children aged 0–6 years in childcare facilities | Childcare facilities (China) | Impact and effectiveness of detection tools and public health preventive measures to interrupt transmission of hand, food, and mouth disease | Environmental disinfection and isolation measures | 6/157 (3.82) | 6 days | | |
| | (2 studies) | | | | Personal hygiene, environmental disinfection, and isolation measure | 54/620 (8.88) | 2 weeks | Yes | |
| | | | | | | 16/382 (4.19) | No | Yes (14 days after symptoms relieved) | Body checks (AM) |
| | (6 studies) | | | | All measures except hand hygiene (i.e. facility closure, environmental disinfection, isolation, morning body check) | 372/16780 (2.22) | Full, partial and no closure | Yes | Body checks (AM/PM) and active case searching |
| | | | | | | 13/685 (14.31) | 10 days | Yes | Active case searching |
| | | | | | | 26/689 (3.77) | 2 Weeks | Yes | Body checks (AM/PM) and active case searching |
| | | | | | | 40/608 (8.88) | 2 Weeks | Yes (for symptomatic and asymptomatic children) | Yes (test asymptomatic cases and recommend isolation) |
| | | | | | | 19/369 (5.15) | 2 Weeks | Yes (1 week after symptoms resolved) | Body checks (AM/PM) |
| | (8 studies) | | | | All measures: facility closure, environmental disinfection, hygiene, isolation, morning body check | 91/830 (10.95%0 | 2 weeks | Yes (1 week after symptoms resolved) | Body checks (AM), good ventilation and forbid class sleeping in same room at same time |
| | | | | | | 15/167 (8.82) | 30 days | Yes (2 weeks after symptoms resolved) | Body checks (AM) |

| Study ID | Study type (no. of trials) | Patient population | Setting (Location) | Comparison | Results | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Outcome** | **Number of cases (n/N) (Attack rate, %)** | **Facility closure duration** | **Isolation of HFMD cases until symptoms resolved** | **Other measures** |
| | | | | | | 34/889 (3.82) | 15 days | Yes | Body checks (AM), good ventilation |
| | | | | | | 26/390 (6.67) | Yes (days not stated) | Yes | Body checks (AM/PM) |
| | | | | | | 16/102 (15.69) | 2 weeks | Yes | |
| | | | | | | 23/750 (3.10) | 2 weeks | Yes (for symptomatic and asymptomatic children) | Body checks (AM) |
| | | | | | | 30/213 (14.10) | 2 weeks | Yes | Body checks (AM/PM) |
| | | | | | | 31/110 (28.18) | No | Yes | Body checks (AM), stop admission and active case searching |
| Getz 2016 | Modelling study | School children (aged 5-18) | Schools where a measles outbreak has occurred (California, USA) | Stay at home regulations for children who are not vaccinated vs. inactive control | **Outcome** | **Intervention: Send home Mean ± SD** | **Comparator: No action Mean ± SD** | **Risk estimate (95% CI)** | **Statistical significance p–value** |
| | | 400 student school with 85% vaccination coverage | | | Number of cases | 2.4 ± 305 | 348 ± 403 | MD –345.60 [–415.64, –275.56] ^ | $p < 0.00001$ ^ |
| | | 400 student school with 95% vaccination coverage | | | | 1.6 ± 1.5 | 42 ± 50 | MD –40.40 [–47.33, –33.47] ^ | $p < 0.00001$ ^ |

Abbreviations: CDC: Centre for Disease Control and Prevention; CI, confidence interval; IMD, invasive meningococcal disease; R2001: Richardson 2001; RB: Red Book; RCT, randomised controlled trial; RG: Quick reference guide; RR, relative risk; SD, standard deviation; WHO: World Health Organisation

### Adverse events (including safety) related to the intervention

There were no studies found for adverse events thus the effect of exclusion measures compared with control in children or adults with rash symptomatic diseases is unknown.

### Absenteeism

There were no studies found for absenteeism thus the effect of exclusion measures compared with control in children or adults with rash symptomatic diseases is unknown.

### Length of illness

There were no studies found for length of illness thus the effect of exclusion measures compared with control in children or adults with rash symptomatic diseases is unknown

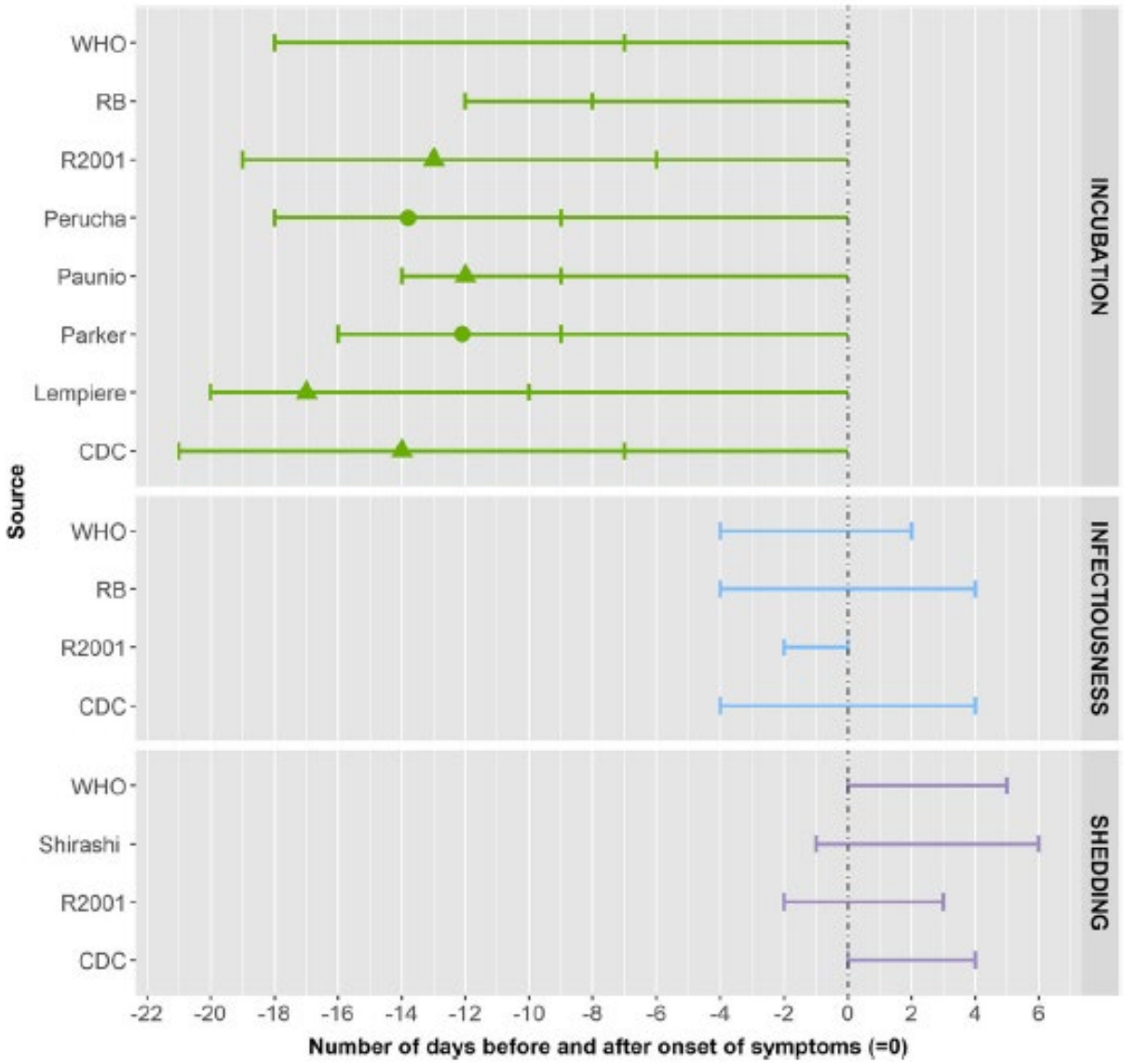
### Behaviour or practice change

There were no studies found for behaviour or practice change thus the effect of exclusion measures compared with control in children or adults with rash symptomatic diseases is unknown

