Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

Learnings from efforts to synthesise evidence on the COVID-19 incubation period

Dear Editor,

Public health and containment initiatives are critical to preventing transmission of the SARS-CoV-2. Fundamental to these measures is understanding the interval between infection and symptom onset (i.e. incubation period). Early estimates of the incubation period were based on cases from China,[1] which suggested a median (50th percentile) of five days, and a 99th percentile of 14 days. Such estimates underpinned the widely applied quarantine period of 14 days. Misestimating the incubation period has implications for transmission risk if presymptomatic cases are released from quarantine prematurely, while prolonged quarantine is detrimental to people's mental health and economic activity.

We conducted a systematic review and meta-analysis of COVID-19 incubation periods soon after WHO declared it a pandemic. We searched bibliographic databases, preprint publication sites and websites of several leading medical journals. The search strategy was developed with an information specialist, experts in infectious disease and public health medicine, and was guided by previous reviews.[2,3] We performed the latest of our searches on 2 April 2020. We used Bayesian methods (exploring Gamma, Weibull and log-normal distributions) to estimate the distribution of incubation times. From 444 citations, we screened 151 full-text articles and identified 42 eligible studies. Of these, 18 were peer-reviewed, 22 were preprints and two were abstracts.

We found that most reports lacked precision in specifying the probable timing of infection. For instance, only 18 studies reported including only cases with a clearly defined exposure period. Only eight restricted the possible exposure period, the shortest being three days (four studies), despite the ideal window of exposure being a single day. Only 16 studies explained how they handled uncertain exposure periods that spanned several days; of which only eight reported methods capable of addressing such uncertainty (i.e. censoring). Another eight assumed a specific date of exposure, e.g. the mid-point or first possible exposure; methods that tend to overestimate the incubation period (see Supplementary Table 1 for list of studies). Furthermore, some studies only reported measures of central tendency, limiting the data available to estimate the upper tail of the distribution, information that is critical to inform decisions about the length of quarantine and isolation measures.

These methodological shortcomings contributed to high heterogeneity across the 42 studies. For example, the reported median ranged from 3 to 10.5 days, and the 99th percentile from 11.9 to 20.6 days. Our pooled estimates of the median incubation period differed by almost three days, depending on what data sources were included in the analysis; with analyses including methodologically weaker studies producing longer estimates.

In view of these methodological limitations, we considered it unwise to publish this review, as meta-analytic estimates can be misleading,[4] particularly in the chaos of a rapidly changing epidemiological and political landscape. However, we do see value in sharing our experiences and highlighting the difficulties in undertaking research and evidence synthesis during a pandemic. We are conducting a systematic review and individual patient meta-analysis of 'point-source' outbreaks.[5] We envisage this will allow more reliable estimates of the incubation time.

Author statements

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Ethical approval

None sought.

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Conflict of interest

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2021.05.002.

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