A Meta-Analysis of Global SARS-CoV-2 Variant Incubation Periods: Epidemiological Insights for Continued Emergency Preparedness and Response Along the Continuum of Pandemic Phases

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Abstract **Understanding the evolution of global SARS-CoV-2 variant incubation periods provides valuable epidemiological insights for continued emergency preparedness and response along the continuum of pandemic phases. We conducted an updated meta-analysis of global COVID-19 mean and median incubation periods among several dominant SARS-CoV-2 variants. The overall pooled mean incubation period was 4.15 days (95% confidence interval (CI) [3.91, 4.39]) and the overall pooled median incubation period was 3.64 (95% CI [3.16, 4.13]). Our updated results show that SARS-CoV-2 continues to evolve through a gradual shortening of the incubation period over time. This information is important for informing current and future COVID-19 evidence-based decision-making, and is valuable for updating and streamlining public health guidance and recommendations, as well as advising future emergency preparedness and response planning.**

Keywords: meta-analysis, COVID-19, incubation period, pandemic, epidemiology, emergency preparedness and response, infectious disease, continuum of pandemic phases

Introduction

Background

From the onset of the COVID-19 pandemic, SARS-CoV-2 has evolved to include a broad genetic diversity with multiple lineages producing numerous dominant variants, each with a unique and shifting transmissibility, virulence, and incubation period (Centers for Disease Control and Prevention [CDC], 2024a, 2025a; World Health Organization [WHO], 2024). Globally, while various peer-reviewed studies have assessed the average incubation period of COVID-19 since the onset of the pandemic, estimates vary based on time period, number of participants, and geographic location (Wu, Kang, et al., 2022). Therefore, obtaining updated and reliable estimates of the incubation period for novel infectious diseases, such as COVID-19, is essential for informing infectious disease emergency preparedness and response and evidence-based public health decision-making. Continuous analysis of a novel disease's incubation period over time provides valuable insights for developing or updating case definitions, establishing quarantine and isolation periods, streamlining public health responses and disease investigations, and developing effective public health protocols and policies (Lauer et al., 2020; Lilienfeld et al., 1994; Linton et al., 2020; McAloon et al., 2020; Nishiura, 2007; Rogers, 2020; U.S. Department of Health and Human Services, n.d.; WHO, 2020; Wu, Chen, et al., 2022; Wu, Kang, et al., 2022).

Objective

Given the rapid evolution of the COVID-19 pandemic, this meta-analysis aims to provide an updated estimate of the global mean and median incubation periods for COVID-19 (including historically dominant SARS-CoV-2 variants) using epidemiological data published after February 10, 2022, which was the most recent meta-analysis of COVID-19 incubation periods (Wu, Kang, et al., 2022) when our analysis began. Additionally, we discuss the importance of continued COVID-19 epidemiological research for effective emergency preparedness and response along the continuum of pandemic phases, particularly during the transition and interpandemic phases.

Methods

Literature Search

A literature search and meta-analysis were performed using guidance from the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) (Moher et al., 2009; Stroup et al., 2000). This article is written in accordance with the PRISMA reporting checklist.

We conducted a systematic literature search via the National Center for Biotechnology Information's PubMed search engine using the search parameter from February

