The Clinical Meaning of Severe Acute Respiratory Infection Surveillance System during COVID-19 Pandemic

고려의대 이영석

호흡기감염병 연구회

- **2015. 05.**
  - MERS 민관종합대응 Task Force Team (TFT) 대한결핵 및 호흡기학회 이사장 신동호/총무이사 김영균 참석
  - 대한결핵 및 호흡기학회 내 MERS 대응 TFT 구성 제안
  - 대외협력이사 심재정교수를 위원장으로 하는 MERS 대응 TFT 구성
    - 위원장 : 심재정(고려의대)
    - 위 원 : 김동규(한림의대), 유광하(건국의대), 김제형(고려의대), 이상민(서울의대), 홍상범(울산의대), 임성용(성균관의대), 이진국(가톨릭의대), 민경훈(고려의대) 이상 8명

호흡기감염병 연구회

- 최근 호흡기바이러스 질환이 계속하여 유행하고 있지만 매번 감염쪽에서 주도적으로 대정부 활동 등을 하고 있음. 실제로 일선 현장에서는 호흡기내과가 발로 뛰고 있는데도 불구하고 호흡기내과가 배제되고 있는게 현실임. 이번에도 타학회에 비해 우리학회의 움직임이 늦은감이 있지만 우리학회도 이번을 계기로 학회가 선도적으로 대정부 활동 등을 담당할 기구(연구회) 개설이 필요함

중증 호흡기 감염병 연구회 설립

회 장 : 심재정 (고려대)

부회장: 서지영 (성균관대), 박용범 (한림대), 총 무 : 유광하 (건국대), 김제형 (고려대)

간 사 : 민경훈 (고려대), 재 무 : 이진국 (가톨릭대), 학 술 : 임성용 (성균관대)

정 보 : 김동규 (한림대), 운영위원 : 홍상범 (울산대), 이상민 (서울대)

호흡기감염병 연구회

PROGRAM

13:30~14:00	등 록	
14:00~14:15	중증 호흡기 감염병 연구회 창립식	사회 : 김제형
	축 사	신동호 대한결핵 및 호흡기학회 이사장
	인사말	심재정 중증 호흡기 감염병 연구회 회장
	경과보고	민경훈 중증 호흡기 감염병 연구회 간사
	Session I. 중증 호흡기 감염병의 이해	**좌장 : 신동호**
14:15~14:45	중증 호흡기 감염병 개요 및 현황	박용범 (한림의대 내과)
14:45~15:15	질병관리본부의 호흡기 감염병 감시 및 대응 체계	이동한 (질병관리본부 감염병관리센터 감염병감시과장)
15:15~15:45	중증 호흡기 질환과 관련된 바이러스 특성 및 실험실 감시	김기순 (국립보건연구원 인플루엔자바이러스과 과장)
15:45~16:05	Coffee break	
	Session II. 중증 호흡기 감염병 연구회가 나아가야 할 길	**사회 : 임성용**
16:05~16:50	중증 호흡기 감염병 연구회 로드맵	임성용 (성균관의대 내과)
16:50~17:10	대한결핵 및 호흡기학회 모바일 앱을 이용한 호흡기 감염병 감시 시연	M2커뮤니티
17:10~17:20	폐 회	

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호흡기감염병연구회

1기 회장 (2016): 심재정 (고려의대)

2기 회장 (2019): 서지영 (성균관의대)

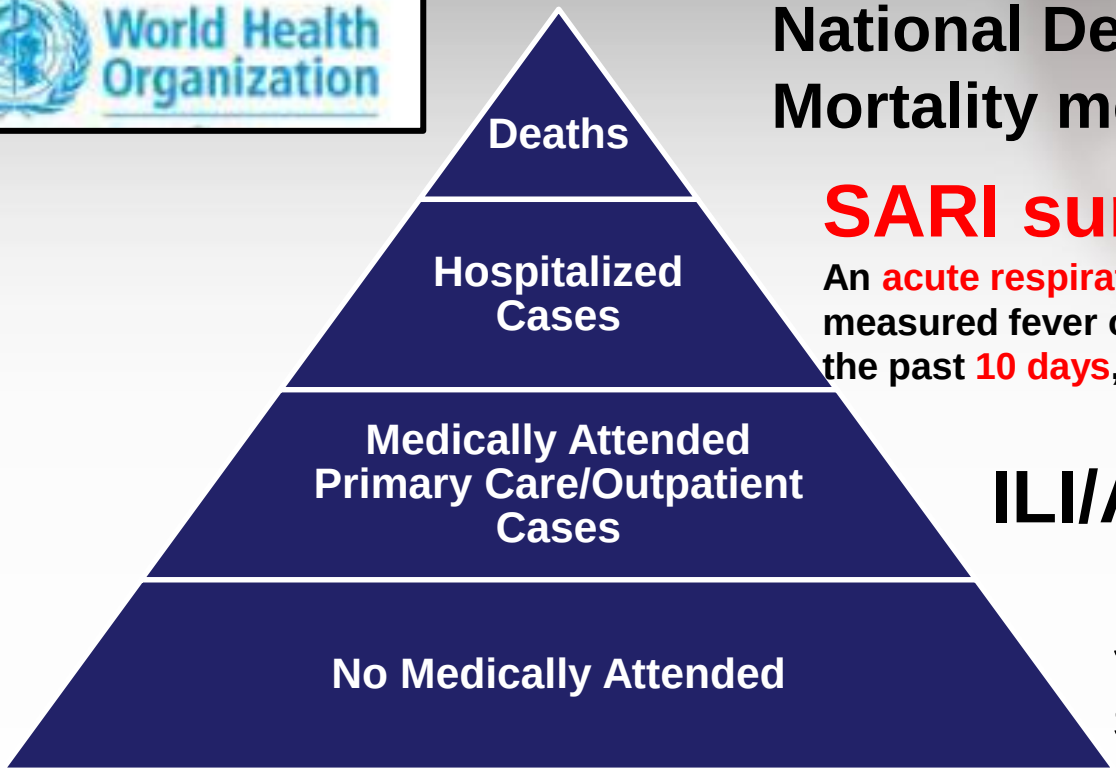
3기 회장 (2021): 전경만 (성균관의대)