### 4.5.3.2 Figures

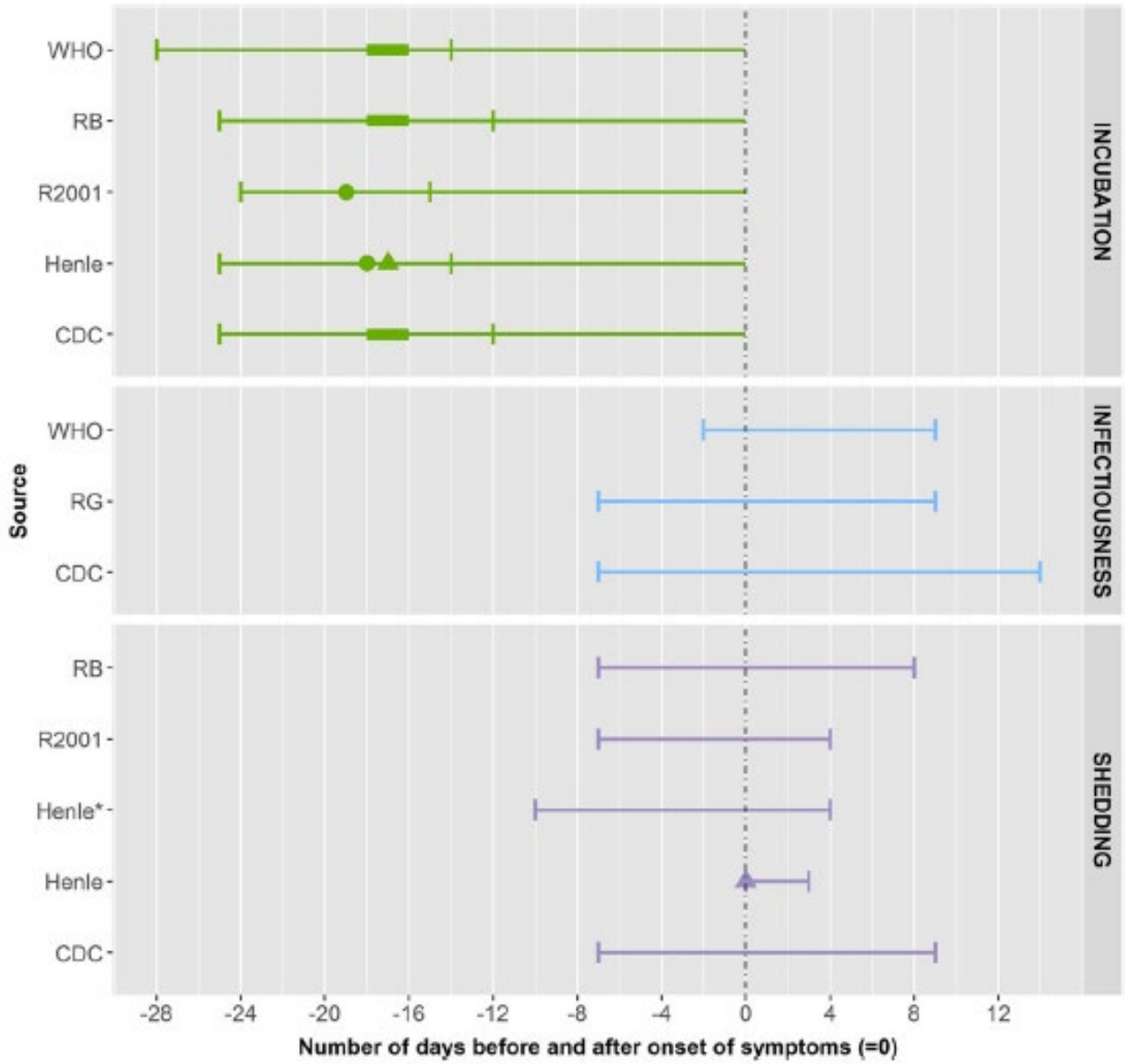
Outcome results related to protective measures for rash symptomatic diseases are presented in Figure 9 to 14.

**Figure 9 Summary measures for the incubation period, infectiousness and shedding period for measles by source**



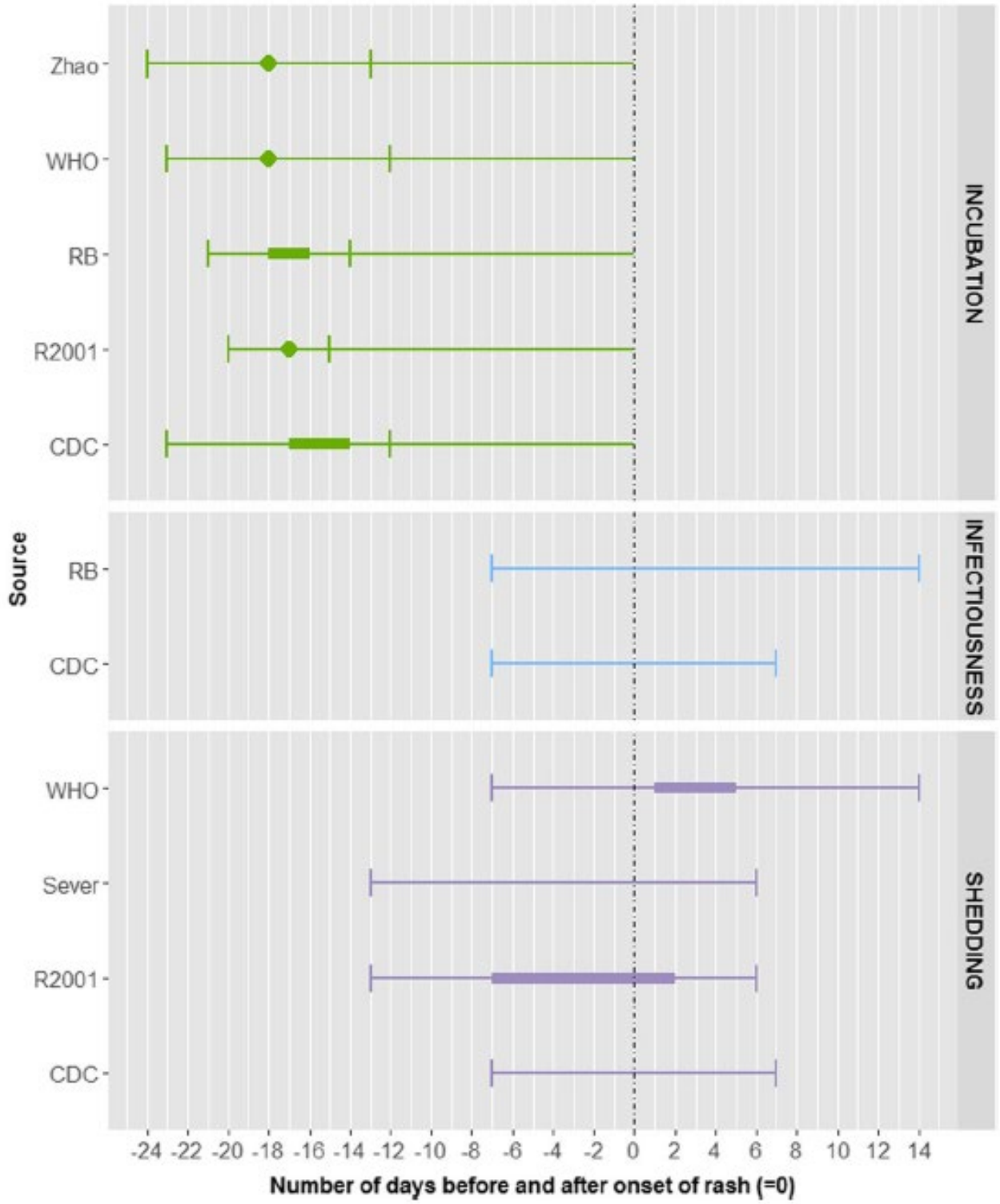

Source: Czumbel 2018, page 4 (Figure 2) [See Appendix E1.1]