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TABLE **1**

Mean and Median COVID-19 Incubation Period Estimates From Eligible Studies

Study	Mean Incubation Period (Days)	95% LCL or *SD*	95% UCL	Median Incubation Period (Days)	95% LCL or IQR	95% UCL or IQR
Alsayyad et al., 2023	4	2	6	2	2	7
Chen et al., 2022	7.21	6.36	8.10	–	–	–
Chen et al., 2024	4.54	2.07*	–	4.00	3.00	6.00
Cortés Martínez et al., 2022	–	–	–	2.80	2.50	3.10
Del Águila-Mejía et al., 2022	3.1–3.3	2.6–2.7*	–	3.0	1.0	4.0–5.0
Du et al., 2022	–	–	–	7.0–11.5	3.8–7.0	9.0–12.5
Durmaz et al., 2022	5.00	1.88	6.29	4.50	2.00	6.00
Galmiche et al., 2023	3.61–5.18	3.55–4.93	3.68–5.43	–	–	–
Geenen et al., 2023	–	–	–	2.6	0.7	5.3
Guo et al., 2023	3.4–3.8	2.9–3.1	4.0–4.8	2.9–3.4	2.5–2.7	3.4–4.2
He et al., 2024	2.4	0	9.9	–	–	–
Huang et al., 2022	7.8	7.4	8.5	–	–	–
Jen et al., 2022	–	–	–	3.64	3.17	4.14
Jiang et al., 2024	5.4	5.2	5.7	–	–	–
Kim et al., 2023	5.2	3.4*	–	4.0	3.0	7.0
Li et al., 2024	3.39–5.04	3.00–4.83	3.55–5.33	3.07–4.61	2.66–4.41	3.33–4.87
Linton et al., 2022	4.8	4.4	5.1	–	–	–
Liu et al., 2023a	3.05	2.63*	–	–	–	–
Liu et al., 2023b	2.29	2.14*	–	–	–	–
Lopez Bernal et al., 2022	4.51	0	11.00	–	–	–
Ma et al., 2022	3.83	3.04	4.62	5.00	3.00	7.00
Ma et al., 2024	–	–	–	2.0–6.0	2.0–4.0	3.0–7.5
Manica et al., 2022	4.5–4.9	4.0–4.4	5.0–5.4	–	–	–
Men et al., 2023	5.84	2.93*	–	5.00	2.00	8.00
Ogata & Tanaka, 2023	2.6–3.7	2.3–3.4	2.8–4.0	2.5	2.3	2.7
Peng et al., 2022	–	–	–	7	5	9
Sreedevi et al., 2023	1.6	2.6*	–	–	–	–
Tanaka et al., 2022	3.03–4.94	1.33–2.19*	–	2.80	2.50	3.10
Wang et al., 2022	6.64	6.20	7.00	–	–	–
Wang et al., 2023	5.7	4.8	6.6	–	–	–
Ward et al., 2022	3.48–4.19	3.43–4.13	3.53–4.26	–	–	–
Watare et al., 2022	–	–	–	7.0	4.0	13.8
Wei et al., 2023	4.6	2.5	6.7	4.4	3.1	6.0
Wu et al., 2022	–	–	–	9	0	17
Xiao et al., 2023	0.99	0.86*	–	–	–	–
Xin et al., 2022	5.50	5.10	5.90	5.03	4.63	5.41
Xin et al., 2023	3.8	3.5	4.1	–	–	–
Xiong et al., 2023	3.27	3.07	3.45	3.04	2.87	3.18
Yadav et al., 2023	–	–	–	4	4	5
Zeng et al., 2023	2.8–4.3	0.8–1.3	7.0–10.1	3.0–4.0	2.0–3.0	4.0–7.0

Note. IQR = interquartile range; LCL = lower confidence level; UCL = upper confidence level.
* *SD.*

10, 2022, through October 16, 2024. Further, we used the following search terms: ("COVID" OR "COVID-19" OR "SARS-CoV-2" OR "2019-nCoV" OR "coronavirus" OR "novel coronavirus") AND ("incubation period" OR "incubation").

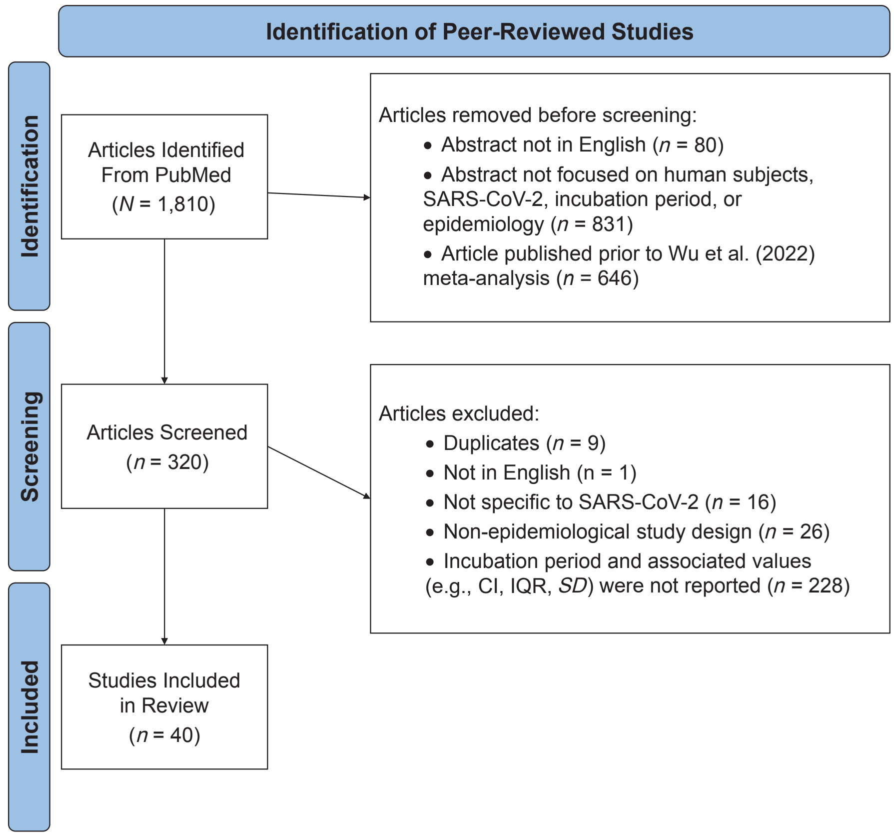
Additionally, we reviewed bibliographies of all identified published articles to identify additional relevant publications that were not captured in the primary literature search. We included studies as eligible for our meta-analysis if they met the following criteria: 1) published in English, with the exception of non-English studies with data available in previous reviews or meta-analyses; 2) human subject epidemiological studies; 3) specific to COVID-19; 4) reported an incubation period; and 5) published after February 10, 2022. We excluded descriptive epidemiological studies, such as case reports and case series. All studies were manually and independently screened by two reviewers. Any studies for which there was disagreement on inclusion/exclusion criteria were reevaluated and confirmed by a third-party reviewer.