호흡기감염병 연구

- Severe Acute Respiratory Infection Surveillance
- Prospective, multicenter, observational study on severe coronavirus disease 2019
  - **14개 병원 참여**
  - **125명 환자 임상 정보 수집 및 369 검체 수집**
- Carbapenem resistance gram negative bacteria pneumonia/bacteremia
  - **14개 병원 참여**
  - **739명 환자 임상 정보 수집**
- Surveillance of Korean adults with hospital acquired pneumonia

Severe Acute Respiratory Infection (SARI)

World Health Organization



National Death Reporting, Mortality modeling

SARI surveillance

An acute respiratory illness with a history of fever or measured fever of ≥ 38℃ and cough with onset within the past 10 days, requiring hospitalization

ILI/ARI surveillance

Surveys and serological studies

The spectrum of influenza infections and the respective surveillance methods based on EURO/WHO's Guidance for Sentinel Influenza Surveillance in Humans

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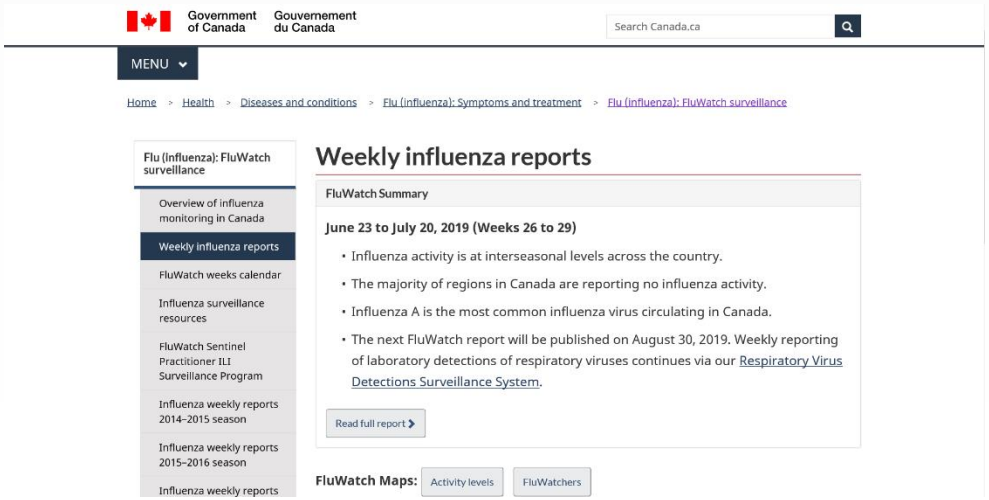
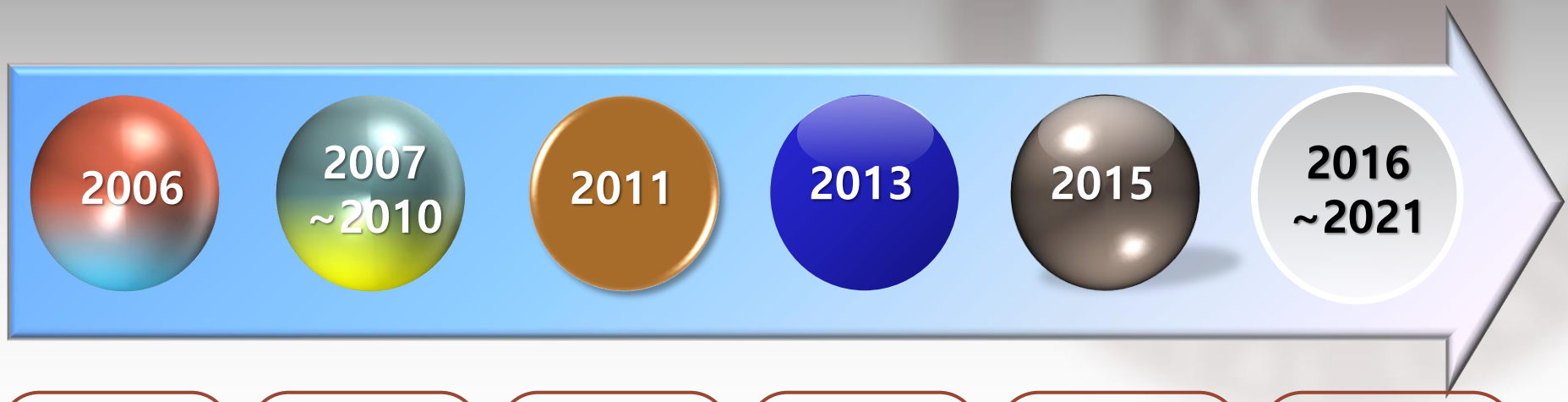
SARI surveillance

호흡기감염병의 조기 인지와 유행양상과 중증도 파악하여
이에 따른 조기에 적절한 대응이 필요

SARI surveillance



SARI surveillance



- 2006: •시범사업을 통한 병원기반 감시체계 모델구축 •9개 기관
- 2007~2010: •지역사회획득 폐렴(CAP) 입원환자감시 •폐렴/인플루엔자 (P&I) 사망자감시 •19~40개 기관
- 2011: •의료관련감염병 표본감시와 통합운영 •100개 표본 (P&I 50개 기관)
- 2013: •중증호흡기감염병 실험실감시 시범운영 (중증폐렴 입원환자 대상): 6개/30기관
- 2015: •중증급성호흡기 감염증감시(SARI)시범운영 •16개 기관 •SARI 웹신고시스템 개발
- 2016~2021: •사업책임기관 변경 •SARI 감시 전체기관으로 확대 •연중감시

