

1 **Title:**

2 **Reduction in time delay of isolation in COVID-19 cases in South Korea**

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25 **Abstract**

26 Korean public health authorities raised the public alert to its highest level on February 23,
27 2020 to mitigate the 2019 novel coronavirus disease epidemic. We have identified that the mean
28 delay from symptom onset to isolation was reduced to one day after raising the alert. Vigilance
29 can reduce this interval.

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31 **Main text**

32 Since the first case of the 2019 novel coronavirus disease (COVID-19) was identified in South
33 Korea on January 20, 2020 [1], COVID-19 has infected 9,887 people and killed 165 in South
34 Korea as of April 1, 2020 [2]. In the early phase of the COVID-19 epidemic in Korea, Korean
35 public health authorities mainly conducted contact tracing of confirmed cases and quarantining
36 of confirmed and suspected cases [1]. However, as the number of COVID-19 cases increased,
37 Korean public health authorities raised the infectious disease alert to red alert on February 23,
38 2020 [3]. Central disaster and safety countermeasures were set up and addressed the public alert
39 to report illness related to COVID-19 to public health authorities for screening.

40 To assess the response's impact during the highest alert phase in Korea, we obtained data
41 on 576 confirmed COVID-19 cases reported from the Korea Centers for Disease Control and
42 Prevention, the city department of public health, and news reports for February 1–March 30,
43 2020. We extracted information about confirmed cases using a structured data-extraction form.
44 We used case-based data on the date of exposure of confirmed cases, date of illness onset, and
45 date of isolation. We compared the time interval from illness onset to isolation before and during
46 the red alert (after February 23, 2020), assuming that the number of intervals was log-normal,
47 Weibull, or gamma-distributed (Appendix). Further, we conducted a similar analysis to identify
48 the interval from exposure to isolation. The range of intervals was reported with 95% confidence
49 intervals (2.5th and 97.5th percentiles). To identify the difference between these intervals in the
50 early epidemic and during the red alert, we conducted a Mann–Whitney U test. All statistical
51 analyses were performed in R version 3.0.2 (R Foundation for Statistical Computing).

52 Of the 576 laboratory-confirmed cases reported (6% of the 9,786 Korean COVID-19
53 cases as of March 31, 2020), 211 included the date of exposure, illness onset, or isolation and

54 were analyzed (Appendix). The mean delay between symptom onset and isolation was 4.3 days
55 (95% CI 0.5–11.3 days) in the early phase and 3.3 days (95% CI: 0.5–9.4 days) during the red
56 alert. This reduction was significantly lower than in the early phase of COVID-19 epidemics in
57 Korea (p -value = 0.02). The mean delay from exposure to a confirmed case to isolation was 7.2
58 days (95% CI 1.7–14.4 days) before the red alert and 6.5 days (95% 1.7–15.7 days) during the
59 red alert (Figure). Therefore, the mean delay was shortened by 0.8 days; however, this was not
60 significantly lower (p -value = 0.07).

61 Most COVID-19 transmissions occur during the presentation of symptoms of cases;
62 therefore, we believe that COVID-19-affected countries are making efforts to reduce the time
63 delay from symptom onset to isolation by strengthening countrywide surveillance and control
64 programs for COVID-19. In Korea, to enhance the surveillance, public health authorities have
65 operated 80 drive-through screening centers (operated since February 23, 2020) and have
66 designated 341 private hospitals as public relief hospitals for COVID-19 (operated since
67 February 25, 2020) [4, 5]. This provided easier access to screening tests for suspected cases of
68 COVID-19 in the community compared to the early phase and could reduce the interval from
69 symptom onset to isolation.

70 The delay from illness onset to isolation early in the epidemic in Korea is relatively
71 shorter than that in China (mean estimate of 5.8 days, 95% CI 4.3–7.5 in early January 2020) [6].
72 However, more efforts are needed from public health authorities and the public to prevent the
73 potential spread of COVID-19 in communities since the infectiousness of COVID-19 begins
74 before illness onset [7].

75 Our study has some limitations. We estimated the time delay based on self-reported data
76 and obtained data from various sources. Additional studies should incorporate more detailed
77 information from additional laboratory-confirmed cases.

78 Efforts to reduce this interval are ongoing in South Korea and vigilance in other countries
79 can reduce this interval.

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87 **About the Author**

88 Dr. Ryu is an assistant professor of preventive medicine at Konyang University, Daejeon, South
89 Korea. His research interests include infectious disease epidemiology with focus on influenza
90 and public health interventions.

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116 **FIGURE LEGEND**

117 **Figure.** Distribution of interval from symptom onset to isolation and exposure to isolation. (A)
118 Symptom onset to isolation data from 211 cases in South Korea early in the epidemic. The black
119 line is the estimate before the red alert was implemented on February 23, 2020 and indicates a
120 fitted gamma distribution. The red line is the estimate during the red alert and indicates a fitted
121 log-normal distribution. (B) Data of exposure to isolation from 174 cases in South Korea. The
122 black line is the estimate before the red alert was implemented on February 23, 2020 and
123 indicates a fitted gamma distribution. The red line is the estimate during the red alert and
124 indicates a fitted log-normal distribution.

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