Once the relevant published articles were identified, the following data were extracted from each publication: 1) first author, 2) publication year, 3) country studied, 4) study design, 5) study language, 6) study period, 7) COVID-19 variant, 8) sample size, 9) mean or median incubation period, and 10) corresponding 95% confidence interval (CI) or *SD* (σ). We collected these details and manually entered the data into a database. All data extracted were confirmed and checked by another author on the team prior to any analyses.

After collecting the data, standard descriptive statistics were conducted to assess the variability and range of the data from our literature search. Furthermore, we elected to use incubation period estimates of both the mean and the median. The median was included because it is often considered the preferred measure of central tendency, given the variability in incubation periods that can be experienced across populations and individuals. The usual skewness and asymmetrical curve of the data best represent a log-normal distribution, which is commonly observed among infectious disease outbreaks and epidemics, including COVID-19 (Friis & Sellers, 2009; Lilienfeld et al., 1994; McAloon et al., 2020; Scott & Mazhindu, 2005). The

FIGURE **1**

Flowchart of Literature Search for Study Inclusion



Note. CI = confidence interval; IQR = interquartile range.
Source: Page et al., 2021.

mean and median estimates are reported in Table 1. For reported mean estimates, 95% CIs and *SD*s were extracted to calculate corresponding *SE*s for use in the random effects meta-analyses. For median estimates, the CI intervals or interquartile ranges (IQRs) were extracted to calculate pooled medians. If a study presented both vaccinated and unvaccinated individuals, the incubation period of unvaccinated individuals was selected for consistency and to represent a potentially more accurate assessment of incubation period less influenced by vaccination.

Meta-Analyses

Random effects analyses, following the DerSimonian and Laird method, were conducted using the mean and median incubation periods and corresponding *SE*s reported in each article. For articles in which standard CIs were reported, *SE*s were calculated using the CI upper limit (CI_{Upper}) and lower limit (CI_{Lower}) in the following equation:

$$\text{Standard Error} = \frac{(CI_{Upper} - CI_{Lower})}{(2 \times 1.96)} \quad (1)$$

For articles reporting *SD*, the *SE* was calculated with *SD* (σ) and sample size (n) in the following equation:

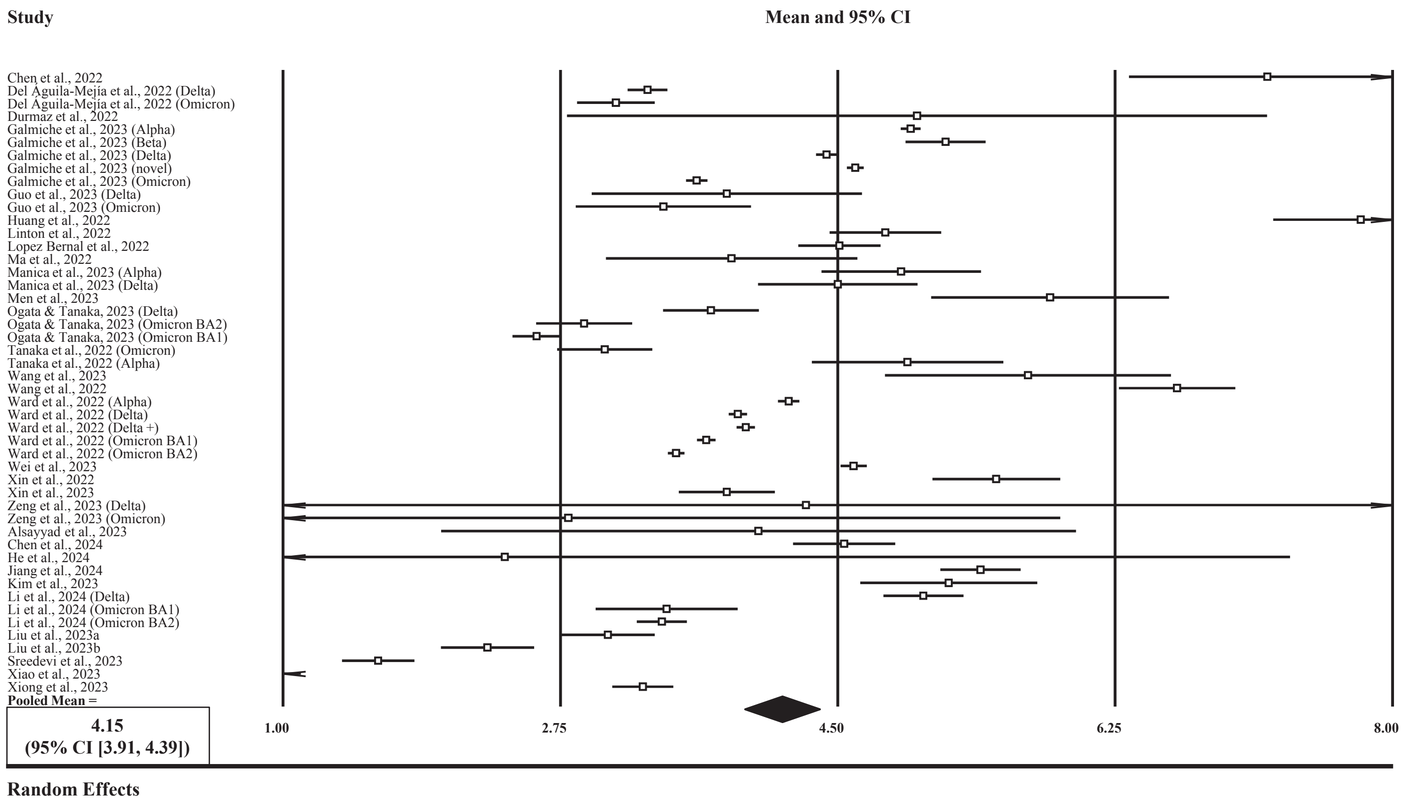
$$\text{Standard Error} = \frac{\sigma}{\sqrt{n}} \quad (2)$$

We conducted subgroup meta-analyses by SARS-CoV-2 variant and by country and region.

Heterogeneity was investigated for each meta-analysis performed, and correspond-

FIGURE **2**

Forest Plot of Mean COVID-19 Incubation Period



Note. CI = confidence interval.

ing I^2 and *p*-values were reported. All meta-analyses were performed in Comprehensive Meta-Analysis software program (CMA Version 4; Borenstein et al., 2022) and in R, specifically the metamedian package (R Core Team, 2025). In instances where the number of medians being pooled included ≤2 effect estimates, the average of the values and range (or IQR) were reported in the results.

Results

Literature Search

The literature search yielded 1,810 publications. Of these, 80 were not published in English; 831 were not focused on human subjects, were not epidemiological-based studies, or did not focus on SARS-CoV-2 or incubation periods; and 646 were published before the Wu, Kang, et al. (2022) meta-analysis on February 10, 2022. Of the remaining 320 publications, 16 were not specific to SARS-CoV-2; 228 did not report an incubation period or associated CI, *SD*/*SE*, or IQR; 26 were excluded due to study design (e.g., letter to the editor); 9 were duplicates; and 1 publication was not published in English. As such, 40 publications were considered for our evaluation (Figure 1).