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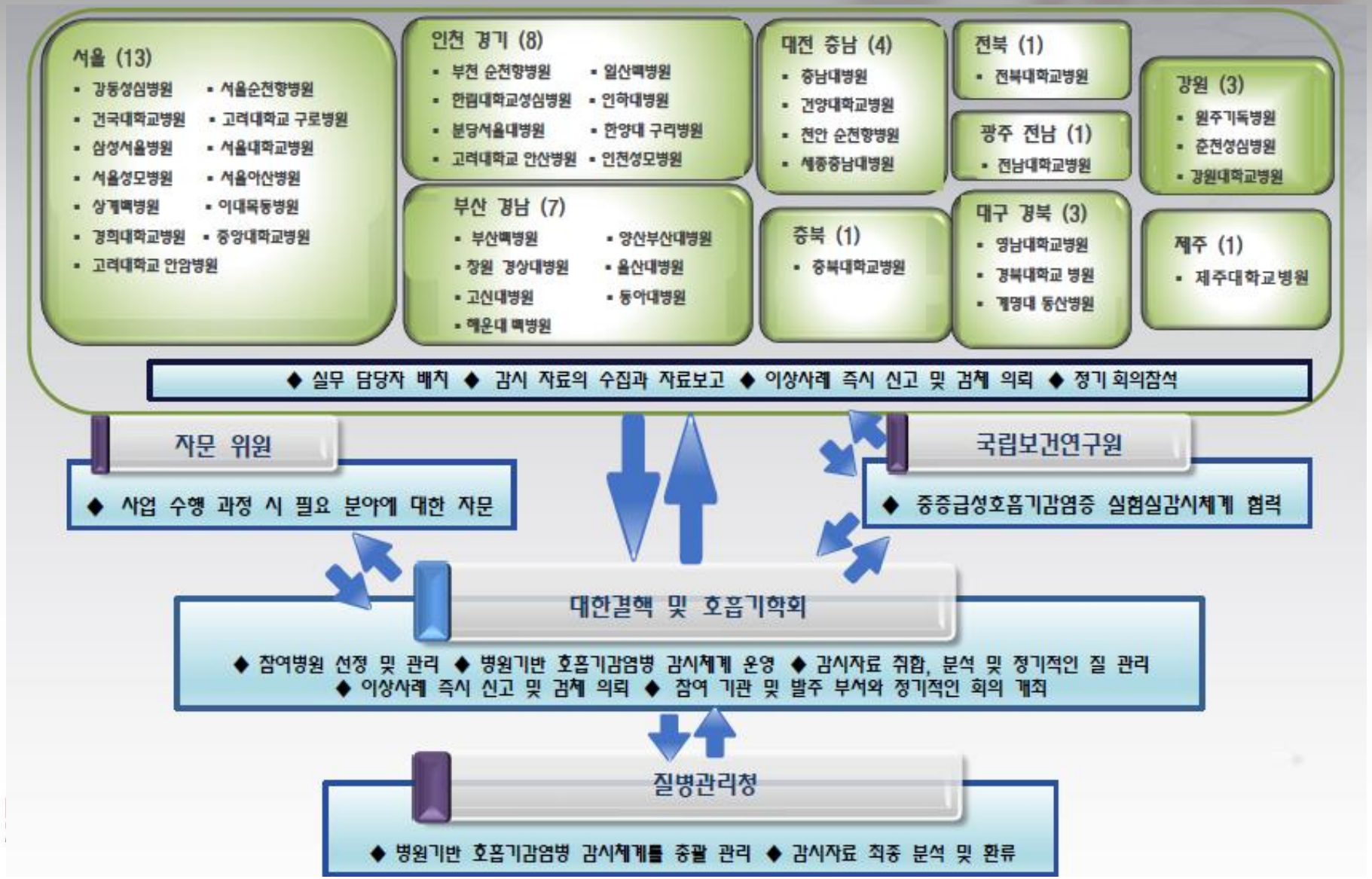
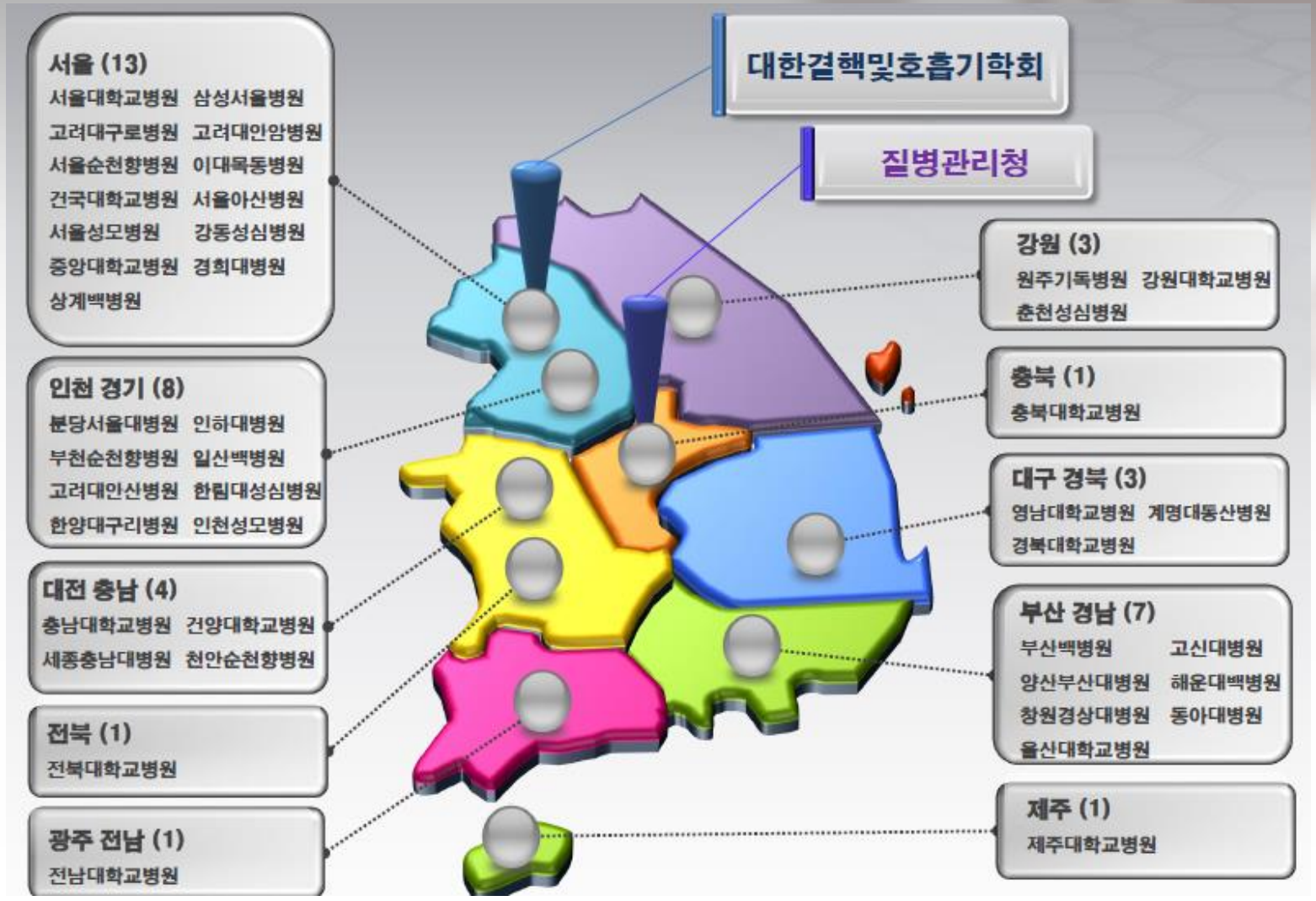
SARI surveillance (2016)