**Figure 10 Summary measures for the incubation period, infectiousness and shedding period for mumps by source**



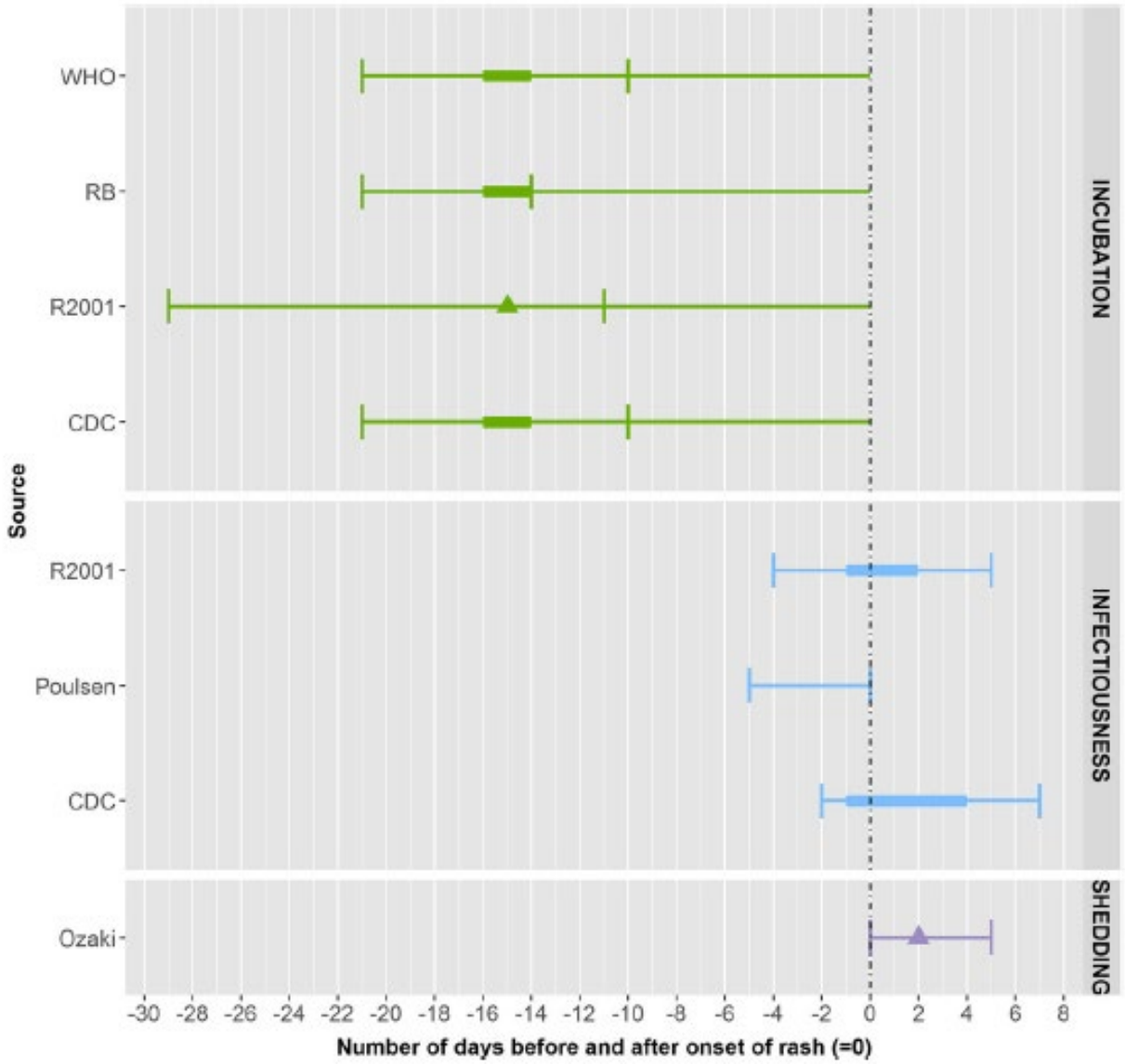

Source: Czumbel 2018, page 5 (Figure 3) [See Appendix E1.1]

**Figure 11 Summary measures for the incubation period, infectiousness and shedding period for rubella by source**



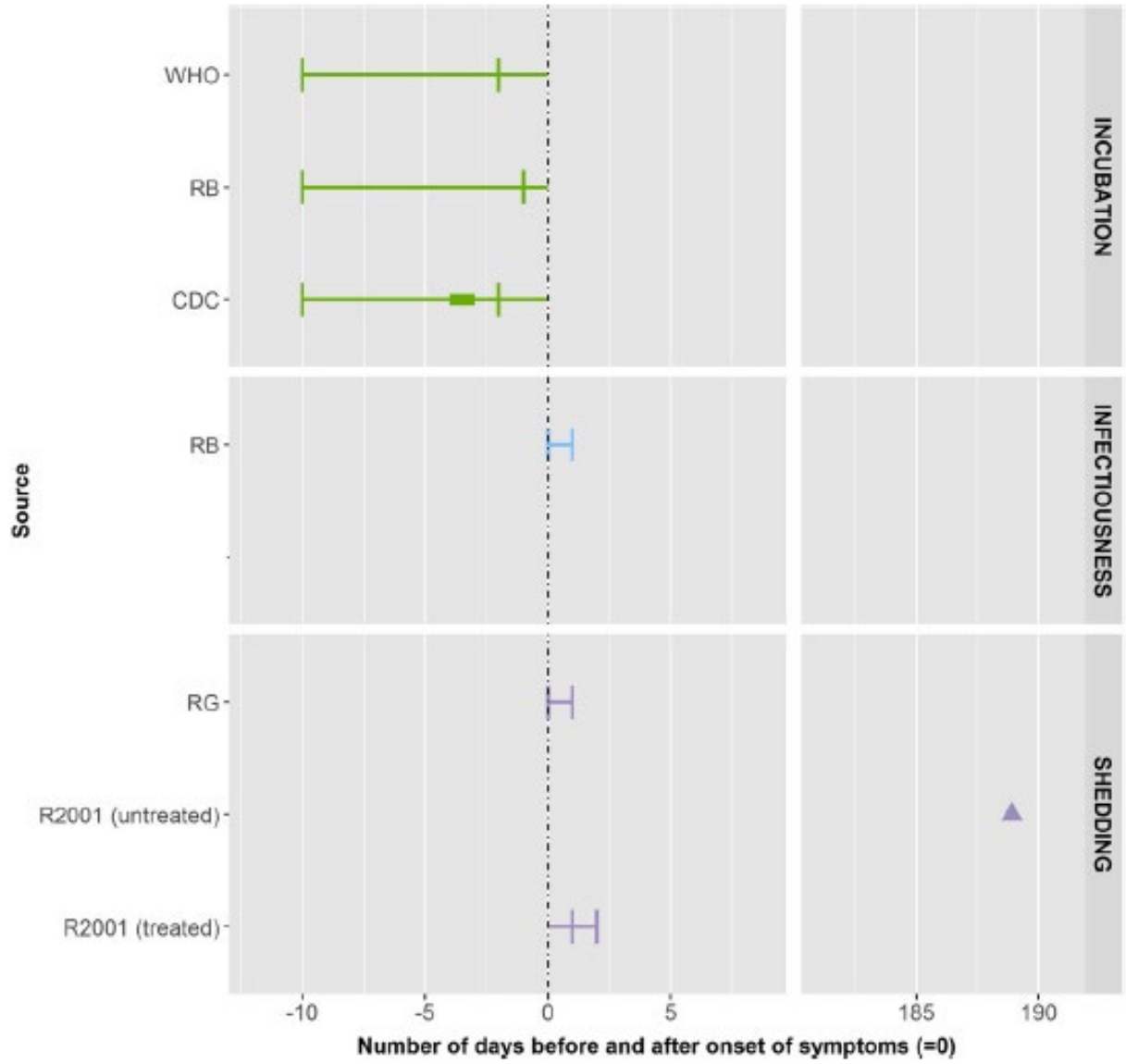

Source: Czumbel 2018, page 6 (Figure 4) [See Appendix E1.1]

**Figure 12 Summary measures for the incubation period, infectiousness and shedding period for varicella by source**



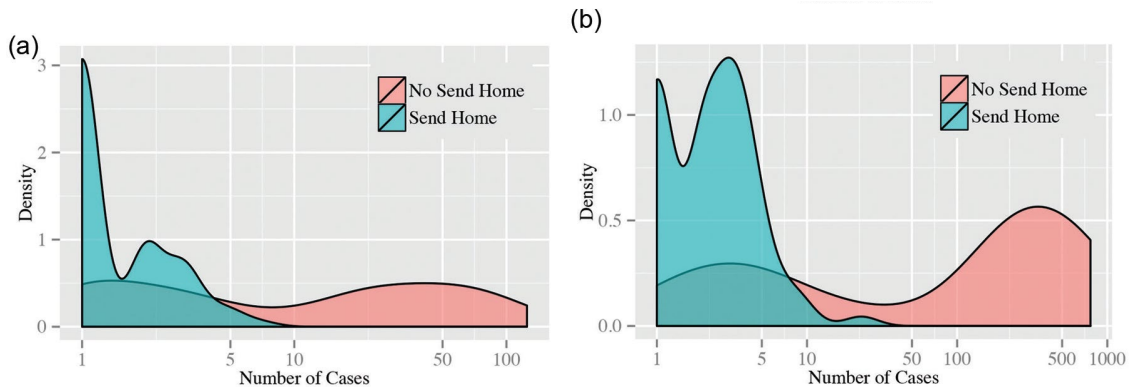

Source: Czumbel 2018, page 7 (Figure 5) [See Appendix E1.1]