Descriptive Statistics

A total of 31 studies reported mean incubation periods with corresponding information on CIs or *SD*/*SE*s, and 24 studies reported median incubation period values and corresponding CIs or IQRs. Articles included in our analysis spanned 13 countries, 3 continents, and 5 SARS-CoV-2 variant types (Alsayyad et al., 2023; Chen et al., 2022; Chen et al., 2024; Cortés Martínez et al., 2022; Del Águila-Mejía et al., 2022; Du et al., 2022; Durmaz et al., 2022; Galmiche et al., 2023; Geenen et al., 2023; Guo et al., 2023; He et al., 2024; Huang et al., 2022; Jen et al., 2022; Jiang et al., 2024; Kim et al., 2023; Li et al., 2024; Linton et al., 2022; Liu et al., 2023a, 2023b; Lopez Bernal et al., 2022; Ma et al., 2022; Ma et al., 2024; Manica et al., 2022; Men et al., 2023; Ogata & Tanaka, 2023; Peng et al., 2022; Sreedevi et al., 2023; Tanaka et al., 2022; Wang et al., 2022, 2023; Ward et al., 2022; Watare et al., 2022; Wei et al., 2023; Wu, Chen, et al., 2022; Xiao et al., 2023; Xin et al., 2022, 2023; Xiong et al., 2023; Yadav et al., 2023; Zeng et al., 2023; Zhao et al., 2023) (Table 1).

Meta-Analyses

Figure 2 presents the overall random effects result (meta-risk ratio [RR] or pooled mean) and corresponding 95% CIs for the COVID-19 mean incubation period. Universal heterogeneity was demonstrated across studies, and therefore we present results from our random

TABLE **2**

Pooled Analysis of Mean and Median Incubation Periods by COVID-19 Variant

Variant	Mean			Median		
	# (Effect Estimates) *	Pooled Mean	95% CI	# (Effect Estimates) *	Pooled Median	95% CI
Novel	10	5.51	[4.96, 6.07]	8	4.69	[3.43, 5.95]
Alpha	4	4.73	[4.17, 5.28]	2 **	7.75 **	[4.00, 13.80] **
Beta	1	5.18	[4.93, 5.43]	–	–	–
Delta	13	4.09	[3.74, 4.45]	9	3.71	[3.06, 4.36]
Omicron	20	3.39	[3.00, 3.77]	14	2.80	[2.35, 3.25]
Overall	48	4.15	[3.91, 4.39]	34 ***	3.64	[3.16, 4.13]

Note. CI = confidence interval.
* Multiple effect estimates can come from one article.
** Average of two medians and range reported.
*** One estimate included a combined Omicron and Delta median value, used only in the overall analysis and not the variant specifically.

TABLE **3**

Random Effects Meta-Analysis of Mean and Median COVID-19 Incubation Periods by Geography

Geographic Location	Mean			Median		
	# (Effect Estimates) *	Pooled Mean	95% CI	# (Effect Estimates) *	Pooled Median	95% CI
Asia	32	4.16	[3.60, 4.73]	27	3.77	[3.21, 4.33]
China	21	4.43	[3.69, 5.17]	20	4.00	[3.26, 4.73]
India	1	1.60	[1.37, 1.83]	1	4.00	[4.00, 5.00] **
South Korea	1	5.20	[4.65, 5.76]	1	4.00	[3.00, 7.00] **
Japan	6	3.64	[2.92, 4.35]	2	2.65 ***	[2.31, 3.10] ***
Singapore	2	3.30	[0.76, 5.83]	2	3.50 ***	[2.00, 7.00] ***
Bahrain	1	4.00	[2.00, 6.00]	1	2.00	[2.00, 7.00] **
Europe	16	4.14	[3.88, 4.41]	5	2.86	[1.37, 4.35]
France	5	4.55	[4.07, 5.03]	–	–	–
Italy	2	4.70	[4.31, 5.09]	–	–	–
Spain	2	3.23	[3.04, 3.42]	3	2.88	[2.31, 3.45]
Turkey	1	5.00	[2.80, 7.21]	1	4.50	[2.00, 6.00] **
Belgium	0	–	–	1	2.60	[0.70, 5.30]
UK	6	3.92	[3.70, 4.14]	–	–	–
Africa	0	–	–	1	7.00	[4.00, 13.80] **
Ethiopia	0	–	–	1	7.00	[4.00, 13.80] **