SARI surveillance (2021)

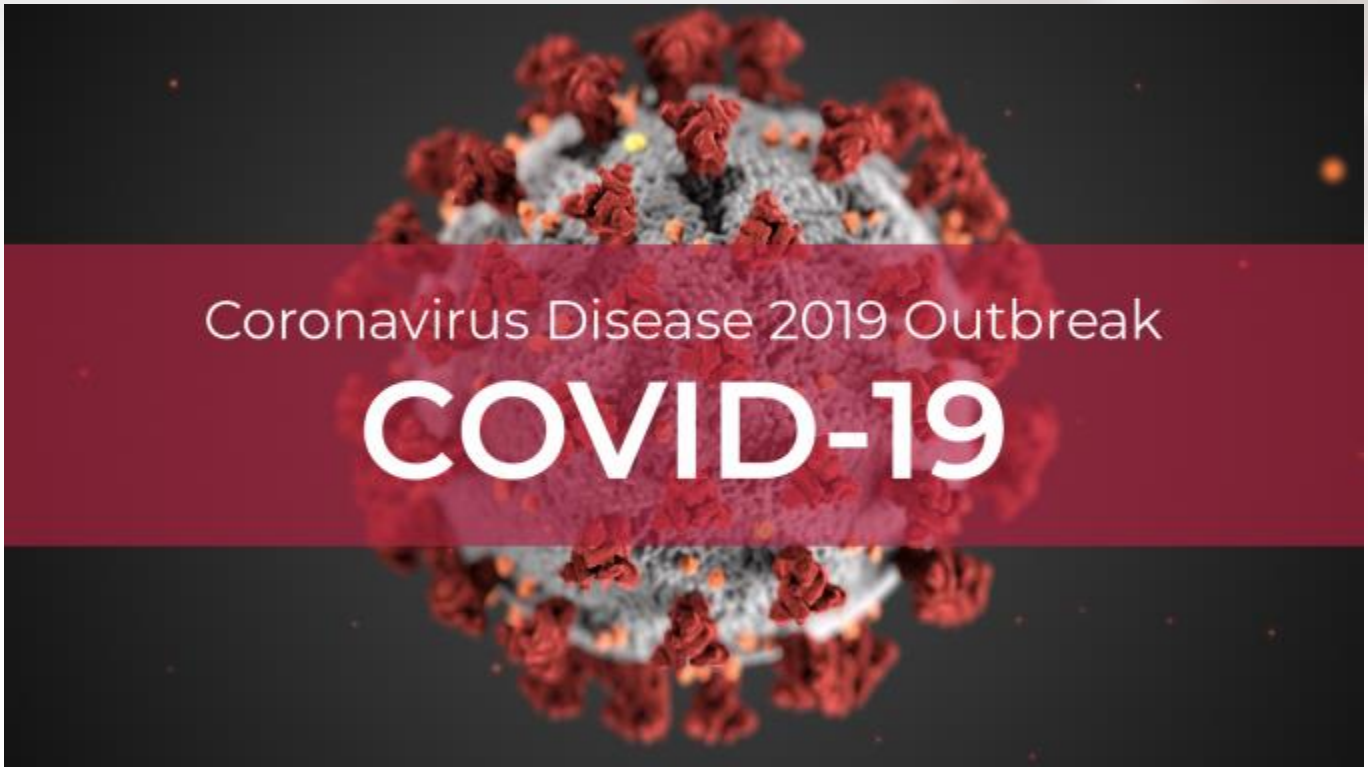


SARI surveillance (2021)



