

Development of an Indicator-Based Framework for Epidemic Phase Classification in Emerging Respiratory Infectious Diseases

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OBJECTIVE

The COVID-19 pandemic underscored the necessity of timely, evidence-informed policy responses to emerging infectious disease outbreaks.

In South Korea, crisis management protocols define decision-making structures but often rely on qualitative judgments rather than data-informed indicators.

This study aimed to develop a structured, consensus-based framework using quantifiable indicators to classify epidemic phases of emerging respiratory infectious diseases.

METHOD

A two-round Delphi survey was conducted with 39 multidisciplinary experts representing clinical medicine, public health, and health policy.

Participants rated the importance and prioritization of 15 candidate indicators derived from the guidance of the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC).

Consensus and stability of indicators were assessed using statistical criteria, with the content validity ratio (CVR) calculated to evaluate expert agreement.

RESULTS

Based on the Delphi survey results, four key indicators were identified for assessing epidemic phases of emerging respiratory infectious diseases:

- (1) Incidence rate per 100,000 population per week,
- (2) Reproduction number (R_t),
- (3) Case fatality rate, and
- (4) New ICU admissions per 100,000 population per week.

All selected indicators demonstrated acceptable content validity.

Experts recommended classifying each selected indicator into three levels of intensity (low/medium/high), and determining the overall epidemic phase through an aggregate scoring method based on the WHO framework. Furthermore, epidemic phases were recommended to be adjusted at intervals of three to four weeks.

This framework provides a methodological structure that standardizes assessment indicators of the epidemic situation and the method for determining and adjusting epidemic stages. It facilitates transparent, repeatable policy decisions and can be adapted to local health system capacities and epidemiological contexts.

Table 1. Importance and content validity ratio of key indicators from second-round Delphi survey

Indicator	Importance		Content Validity Ratio (CVR)
	Mean	SD	
Incidence rate (per 100,000/week)	8.67	2.51	0.83
Reproduction Number (R _t)	8.29	2.01	0.83
Case Fatality Rate (%)	8.25	1.87	0.83
New ICU Admissions (per 100,000/week)	7.67	1.34	0.58

Table 2. Scoring framework for epidemic staging of emerging respiratory infectious diseases (unit: points)

Indicator	Incidence rate (per 100,000 /week)	Case Fatality Rate (%)	Reproduction Number (R _t)	New ICU Admissions (per 100,000 /week)
Intensity				
Low	0	0	0	0
Medium	1	1	1	1
High	2	2	2	2

CONCLUSIONS

This indicator-based framework offers a structured foundation to enhance national preparedness and decision-making in future emerging respiratory infectious disease outbreaks. It contributes to improved data-informed situational awareness, optimized resource allocation, and more ethical, equitable, and coordinated public health responses.

Future work will focus on validating threshold levels, fostering community deliberation, and incorporating diverse public input into infectious disease preparedness and response systems.

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