Note. CI = confidence interval.
* Multiple effect estimates can come from one article.
** Interquartile range.
*** Average of two medians and range reported.

effects models exclusively (I^2 = 99.1%, p = .000). Of the 31 studies included in the meta-analysis of mean incubation period, there were 48 effect estimates in total (i.e., multiple estimates from one article for variant type). The overall meta-RR for the mean incubation period was 4.15 days (95% CI [3.91, 4.39]). Of the 24 studies included in the pooled analysis of median incubation periods, there were 34 effect estimates that yielded a pooled median of 3.64 days (95% CI [3.16, 4.13]) (Table 2). The overall median of the medians was 3.82 (95% CI [3.0, 4.51]), whereas the average of the medians was 4.14 (95% CI [3.54, 4.73]).

When considering SARS-CoV-2 variants, the mean incubation period decreased chronologically with each successive variant, apart from the Beta variant. Of note, however, analysis of the Beta variant included only one study and, as such, the reported mean incubation period could be biased because of the small sample size. The pooled mean incubation period meta-RR for the novel variant was 5.51 days (n = 10 effect estimates, 95% CI [4.96, 6.07]), whereas the mean incubation period for the Omicron variant decreased to 3.39 days (n = 20 effect estimates, 95% CI [3.00, 3.77]). Similarly, the pooled median incubation period meta-RR of the novel variant was 4.69 days (n = 8 effect estimates, 95% CI [3.43, 5.95]), whereas the median incubation period for the Omicron variant decreased to 2.80 days (n = 14 effect estimates, 95% CI [2.35, 3.25]). The pooled mean and median for each variant are reported in Table 2.

We also examined mean and median incubation periods across geographical locations among the countries and regions in the eligible studies. These locations (Table 3) included Asia (China, India, South Korea, Japan, Singapore, and Bahrain), Europe (France, Italy, Spain, Turkey, Belgium, and the UK), and Africa (Ethiopia). There were no eligible studies from the U.S. Among the studies examining COVID-19 in Asia, 32 effect estimates yielded a pooled mean incubation period of 4.16 days (95% CI [3.60, 4.73]) and a pooled median incubation period of 3.77 days (95% CI [3.21, 4.33]). The pooled mean incubation period among studies focused on European populations was 4.14 days (95% CI [3.88, 4.41]) and the pooled median incubation period was 2.86 days (95% CI [1.37, 4.38]). Ethiopia was the only country examined in this analysis from Africa; the median incubation period, based on one value, was 7 days (95% CI [4.00, 13.80]).

Discussion

COVID-19 Incubation Period Evolution

To our knowledge, this analysis is the first updated meta-analysis of COVID-19 incubation periods since 2023 (Xu et al., 2023) and demonstrates lower mean and median incubation periods for COVID-19 than most previously published meta-analyses. We observed a pooled mean incubation of 4.15 days (95% CI [3.91, 4.39]) across all geographic locations and variants and an overall pooled median incubation period of 3.64 days (95% CI [3.16, 4.13]).

McAloon et al. (2020) conducted a rapid systematic review and meta-analysis including 8 published studies and reported a mean incubation period of 5.8 days (95% CI [5.0, 6.7]) and a median incubation period of 5.1 days (95% CI [4.5, 5.8]) for the novel variant. A 2021 World Health Organization (WHO) meta-analysis combined findings from 72 published studies and reported that the average incubation period for the COVID-19 novel variant was 6.3 days (95% of estimates were between 1.8 and 11.9 days) and the median incubation period was 5.4 days (95% of estimates were between 2.0 and 17.9 days) (Xin et al., 2021).

In December 2021, CDC stated that the incubation period for COVID-19 was 2–14 days, with a median of 5 days (CDC, 2025b). Relying on a systematic review and meta-analysis published by Alene et al. (2021), the next year CDC noted that the average incubation period for COVID-19 was approximately 6.5 days, but that the incubation period could extend up to 14 days (CDC, 2024b).

A systematic review and meta-analysis by Du et al. (2022) reported that the overall mean incubation period for combined SARS-CoV-2 variants ranged from 3.0 to 6.5 days. Furthermore, when considering differences in variants, these authors reported a mean incubation period of 4.8 days for the Delta variant and 3.6 days for the Omicron variant.