COVID-19 Pandemic

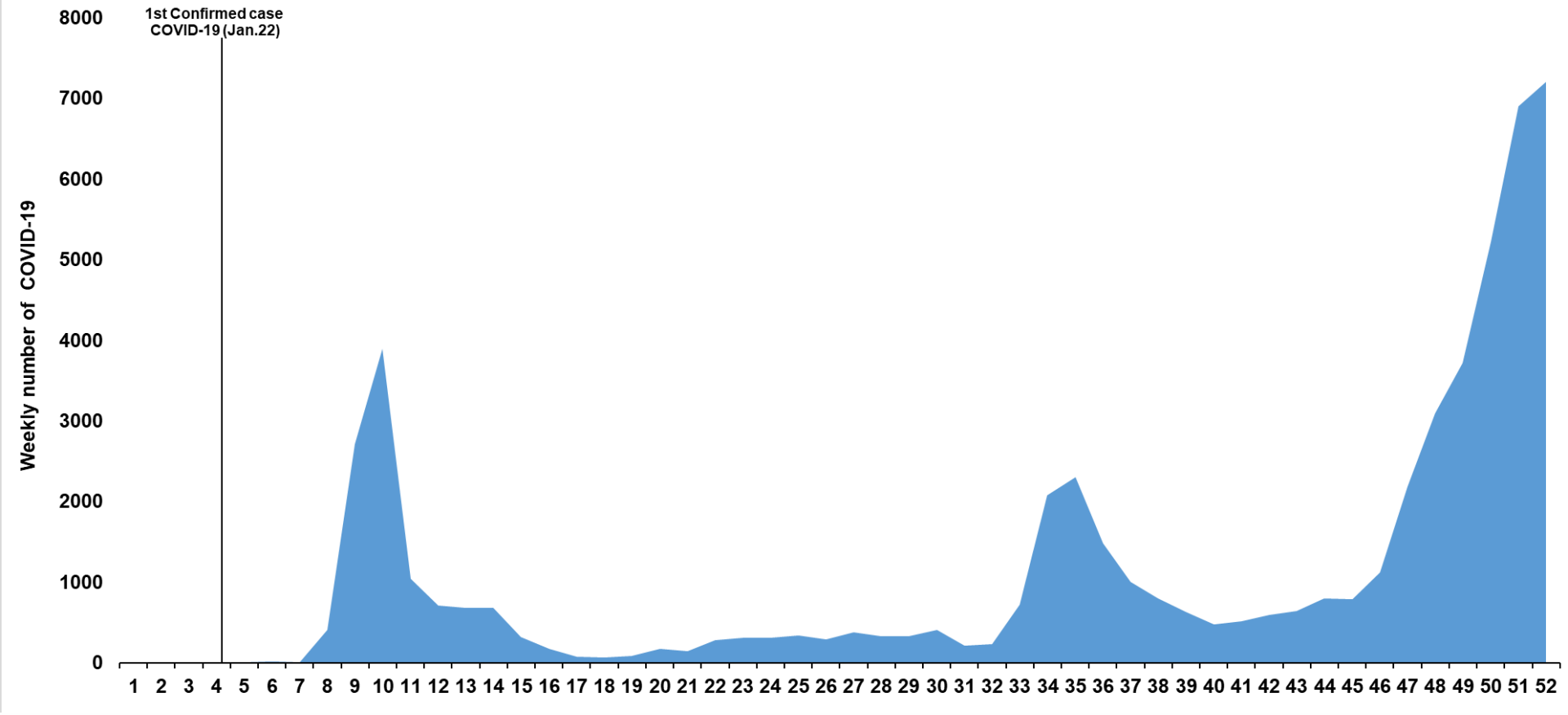
2019.12 COVID-19



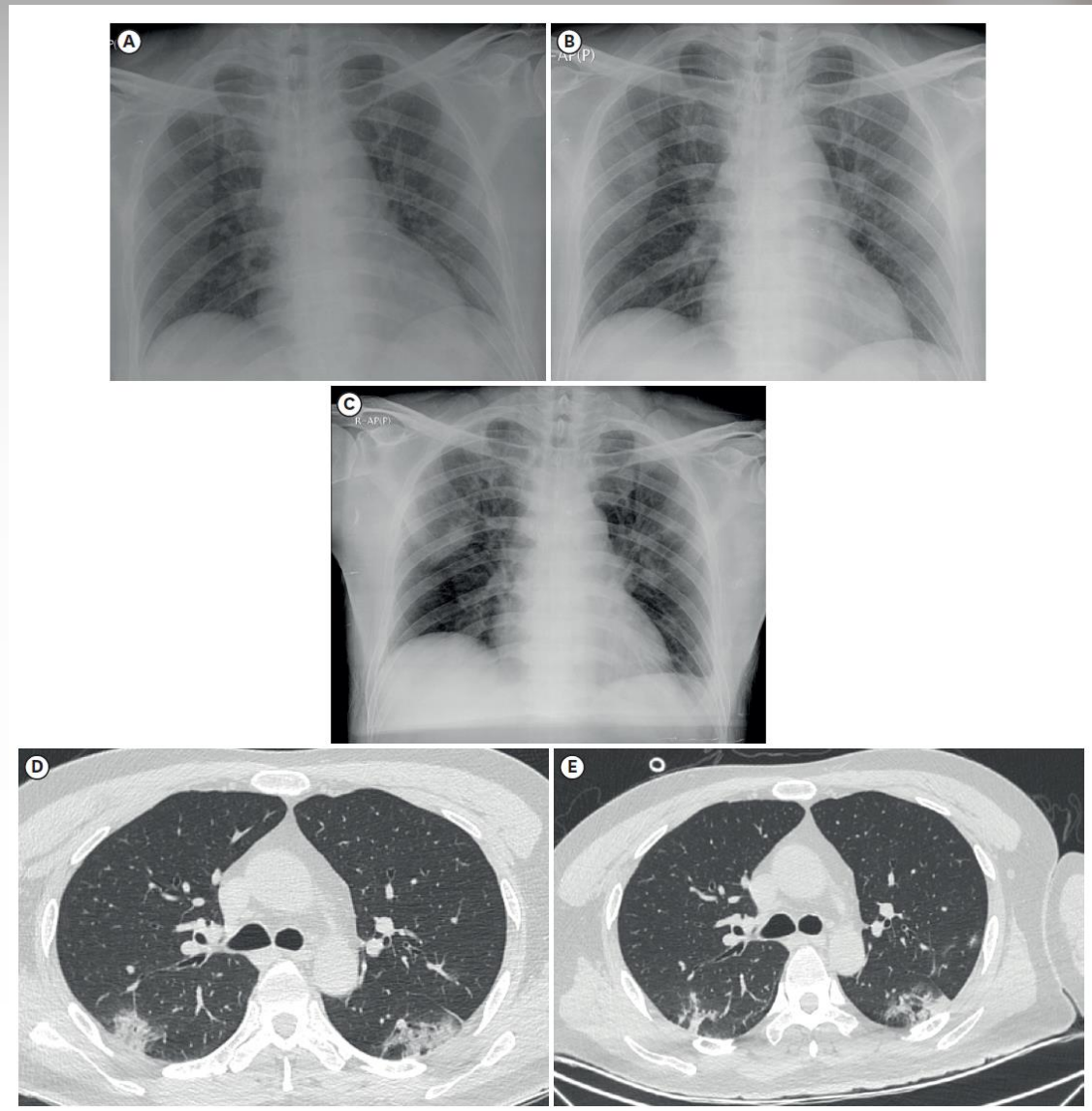
COVID-19 Pandemic

2020.3 COVID-19 Pandemic

COVID-19 in Korea



COVID-19 index case



JKMS 2020;35:e79