**Figure 13 Summary measures for the incubation period, infectiousness and shedding period for meningitis by source**




Source: Czumbel 2018, page 8 (Figure 6) [See Appendix E1.1]

**Figure 14 Probability density plots of log number of cases from 100 runs of the model for each of the with and without implementation of the 'send unvaccinated students home' policy cases: (a) low vaccination rate community (85%); (b) high vaccination rate community (95%)**




Source: Getz 2016, page 391 (Figure 4) [See Appendix E1.4]

## 4.7 Other infectious diseases

### 4.7.1 Description of studies

Five citations (9, 10, 33-35) corresponding to three studies (Czumbel 2018, Högberg 2004, McNeil 2021) and one National Guidelines (CDNA SoNGs 2018) were identified in the literature. No additional studies were identified through other sources. There were 25 studies awaiting classification and no ongoing studies. An overview of the PICO criteria of included studies is provided in Table 12

One systematic review of observational studies and clinical trials (Czumbel 2018) was carried out in a community setting across 28 countries (United States, United Kingdom, Finland, Spain, Japan, China, Guinea–Bissau, Sweden, Republic of Guatemala, Australia, the Netherlands, Peru, Chile, Italy, Germany, India, Republic of the Union of Myanmar, Denmark, People's Republic of Bangladesh, Thailand, Norway, Taiwan, Canada, France, Malaysia, Trinidad, Kenya, Hong Kong) and focussed on children aged from 1 month to 18 years. The systematic review investigated four key prognostic factors (1) the incubation period, (2), the period of infectiousness, (3) the duration of shedding and (4) the setting specific exclusion period across the most common transmittable childhood infectious diseases including Hepatitis A, meningococcal infection, roseola, human parvovirus B19, impetigo, glandular fever, streptococcal sore throat. PubMed and Medline databases were searched for citations between 1980 and June 2015. CDC, WHO and the American Academy of Paediatricians Red Book were used to search for reference and relevant cited articles in October 2014.

The remaining studies were retrospective cohort trials carried out in either Sweden (Högberg 2004) or the United States (McNeil 2021). One study included children from 14-day care centres across two regions in Sweden (Högberg 2004) and the remaining study was conducted in a community setting including children under the age of 18 years (McNeil 2021). Högberg 2004 compared the exclusion of penicillin-non-susceptible Streptococcus pneumoniae (PNSP) carriers against no intervention and McNeil 2021 investigated the indirect impact of Coronavirus prevention strategies on invasive Staphylococcus aureus, Streptococcus pneumoniae (pneumococcus) and Group A Streptococcus against a historical cohort.

The National Guidelines was written on behalf of the Australian Government, Department of Health and Ageing by the Communicable Diseases Network Australia (CDNA). The Guidelines are provided to assist public health units in responding to a notifiable outbreak of Hepatitis A. They capture the knowledge of experienced professionals, build on past research efforts, and provide advice on best practice based upon the best available evidence at the time of completion.

Results for exclusions measures versus inactive control (historical cohort) for other infectious diseases are provided in the Summary of Findings table (see 4.7.3).

**Table 12 Characteristics and quality of included studies: Other infectious diseases**

| Review ID Quality | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| CDNA SoNGs 2018 (35) | National Guidelines | NA | Australia | Hepatitis A | NA | Incubation period<br>Period of infectiousness<br>Case management: Isolation and restriction |
| Czumbel 2018 (ECDC 2016) (9, 10) | SR | Households, children's homes, hospital, schools, nurseries, day care centres, community | Various | Various childhood disease (comprehensive) | NA | Incubation period<br>Period of infectiousness or duration of shedding<br>Exclusion period |

| Review ID Quality | Study design | Setting | Location | Condition | Intervention/ Comparator | Outcomes |
|---|---|---|---|---|---|---|
| | | parks | | | | |
| Högberg 2004 (33) | Cohort study | Day care centres | Sweden | Penicillin-non-susceptible *Streptococcus pneumoniae* (PNSP) | Exclusion of PNSP carriers | Prevalence of PNSP |
| McNeil 2021 (34) | Retrospective cohort | Community - hospital data | Houston, Texas, USA | *Staphylococcus aureus, Streptococcus pneumonia, Streptococcus pyogenes* (group A Streptococcus) | Rates of disease in 2017, 2018, 2019 and 2020 (2020 during COVID) | Incidence per 10 000 each year |

Abbreviations: CDNA SoNGs, Communicable Diseases Network Australia Series of National Guidelines; COVID-19, coronavirus 2019; NA, not applicable; SR, systematic review

### 4.7.2 Critical appraisal

One systematic review (Czumbel 2018) was assessed to be of moderate quality. Limitations arose due to the lack of a satisfactory technique for assessing the risk of bias in individual studies included in the review. Additionally, the review did not conduct a meta-analysis so appropriate methods for statistical combination of results and publication bias could not be assessed.

Two additional studies were judged to be of overall moderate risk of bias by the JBI manual (Högberg 2004, McNeil 2021). Both studies did not provide information relating to strategies used to deal with confounding factors and it was uncertain if participants were lost to follow up and there were any strategies used to address incomplete follow up data.

Details are provided in **Appendix D4.**

### 4.7.3 Summary of findings

#### 4.7.3.1 Exclusion period (vs no exclusion period)

Two citations corresponding to one study (Czumbel 2018) reported new evidence on two other infectious diseases. A summary of the new evidence is presented in Table 13. All outcomes from the included study presenting new evidence were assessed to be of overall very low certainty of evidence.

Results for outcomes across the review presenting new evidence was judged to have no serious concerns of bias. As outcomes from each condition corresponded to a single study, inconsistency was not assessed and did not downgrade the certainty of evidence. Similarly, there was no serious indirectness for the available evidence of each disease. The evidence is generalisable to the Australian population. All studies were conducted in a community setting which did not downgrade the certainty of evidence. Outcomes from both diseases were assessed to have serious imprecision due low patient numbers and wide range of results across the included studies in the systematic review (Czumbel 2018). As such, the certainty of evidence was downgraded. The included study did not appear to have any publication bias and did not contribution to downgrading the certainty of evidence.

**Table 13 Summary of new evidence: Other infectious diseases**

| Disease | Previous Guidelines | Summary of New Evidence | Certainty of evidence | Source |
|---|---|---|---|---|
| Impetigo (Streptococcal) | Exclude until appropriate antibiotic treatment has started | Exclusion until 24 hours after treatment has been initiated | Very low ⊕⊖⊖⊖ | Czumbel 2018 (0 studies) |
| Scarlet fever | Exclude until the person has received antibiotic treatment for at least 24 hours and feels well | Minimum exclusion of cases from school was 24 hours, but not effective. Excluded from nursery for 5 days after the start of treatment with penicillin. | Very low ⊕⊖⊖⊖ | Czumbel 2018 (2 studies) |

Transmission related outcomes (e.g. number of cases)

A summary of the evidence relating to transmission in other infectious diseases is presented in Table 14

**Table 14 Results for exclusion period vs no exclusion period: Transmission related outcomes in people with other infectious diseases**