Similarly, Wu, Chen, et al. (2022) reported that the mean incubation period for the Alpha variant was 5.00 days, Beta variant was 4.50 days, Delta variant was 4.41 days, and Omicron variant was 3.42 days. The next year, Xu et al. (2023) reported based on their meta-analysis that the novel variant had a pooled mean incubation period of 6.5 days, followed by the Alpha variant at 4.92 days, the Delta variant at 4.63 days, and the Omicron variant at between 3.49 days and 4.06 days. Several authors have noted that as SARS-CoV-2 continues to mutate, the incubation period for each new variant of concern appears to shorten (Wu, Kang, et al., 2022; Xu et al., 2023).

Our results are consistent with this observation, demonstrating a chronological reduction in incubation period by variant and an overall lower pooled mean and median compared with findings from previous meta-analyses. Moreover, our findings are consistent with previously published meta-analyses, which have reported median incubation periods to be shorter than the mean incubation period, as well as the finding of the log-normal distribution and normal skewedness of the COVID-19 incubation period data.

The emergence of a gradual shortening of pooled mean and median COVID-19 incubation periods reported across meta-analyses since 2020—specifically including the further shortening of pooled incubation periods reported in our analysis since the publication of Wu, Kang, et al. (2022)—demonstrates the continued evolution of SARS-CoV-2 variants beyond the initial onset of the COVID-19 pandemic (Gregory & Hall, 2026).

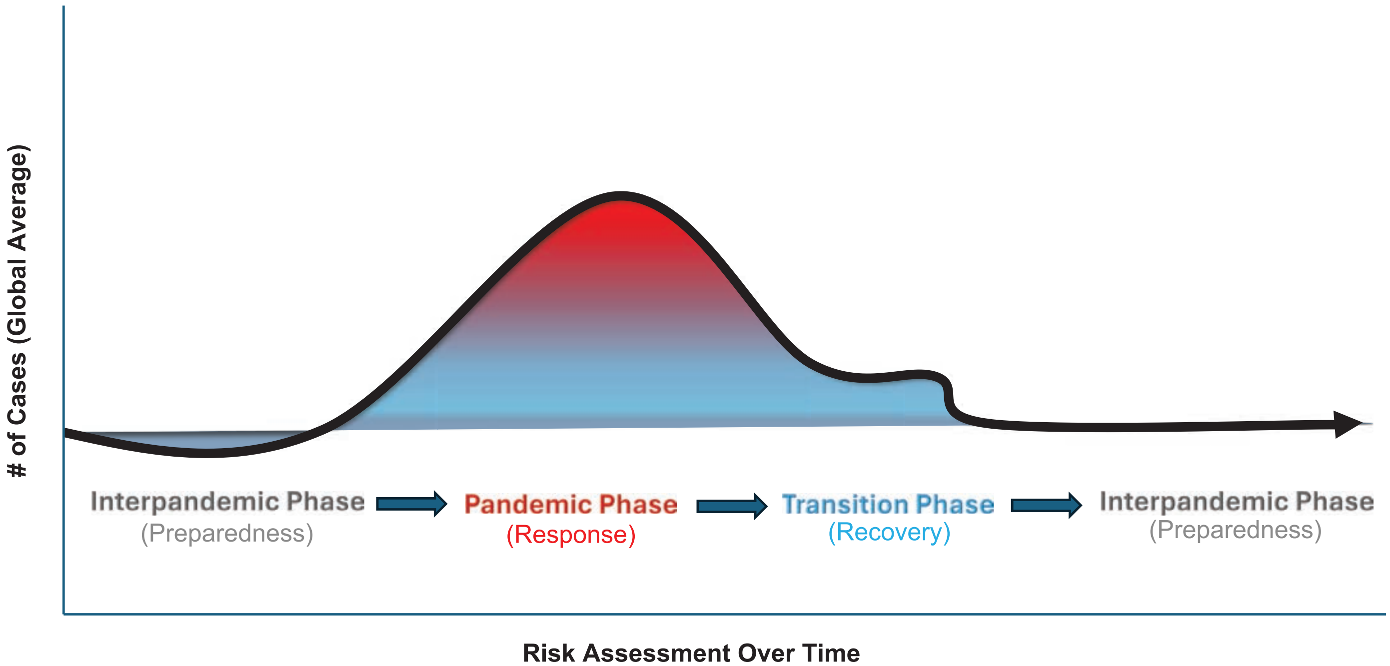
Heterogeneity

Our results were found to be heterogeneous. As such, random effects were used in lieu of fixed effects to account for inverse variance weighting. Although heterogeneity indicates issues with pooling estimates (i.e., publication bias), our heterogeneity results were consistent with other meta-analyses of COVID-19, for example that Wu, Kang, et al. (2022) reported I^2 = 98.8% for pooled mean and Xin et al. (2021) reported I^2 = 81% for pooled mean.