COVID-19 index case

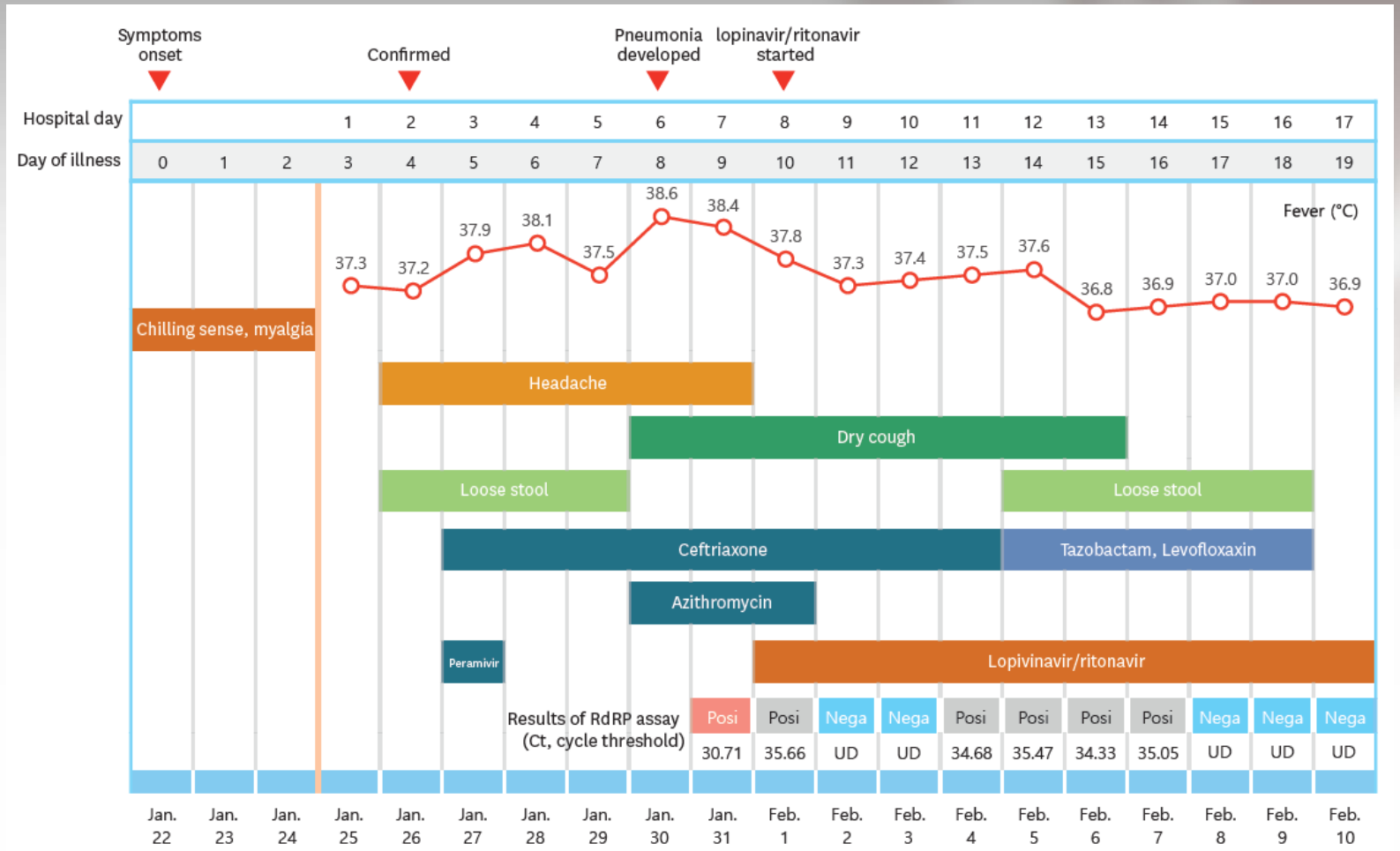


Fig. 2. Clinical course, treatment and viral load of the patient.
RdRP = RNA-dependent RNA polymerase, Posi = positive, Nega = negative, UD = undeteced, Ct = cycle threshold.