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| CDNA SoNGs 2018 | National Guidelines | Community | Australia | **Hepatitis A** | While in the infectious period which can be defined as:<br>· from two weeks before the onset of the prodrome to at least seven days after the onset of jaundice; OR<br>· from two weeks before the onset of the prodrome to 2 weeks after the onset of symptoms if there is no jaundice; OR<br>· for asymptomatic cases, estimated using the timing of contact with the source | The incubation period averages 28 to 30 days, with a range of 15 to 50 days. | Two weeks before the onset of prodromal symptoms to either one week after the onset of jaundice OR two weeks after the onset of prodromal symptoms | |
| Czumbel 2018 | SR<br>3 (1967, 1952, 1986)<br><br>(CDC, Red Book advice) | Children aged 1 month to 18 years. For exclusion measures: children attending a school or other childcare setting | Schools, day care centres, households, institutions and hospitals | **Hepatitis A** | One study suggested exclusion from school until severe symptoms persist combined with application of hygienic measure was found useful.<br>One week of exclusion after onset of jaundice. | Between 30 and 125 days (median of 37 days) | | |
| | SR<br>2 (1939, 1998<br><br>(CDC, Red Book advice) | | | **Roseola** | RG: No need, unless the child is unable to participate, or the child meets other exclusion criteria such as fever with behavioural change | Serial interval 5 to 15 days (average, 10 days) | Up to 60–90 days (intermittent) | |
| | SR | | | **Human** | **RG:** No need, unless the child has an | | | |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Exclusion measures (case attack rate, reduction in peak) | Incubation period | Period of infectiousness | Duration of shedding |
| | (CDC, Red Book advice) | | | **parvovirus B19** | underlying blood disorder, such as sickle cell disease, or a compromised immune system, unable to participate; the child meets other exclusion criteria such as fever with behavioural change<br>**CDC:** The greatest risk of transmitting the virus occurs before symptoms of EI develop; therefore, transmission cannot be prevented by identifying and excluding persons with EI. A policy to routinely exclude members of high–risk groups is not recommended. | | | |
| | SR<br>1 (1985) | | | **Glandular fever** | | | | Range up to ≥29 weeks after onset |
| | SR<br>2 studies (1933, 1988)<br><br>(CDC, Red Book advice) | | | **Streptococcal sore throat** | The authors of the outbreak investigation study suggest that due to the long duration of shedding, exclusion from school for 3 weeks will not be effective.<br>The other study suggested keep infected children at school until the first sign of catarrh or cough, to protect younger children<br>**RB:** Until 5 days of appropriate antimicrobial therapy course completed<br>**CDC:** Until 5 days of a full course of antimicrobial treatment; Untreated: 21 days from onset of cough<br>**R2001:** Treated: 5 days from starting antibiotics; Untreated: at least 3 weeks" | Range between 3 to 21 days, usually between 7 to 10 days<br>- within the same household: 3 days, most probably 7 days; unknown upper limit | Duration of shedding up to 4 to 7 weeks after illness onset<br>Most contagious in the first two weeks after cough onset | Between 2 to 7 weeks after illness onset in those who were untreated and less than 7 days after onset of symptoms in those who were treated |

| Study ID | Study type (no. of trials) included | Patient population | Setting (Location) | Disease | Outcome | Baseline prevalence (%) n/N | Follow up cumulative incidence (%) n/N | No follow up cultures | Follow up time (weeks) |
|---|---|---|---|---|---|---|---|---|---|
| Högberg 2004 | Prospective/ retrospective cohort study | Children from 14 daycare centres who had extensive daily contact | Day care centres (Skane and Goteborg City, Sweden) | Exclusion of penicillin–non–susceptible Streptococcus pneumoniae (PNSP) carriers from day care centres vs. no intervention | Prevalence across each day care centre | | | | |
| | | | | | 1 | 25% (3/12) | 0(0/9) | 1 | 1 |
| | | | | | 2 | 45% (5/21) | 9 (0/16) | 1 | 1 |
| | | | | | 3 | 21% (3/14) | 0 (0/11) | 1 | 1 |
| | | | | | 4 | 29% (2/7) | 0 (0.5) | 1 | 1 |
| | | | | | 5 | 13% (1/8) | 14% (1/7) | 2 | 2 |
| | | | | | 6 | 13% (3/24) | 5% (1/21) | 2 | 2 |
| | | | | | 7 | 11% (2/18) | 13% (2/16) | 2 | 2 |
| | | | | | 8 | 6% (1/17) | 0 (0/16) | 1 | 1 |
| | | | | | 9 | 14% (2/14) | 0 (0/12) | 1 | 3 |
| | | | | | 10 | 20% (3/15) | 0 (0/12) | 1 | 2 |
| | | | | | 11 | 7% (1/15) | 0 (0/14) | 1 | 1 |
| | | | | | 12 | 8% (1/12) | 27% (3/11) | 3 | 9 |
| | | | | | 13 | 54% (7/12) | 33% (2/5) | 2 | 6 |
| | | | | | 14 | 8% (2/24) | 9% (2/22) | 3 | 10 |
| | | | | | **TOTAL Incidence of PNSP** | Study Area A: 2.9% (4//139)<br>Study Area B: 18.4% (7/38) | | | |
| | | | | | Proportion new carriers estimated to be attributed to the lack of intervention | NR | 84% | 95% CI, 49 - 95 | |

| **Study ID** | **Study type (no. of trials) included** | **Patient population** | **Setting (Location)** | **Disease** | **Outcome** | **Intervention n/N (%) Mean ± SD** | **Comparator n/N (%) Mean ± SD** | **Risk estimate (95% CI)** | ***Statistical significance*** **p–value** |
|---|---|---|---|---|---|---|---|---|---|
| McNeil 2021 | Prospective cohort study | Paediatric admissions (<18 years) | Community (Houston, Texas) | Indirect impact of Coronavirus 2 prevention strategies on invasive Staphylococcus aureus, Streptococcus pneumoniae (pneumococcus) and Group A Streptococcus vs. historical cohort | Total hospital admissions for S. aureus (I-CO-SA), Group A streptococcus (IGAS), and pneumococcal disease (IPD) | **2020 = 17348 admissions** | 2017 = 20840 admissions<br>2018 = 20760 admissions<br>2019 = 22304 admissions | NR | NR |
| | | | | | Pneumococcal disease (IPD) incidence | Declined to 13.83/10000 admissions | Incidence stable from 2017 to 2019 (range from 19.26 to 23.39 cases/10000 admissions) | RR 0.51 (95% CI 0.32, 0.81) | *Favours intervention*<br>*p* = 0.02 |
| | | | | | Invasive community onset S. aureus (I-CO-SA) | Stable from 2018 to 2020 57.6/10000 admissions | Increased from 2017 to 2018 (54.7/10000 vs 65.03/10,000) | RR 0.9 (95% CI: 0.78, 1.32) | No significant difference in I–CO–SA between 2019 – 2020<br>*p* = 0.47 |
| | | | | | Streptococcus pyogenes [Group A Streptococcus (GAS)] | Declined in 2020<br>25.36/10000 admissions | Increased incidence 2019 – 2019<br>30.71/10000 to 39.01/10000 admissions | RR = 0.65 (95% CI: 0.45–93) | *Favours intervention*<br>*p = 0.02* |
| | | | | | Specific diagnosis of IPD | Bacteraemia:<br>5.19/10000 in 2020<br><br>Meningitis:<br>2.88/10000 in 2020<br><br>Pneumonia:<br>2.88/10000 in 2020 | Bacteraemia:<br>11.21/10000 in 2019<br><br>Meningitis:<br>7.62/10000 in 2019<br><br>Pneumonia:<br>6.72/10000 in 2019 | Bacteraemia<br>RR 0.46 (95% CI 0.21, 0.99)<br>Meningitis<br>RR 0.37 (95% CI 0.12, 0.98)<br>Pneumonia:<br>RR 0.43 (95% CI 0.15, 1.17) | Bacteraemia:<br>*p* = 0.02<br><br>Meningitis:<br>*p* = 0.03<br><br>Pneumonia:<br>*p* = 0.06 |

Abbreviations: CDC: Centre for Disease Control and Prevention; CI, confidence interval; PHU, public health unit; R2001: Richardson 2001; RB: Red Book; RCT, randomised controlled trial; RG: Quick reference guide; RR, relative risk; SD, standard deviation; WHO: World Health Organisation

### Adverse events (including safety) related to the intervention

There were no studies found for adverse events thus the effect of exclusion measures compared with control in children or adults with other infectious diseases is unknown.

### Absenteeism

There were no studies found for absenteeism thus the effect of exclusion measures compared with control in children or adults with other infectious diseases is unknown.

### Length of illness

There were no studies found for the length of illness thus the effect of exclusion measures compared with control in children or adults with other infectious diseases is unknown.