This finding of heterogeneity is neither surprising nor unexpected, as the reviewed meta-analyses also indicate moderate to high heterogeneity in studies spanning the globe and assessing different variants across different timelines. Given that factors such as government regulations, access to testing and vaccines, and herd immunity can affect individual studies that report incubation periods, the variability across all studies would be virtually impossible to account for statistically. Therefore, it is not surprising that heteroge-

FIGURE **3**

The Continuum of Pandemic Phases



Note. Adapted from the World Health Organization, 2017.

neity is present when grouping or pooling these studies for public health investigations.

Continued Research and Emergency Preparedness and Response Through the Continuum of Pandemic Phases

According to a scoping review of infectious disease articles assessing priority areas and indicators for public health emergency preparedness, Lee et al. (2023) observed that continued research and evidence-informed decision-making are central concepts that are key for infectious disease emergency preparedness and response. Specifically, the importance of building capacity for ongoing data collection and analysis, as well as continued research for informed evidence-based decision-making were emphasized.

As the SARS-CoV-2 virus continues to evolve, new variants likely will replace previous ones, and epidemiological studies assessing infectiousness, severity, and virulence of these new variants will continue to be essential for ongoing public health preparedness and response (CDC, 2025c). Although many communities have moved from the pandemic phase to transition or interpandemic phases, COVID-19 remains a major public health threat in need of updated research for ongoing evidence-based decision-making.

Preparedness is once again placed at the forefront of the public health risk assessment continuum, as observed in the continuum of pandemic phases (Figure 3). The phases highlight the importance of the cyclical nature of pandemics within the context of the all-hazards approach to public health risk management (CDC, 2016, 2025c; WHO, 2017). In this instance, as the pandemic risk decreases there is a de-escalation of actions, leading to a reduction in response activities and a shift toward recovery (i.e., the transition phase). Following recovery, there is another transition to the interpandemic phase, which is characterized by renewed preparedness based principally on updated virological, epidemiological, and clinical data and research (WHO, 2017).

Thus, as communities across the globe transition through the continuum of pandemic phases, and as public health agencies once again prioritize preparedness in the all-hazards approach to public health risk management, evidence-based decision-making—as informed by updated and ongoing epidemiological assessments, data, and research—will be essential for the continuous planning, implementation, and revision of public health response plans, policies, and actions (CDC, 2016; European Centre for Disease Prevention and Control, 2025; WHO, 2017).

The results of our analysis provide valuable and updated epidemiological insights into the continued evolution of COVID-19 incubation periods. This information is crucial for developing or updating COVID-19 prevention and control strategies throughout the continuum of pandemic phases, particularly as communities transition to the interpandemic phase, during which additional vigilance and assessment of public health research and data are essential for evidence-based public health preparedness.

Limitations

Our results were heterogeneous. As a rapidly evolving virus, SARS-CoV-2 poses difficulties in real-time surveillance, tracking, and reporting of global incubation periods. As such, our analysis cannot present all incubation periods. We do, however, provide a comprehensive updated assessment of current published epidemiological literature on the topic of COVID-19 incubation periods. The range in severity of symptoms could also limit public health tracking because asymptomatic individuals and individuals with minor symptoms might have been less likely to be tested. Furthermore, many of the studies included in this assessment used self-reported data of symptom onset, which could be subject to self-reporting bias or recall bias.

Conclusion

Assessing the evolving virulence of the SARS-CoV-2 virus and COVID-19 incubation periods can inform accurate and timely public health guidance and recommendations, as well as inform future emergency preparedness and response planning. The pooled mean incubation period of COVID-19 in our meta-analysis was 4.15 days (95% CI [3.91, 4.39]) and the pooled median incubation period was 3.64 (95% CI [3.16, 4.13]). The consistent trend of shortening mean and median incubation periods of COVID-19, as reported here, is in line with previous meta-analyses. This finding indicates that SARS-CoV-2 variants have continued to evolve beyond the initial years of the 2020 pandemic outbreak. Results from our study can inform continued public health preparedness and aid in developing or updating future COVID-19 prevention and control strategies as communities transition through the continuum of pandemic phases.

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