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JKMS 2020;35:e79

COVID-19 in Daegu

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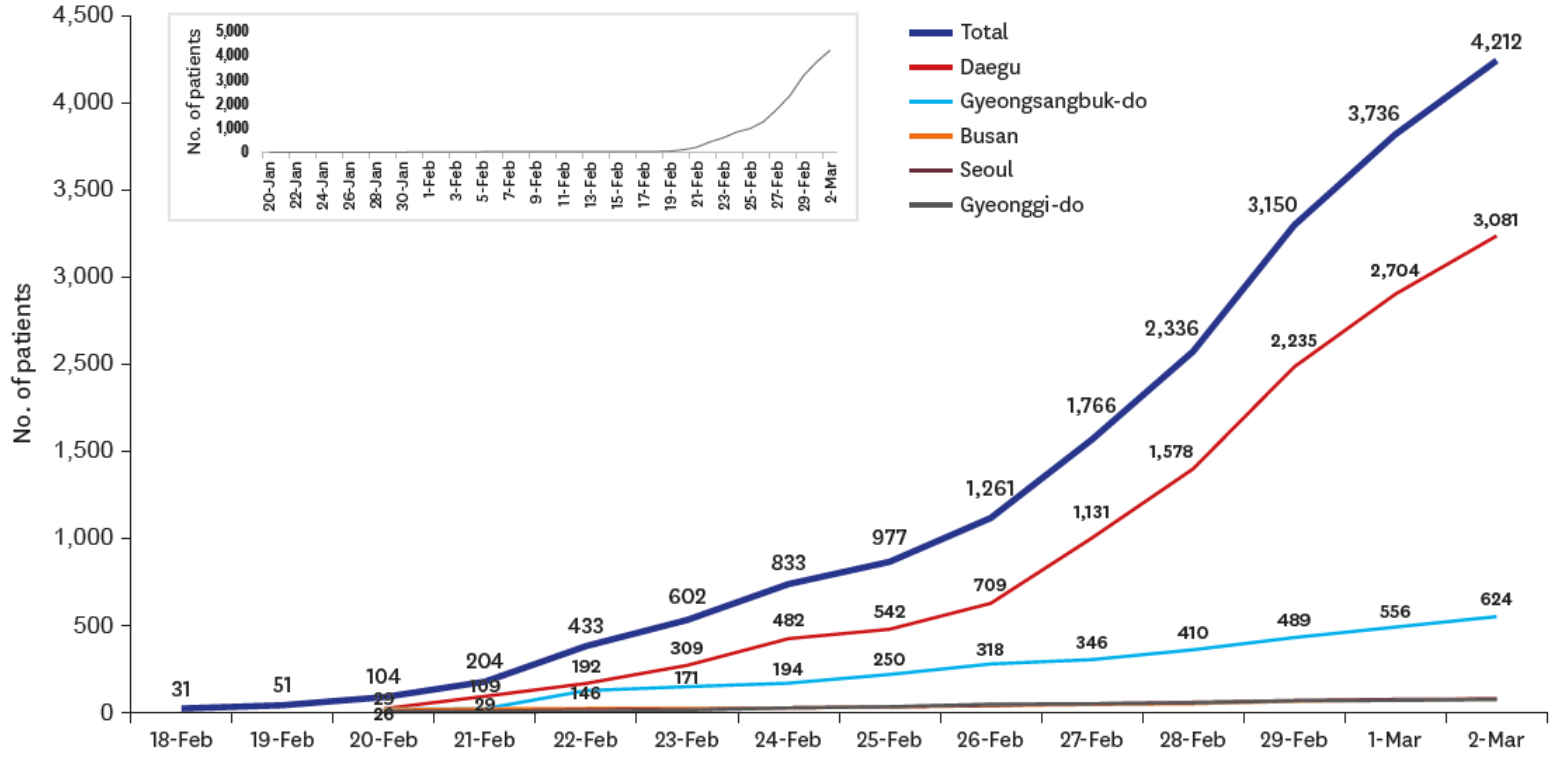
JKMS 2020;35:e112

COVID-19 in Daegu



	18-Feb	19-Feb	20-Feb	21-Feb	22-Feb	23-Feb	24-Feb	25-Feb	26-Feb	27-Feb	28-Feb	29-Feb	1-Mar	2-Mar
Daegu	29	109	192	309	482	542	709	1,131	1,578	2,235	2,704	3,081		
Gyeongsangbuk-do	26	29	146	171	194	250	318	346	410	489	556	624		
Busan	8	8	11	19	34	42	58	61	65	80	83	88		
Seoul	22	27	30	31	35	41	49	56	62	77	87	91		
Gyeonggi-do	12	14	20	24	35	53	51	62	72	82	89	92		

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JKMS 2020;35:e112

COVID-19 in Daegu

Table 3. Mortality in Korean patients with Coronavirus disease-19 as of 0 am, March 2, 2020