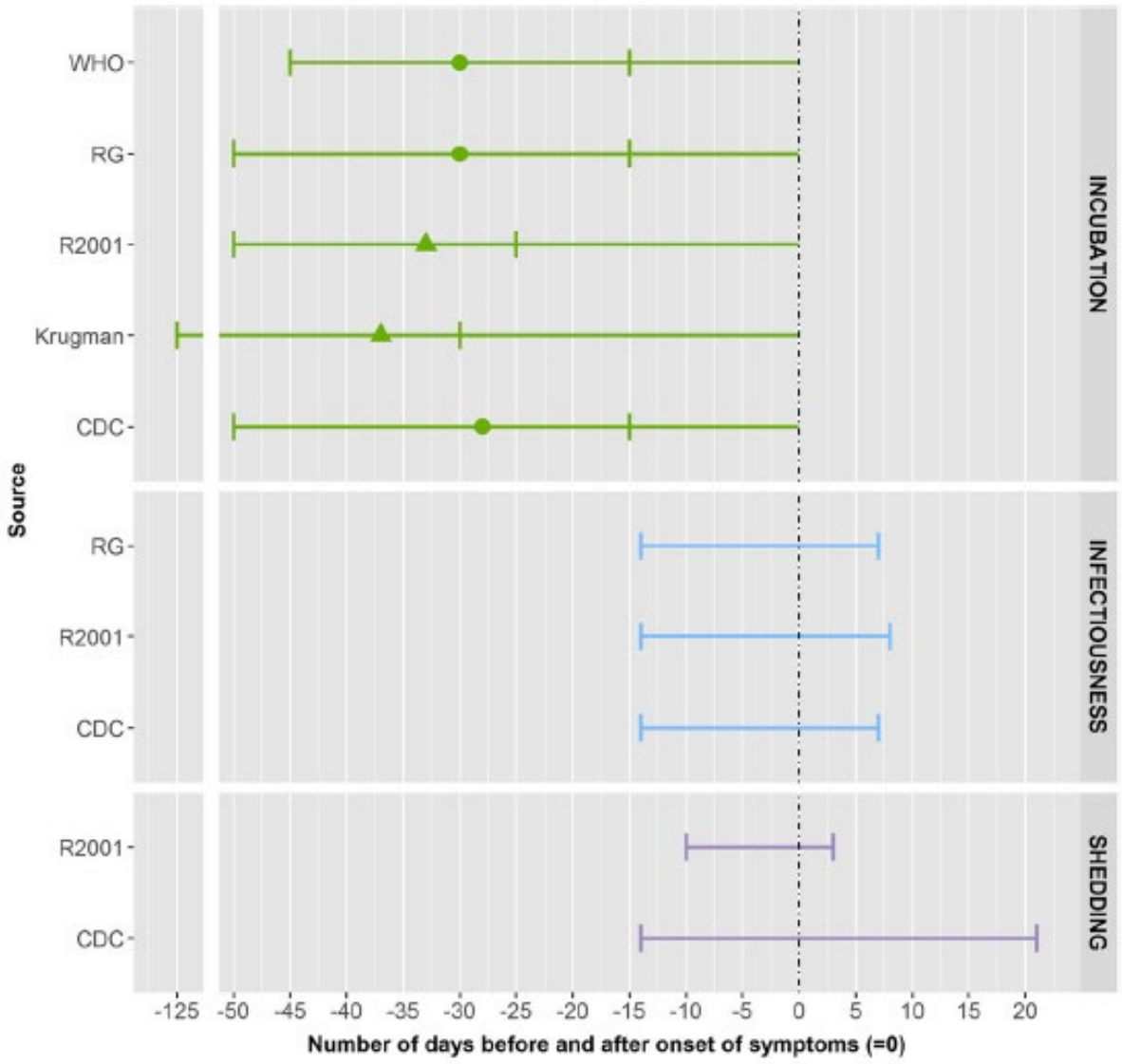
### Behaviour or practice change

There were no studies found for behaviour or practice change thus the effect of exclusion measures compared with control in children or adults with other infectious diseases is unknown.

### 4.7.3.2 Figures

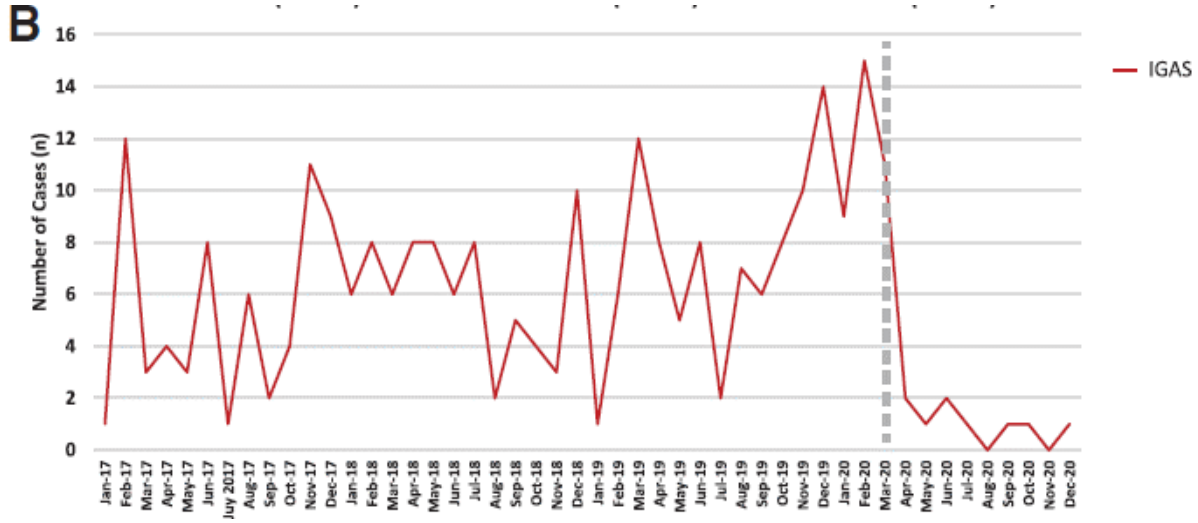
Outcome results related to protective measures for rash symptomatic diseases are presented in Figures 15 to 18.

**Figure 15 Summary measures for the incubation period, infectiousness and shedding period for hepatitis A by source**



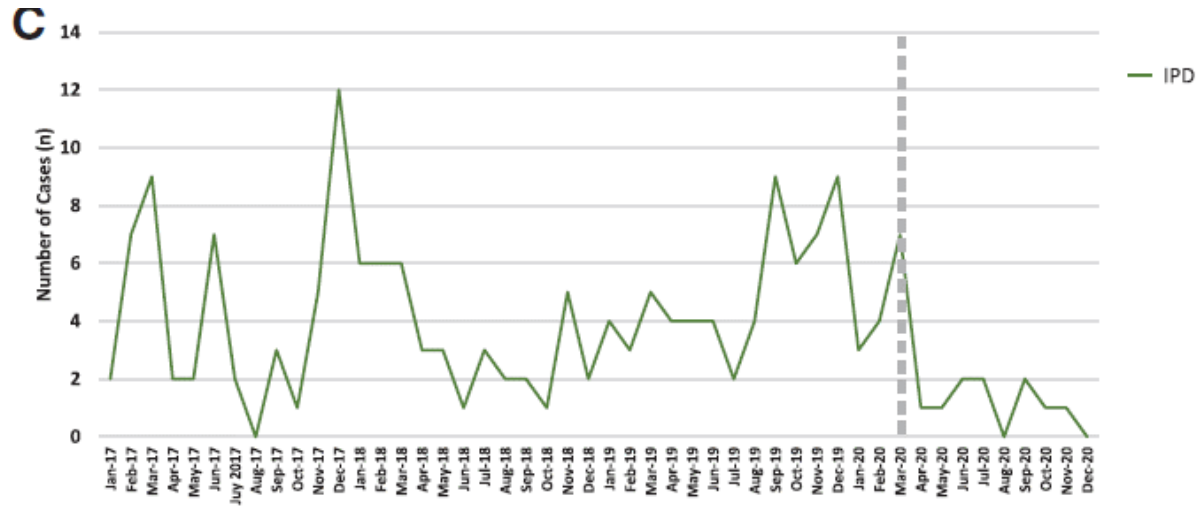

Source: Czumbel 2018, page 10 (Figure 8) [See Appendix E1.1]

**Figure 16 Trend in number of cases of IGAS. The dashed vertical line corresponds to the initiation of infection mitigation mandates**



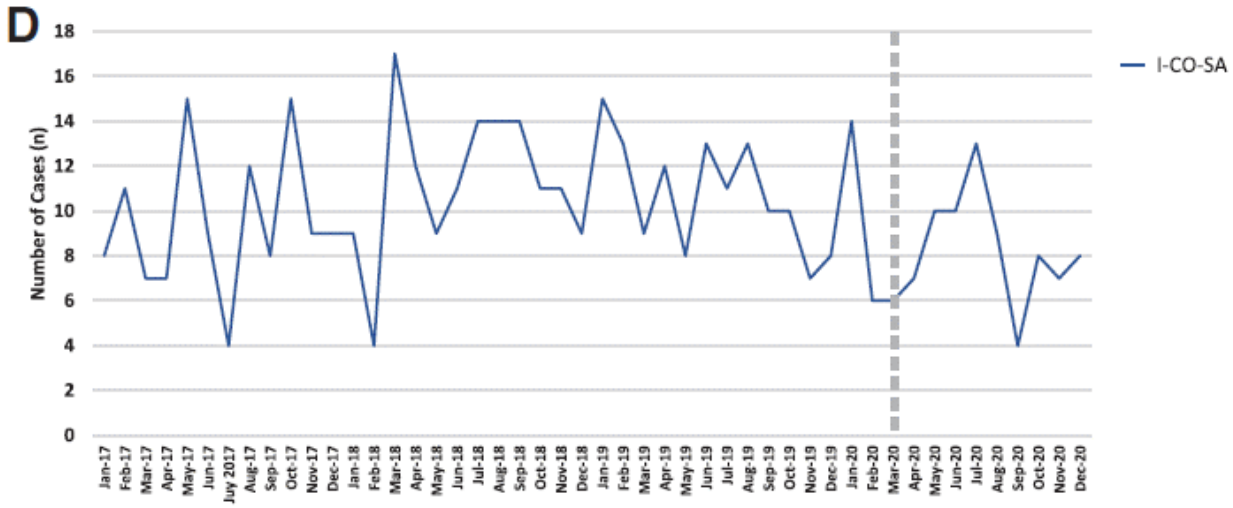

Source: McNeil 2021, page e315 (Figure 1) [See Appendix E1.5]

**Figure 17 Trend in number of cases of IPD. The dashed vertical line corresponds to the initiation of infection mitigation mandates**




Source: McNeil 2021, page e315 (Figure 1) [See Appendix E1.5]

**Figure 18 Trend in number of cases of I-CO-SA. The dashed vertical line corresponds to the initiation of infection mitigation mandates**




Source: McNeil 2021, page e315 (Figure 1) [See Appendix E1.5]

# 5 Discussion

## 5.1 Summary of main results

We conducted a systematic review of Systematic reviews and primary studies to evaluate the effectiveness of exclusion measures for four overarching disease categories pertaining to the 43 infectious diseases listed in the 2013 *Staying Healthy – preventing infectious disease in early childhood education and care services* resource. We identified 20 studies (14 Systematic reviews and six Primary studies) and six National Guidelines with evidence available for meta-analysis for exclusions measures compared to no intervention or an alternative intervention. Results for studies with available evidence are presented in **Appendix E** and narratively described in the results section. Where applicable, studies with new evidence were assessed with the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) framework. GRADE combines information to assess overall how certain systematic review authors can be that the estimates of the effect (reported across a study/s for each critical or important outcome) are correct.

Certainty of evidence is interpreted as follows:

| **Certainty** | **Definition** |
|---|---|
| High certainty | The authors have a lot of confidence that the true effect is similar to the estimated effect. |
| Moderate certainty | The true effect is probably close to the estimated effect. |
| Low certainty | The true effect might be markedly different from the estimated effect. |
| Very low certainty | The true effect is |

### 5.1.1 Gastrointestinal diseases

The new evidence provides very low certainty of the effect of exclusion measures versus inactive control (no intervention) on gastrointestinal diseases. The evidence from two studies (one SR, one retrospective cohort) suggests the implementation of exclusion measures results in no difference to the prevalence of giardia but a reduction in the prevalence of viral gastroenteritis.

For giardiasis, the current guidelines recommend exclusion of the case until there has not been a loose bowel motion for 24 hours with no exclusion required for contacts. New evidence from Czumbel 2018 suggests that no control strategy results in a significantly lower prevalence of giardia.

For viral gastroenteritis, the current guidelines recommend exclusion of the case until there has not been a loose bowel motion for 24 hours with no exclusion required for contacts. The new evidence shows the prevention and control of the COVID-19 pandemic (including isolation) can also limit the infection and transmission of rotavirus and adenovirus.

### 5.1.2 Influenza-like illnesses

The new evidence provides moderate to low certainty of the effect of exclusion measures on influenza-like illnesses. The evidence from three systematic reviews (Burns 2021, Czumbel 2018, Talic 2021) and three National Guidelines (Pertussis 2015, Influenza 2017, COVID-19 2022) suggests the implementation of exclusions measures is effective at preventing the prevalence and transmission of influenza, pertussis and COVID-19.

For influenza, the previous guidelines recommend exclusion of the case until the person is well with no exclusion required for contacts. The new evidence suggests isolation is maintained for at least two days following the last day of fever (Burns 2021) where the period of infectiousness is one day before to 10 days following symptom onset (Czumbel 2018).

For pertussis, previous guidelines indicate exclusion until five days after starting appropriate antibiotic treatment, or for 21 days from the onset of coughing with advice to contact a public health unit for specialist advice about excluding non-vaccinated contacts. New evidence recommends the same five-day exclusion after starting antibiotic treatment but suggest 14 days if the case does not take antibiotics (CDNA SoNGs 2015). This is validated by the period of infectiousness reported as most contagious in the first two weeks after cough onset (Czumbel 2018).

There was no prior advice in the Staying Healthy guidelines provided for COVID-19 measures. New evidence from one systematic review (Talic 2021) reported a favourable effect for physical distancing in reducing the incidence of COVID-19 and SARS-CoV-2 (RR: 0.75 [95% CI 0.59, 0.95] and RR: 0.88, [95% CI 0.86, 0.89] respectively). Similarly, school closures proved effective in reducing the incidence of COVID-19 (95% CI −49, −71) but this was dependent on early implementation. Isolation or stay at home measures were also an effective measure in reducing the transmission of SARS-CoV-2, but the included studies used results for mobility to assess stay at home or isolation and therefore could have been limited by potential flaws in publicly available phone data. The CDNA SoNGs 2022 recommends a quarantine period of seven days for reducing transmission with the period of infectiousness reported as 10 days after the symptom onset yet can vary based on individual factors.

### 5.1.3 Rash symptomatic diseases

The new evidence provides low certainty of the effect of exclusion measures on rash symptomatic diseases. The evidence from two systematic review or modelling studies (Czumbel 2018, Getz 2016) and one National Guidelines (Meningococcal 2017) suggests the implementation of the current exclusion measures may not be effective at reducing the prevalence of meningococcal infections or mumps but exclusion of infectious persons with measles or rubella is essential at decreasing transmission of the disease.

For measles, current guidelines recommend exclusion of the case for four days after onset of the rash with guidance that non-immunised contacts should contact a public health unit for specialist advice. New evidence from a 2016 modelling study comparing sending student home vs. no action suggests unvaccinated students should be sent home during a measles outbreak (MD –345.60 [–415.64, –275.56], $p <$ 0.00001).

Current guidelines for meningococcal infection recommend exclusion until appropriate antibiotic treatment has been completed with advice to contact a public health unit about antibiotics and/or vaccination for people who were in the same room as the case. New evidence from the CDNA SoNGs 2017 reports that with effective antibiotic therapy, meningococci usually disappear from the nasopharynx within 24 hours.

For mumps, the 2013 guidelines suggest exclusion of the case for nine days or until swelling subsides. Evidence from one systematic review (Czumbel 2018) reports exclusions for five days after the onset of parotid gland swelling is effective with the duration of shedding stated as zero to three days after symptom onset.

The previous guidelines suggest exclusion of a person infected with rubella until they have fully recovered or for at least four days after the onset of the rash. New evidence recommends exclusion for six days after rash onset with the duration of shedding reported as the range from six to 14 days post onset of rash (Czumbel 2018).

### 5.1.4 Other infectious diseases

The new evidence provides low certainty of the effect of exclusion measures on other infectious diseases. The evidence from one systematic review (Czumbel 2018) suggests the implementation of the current exclusion measures are effective for streptococcal but may not be required for persons infected with scarlet fever.

For impetigo (streptococcal), the current guidelines recommend exclusion until appropriate antibiotic treatment has started. New evidence suggests an additional 24 hours after treatment has been initiated is required for reducing the transmission of streptococcal (Czumbel 2018).

The 2013 guidelines for scarlet fever recommend exclusion until the person has received antibiotic treatment for at least 24 hours and feels well. New evidence from Czumbel 2018 reported the minimum exclusion of cases from school of 24 hours was not effective. In addition, cases from a nursery suggest exclusion for five days after the start of treatment with penicillin.

## 5.2 Overall completeness and applicability of evidence

This review aimed to identify the available evidence on the effectiveness of exclusion measures in a childcare setting. Most studies identified were systematic reviews or modelling studies. Studies that assessed exclusion measures versus an inactive control (no intervention) or an alternate intervention were included in the synthesis.

There were 6 studies that met the eligibility criteria for the review but were not included in the evidence evaluation due to duplication of data or lack of usable data for the evidence synthesis. The studies are listed in an inventory titled *Details of studies from search results excluded* (Appendix C1, Table C.1).

Studies published in a language other than English were not translated and were not included in the synthesis but were listed in an inventory for completeness (Appendix C2.1). Databases in languages other than English were not searched. There was one publication identified in a language other than English.

The available evidence was from a range of countries including Australia, Canada, China, France, India, Iran, Israel, Japan, Korea, Singapore, Spain, Thailand, the Netherlands, United Kingdom and the United States. All studies examined exclusions measures encompassing isolation, quarantine, school closures, stay at home orders and cohorting. Participants were generally pre-school or primary school age (3-12 years) children, but many studies included the wider community with no limits on population. In general, the included studies provided a clear description of the intervention, outcomes and disease focussed on in the study.

Studies included in this review are those published up until September 2022. Given the amount of evidence for exclusion measures that remained unpublished or was not yet evaluated at the time of the search (93 studies awaiting classification and five studies listed as ongoing) it is unknown whether these studies would meet the eligibility criteria for this review and impact the overall results.

## 5.3 Certainty of the evidence

A large proportion of the studies included in this review had concerns of bias relating to the inability of studies to blind participants, and outcome assessors being aware of the intervention received. This was considered reasonable, given the intervention, and generally did not raise serious concerns when assessing the certainty of the evidence. For most studies we were unable to obtain and therefore assess published protocols or statistical analysis plans, and as per the protocol, did not attempt to contact study authors to obtain this information.

A reported follow up time and its suitability for outcome assessment was not clearly states for most primary studies eligible for included in the analysis. Additionally, lack of information on any reasons loss to follow up and strategies to deal with incomplete data further reduced the overall certainty of evidence. Additional details are outlined in Appendix G.

The certainty of evidence across outcomes was generally downgraded for issues with risk of bias (related to quality of the study) and imprecision (related to wide range of results, lack of adjustment for confounding factors).

## 5.4 Potential biases in the review process

To ensure transparency in the review process we send the final protocol to the SHIC committee for approval before commencing the search. To capture most studies assessing the effectiveness of exclusion measures, we did not apply date, language or outcome restrictions in our search. In addition, we comprehensively searched multiple databases and did not limit by study design (SRs, RCTs, and cohort studies were included). We included detailed documentation of the inclusion criteria to avoid inconsistent application of study selection and used standardised procedures for data collection and critical appraisal. Where possible, we have applied a methodological approach consistent with the *Cochrane Handbook for Systematic Reviews of Interventions* and other best practice methods.

While we have attempted to control for potential biases, some deviations from the protocol were necessary for pragmatic reasons. To ensure these deviations from protocol are clear, deviations and post-hoc decisions have been documented and explained in Appendix F.

Data collection was performed by one researcher who collected data using data extraction forms. A second reviewer checked for completeness and accuracy in data extraction.

We did not include studies published in languages other than English in the analysis, so it is possible that we may have missed studies that may (or may not) impact the overall conclusions of this review.

## 5.5 Agreements and disagreements with other studies or reviews

There are currently no published Cochrane reviews that are specific to exclusions measures for preventing infectious diseases in children. However, the existing SHIC guidelines, CDNA SoNGs (24-26, 31, 32, 35) and WHO infection prevention and control in primary care (37) provided information relating to the use of exclusion as a means of preventing infectious diseases in childcare settings. The results for most infectious diseases are in agreeance with the evidence reported in our review. Most of these guidance documents report that exclusions measures should be used as an effective intervention to achieve reduced prevalence and transmission of disease in children and adults in childcare settings with the length of exclusion dependant on the infectious period and duration of shedding of the virus.

In comparison to the 2013 Guidelines, there was new evidence on the use of exclusions measures for 11 included diseases (impetigo, giardiasis, viral gastroenteritis, measles, meningococcal infection, mumps, rubella, scarlet fever, pertussis, influenza and COVID-19) that may work to inform the upcoming version of the SHIC guidance document.

## 5.6 Limitations

### 5.6.1 At study and outcome level

The main limitations at the study and outcome level are the low number of systematic reviews and trials per comparison for all diseases except influenza, which reduce the precision of the overall effect and prevented any meta- analyses. An additional limitation is that it was not possible to statistically assess the effect of the intervention across all disease categories as majority of studies provided narrative summaries. The inability to assess publication bias using funnel plots also raised potential constraints to the review.

The absence of information about reporting risk of bias for the included studies in the systematic reviews contributed to lower quality of evidence assessments as did the fact than many primary studies failed to report follow up strategies and identify confounding factors. Without a satisfactory technique for assessing the risk of bias for individual studies included in systematic reviews; the robustness of the data was comprised by authors excluding the level of certainty from the analysis, making it difficult to ascertain the quality of results from the systematic review. Where systematic reviews did not conduct a meta-analysis of the results, a judgement regarding the risk of bias of included studies and appropriateness of the method used to combine results was made. Based on guidance for systematic reviews without meta-analysis (36), and in the absence of discussions on the potential impact of risk of bias on the results of the included studies it was considered likely that the quality of the review was impaired.

### 5.6.2 At review level

This review is limited to the assessment of the evidence for the use of exclusion measures to prevent infectious disease transmission in childcare settings to inform the Staying Healthy Advisory Committee for the updated Staying Healthy in Childhood Guidelines. This review is not designed to assess the way diseases are transmitted, or the reasons people or institutions chose to practice the intervention.

The main comparator of interest was exclusion measures compared to inactive control (no intervention) or alternate intervention with outcomes assessed limited to transmission related outcomes, adverse events, absenteeism, length or illness or behaviour and practice change. Majority of studies assessed the impact of exclusion measures on one of the 43 included diseases in the 2013 SHIC Guidelines; however, an additional 3 studies (Czumbel 2018, McNeil 2021, Hoburg 2004) provided evidence for 8 diseases not in the 2013 Guidelines including invasive staphylococcal, Group A streptococcal, pneumococcal, penicillin resistant pneumococcal, MRSA, typhoid, E coli 0157, EPEC, EHEC and RSV.

Given the limited evidence base, many of the results were limited to one or two systematic reviews and primary studies, with the number of included studies in systematic reviews ranging from 16 to 112 publications. Three quarters of the evidence included in the synthesis was for influenza-like illnesses.

Given the low quality of evidence across all disease categories, it is challenging to conclude the effectiveness of exclusion measures for the infectious diseases included. An additional limitation of this review is that several studies were awaiting classification, ongoing, or not translated at the time of the search. This missingness of this data was considered unlikely to substantially change the overall conclusions of the review.

The breadth and diversity of diseases identified for inclusion in this review means that it is possible that some outcome domains and outcome measures have been misclassified or missed during the evidence synthesis process.

A final limitation is that the literature search was last conducted in September 2022, it is possible that given the identification of several studies awaiting classification and ongoing studies, there may be additional evidence that may (or may not) impact the overall conclusions of this review.

# 6 Authors' conclusions

## 6.1 Implications for practice

This report was commissioned by the Staying Healthy Advisory Committee as part of the Staying Healthy in Childhood Guidelines review, with findings intended to inform decisions relating to the upcoming version of the SHIC Guidelines. As such, specific recommendations are not provided.

There is an absence of high certainty evidence examining the effectiveness of exclusion measures compared with no intervention for the 43 infectious diseases listed in the 2013 Guidelines or outcomes that align with the reasons why people are typically excluded from childcare settings in Australia.

A significant proportion of the evidence base in this report assessed the effect of exclusion measures on influenza-like illnesses. Of the outcomes prioritised in the PICO (See Figure 1), there were two infectious diseases (influenza and COVID-19) where the evidence provides moderate certainty of the benefit. In contrast, the evidence provides low certainty of evidence that exclusion measures provide little to no benefit in two diseases (giardia, scarlet fever), as the review reports no effect on the transmissibility of the disease when children were excluded.

For remaining diseases, there were one or two studies eligible for inclusion per infectious disease per outcome. For the outcomes prioritised in the PICO, the evidence provides low certainty of benefit for all outcomes.

## 6.2 Implications for research

There is a need for more robust trials evaluating the effectiveness of exclusion measures compared with no intervention or inactive control. The available evidence could be enhanced by larger studies (more participants enrolled), improved reporting of the methods used, analysis of results from all participants (or better transparency of follow-up data), as well as measuring and reporting outcomes that are important for decision-making. Many of the studies focused on the effect of exclusion measures in symptomatic participants who were excluded for a short period (7 days or less). It is possible the benefits of excluding infectious individuals may be more apparent in people who continue to be excluded for more than 10 days. Information regarding the sustainability of the effect is also unknown, with few studies providing any follow-up data.

There were five studies with an inactive control and undertaken in the required population identified in our search that were listed as ongoing. Evidence reported in these studies are expected to contribute to future updates where studies are completed, and results published, noting that some may never be completed and/or published.

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