Mortality No.	Mortality date	Age	Sex	Underlying disease	Residence city/country	Place of death	Condition at death	Confirmed after death	Exposure
1	Feb 19	62	M	PSY	Cheongdo[a]	Daenam Hospital	Pneumonia	Y	Daenam Hospital
2	Feb 21	54	F	PSY	Cheongdo	Pusan National University Hospital	Pneumonia	N	Daenam Hospital
3	Feb 21	40	M	Hypertension	Gyeongju	Sudden death at Home[b]	NA	Y	NA
4	Feb 23	56	M	PSY	Cheongdo	Dongguk University Gyeongju Hospital	Pneumonia	N	Daenam Hospital
5	Feb 23	56	F	CKD	Daegu	Kyungpook National University Hospital	ECMO, CKD	N	NA
6	Feb 23	59	M	PSY	Cheongdo	Dongguk University Gyeongju Hospital	NA	N	Daenam Hospital
7	Feb 23	61	M	PSY	Cheongdo	Daenam Hospital	NA	N	Daenam Hospital
8	Feb 24	66	M	PSY	Cheongdo	Daenam Hospital	Pneumonia	N	Daenam Hospital
9	Feb 24	68	F	Hypertension, DM	Daegu	Kyungpook National University Chilgok Hospital	ARDS Abdominal distension	Y	Shincheonji contact
10	Feb 25	57	M	PSY	Cheongdo	NA	Pneumonia	N	Daenam Hospital
11	Feb 25	35	M	Hepatic failure due to chronic liver disease	Namyangju	Myongji Hospital	Hepatic failure	N	NA
12	Feb 26	73	M	CKD	Daegu	Kyeimyung University DongSan Hospital	Septic shock, ARDS	N	Shincheonji Church
13	Feb 27	74	M	Kidney transplanted state	Daegu	Home isolation with confirmed positive result[c] DOA at Yeongnam University Medical Center	NA	N	Shincheonji Church
14	Feb 28	69	F	Hypertension, DM	Daegu	Home isolation with pending result[d] DOA at Daegu Catholic University Medical Center	Dyspnea	Y	NA
15	Feb 28	93	F	Heart disease	Daegu	Daegu Medical Center	Pneumonia	N	Nursing Hospital
16	Feb 27	62	F	Cancer	Daegu	DOA Yeongnam University Hospital	Dyspnea	Y	NA
17	Feb 29	77	M	Dementia, Parkinson's disease	Daegu	Kyungpook National University Chilgok Hospital	NA	N	NA
18	Mar 1	82	M	Cerebral infarction, hypertension, DM	Daegu	Kyungpook National University Hospital	NA	N	NA
19	Mar 1	79	M	Hypertension	Daegu	Kyungpook National University Chilgok Hospital	Dyspnea	N	NA
20	Mar 1	85	F	Hypertension, DM	Daegu	Daegu Catholic University Medical Center Emergency Room	Dyspnea	N	NA
21	Mar 1	77	F	Hepatic cancer, hypertension, DM	Daegu	Fatima Hospital	NA	N	NA
22	Mar 1	77	F	Bronchitis	Daegu	Home isolation with confirmed positive result[c]	NA	N	NA

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JKMS 2020;35:e112

COVID-19 in Korea

환자 현황 (2.12. 00시 기준, '20.1.3. 이후 누계)

자세히 >

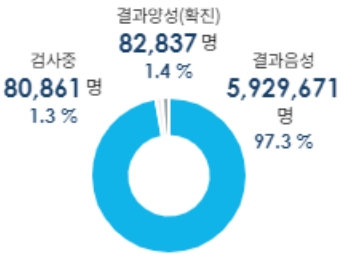
일일확진자	국내발생 384	해외유입 19

확진환자	격리해제	치료 중 (격리 중)	사망
(누적)82,837	= 72,936	+ 8,394	+ 1,507
전일대비 (+ 403)	(+ 298)	(+ 94)	(+ 11)

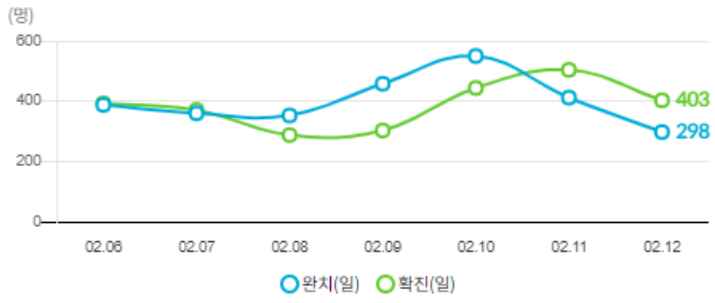
검사현황

누적검사수	6,093,369 건
누적검사완료수	6,012,508 건
누적확진율	1.4 %

(결과양성 / 총 검사완료수 * 100%)



일별 확진환자 발생 및 완치 추세

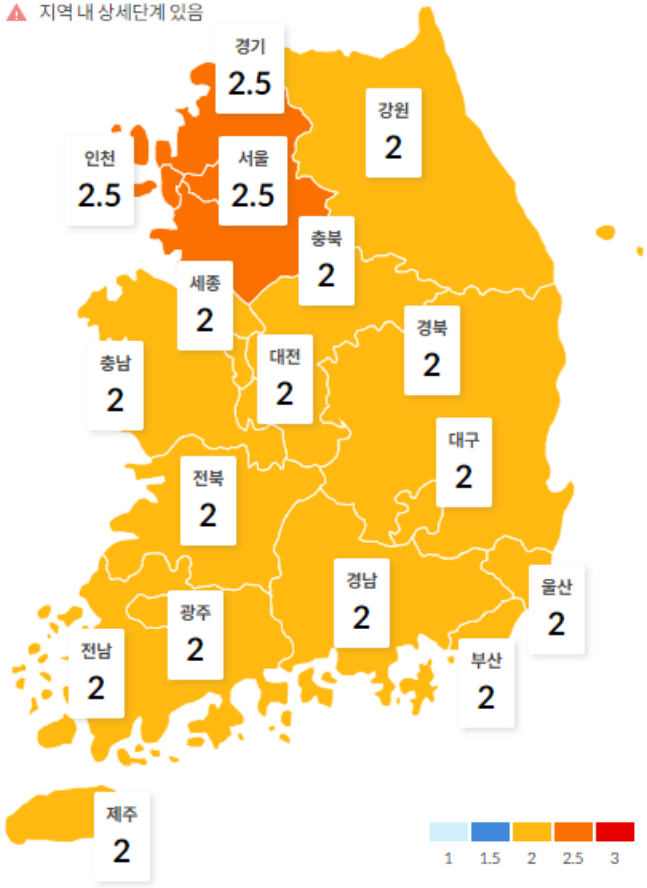


지역별 거리 두기 단계 01.26. 00시 기준

시도별 확진환자 현황 02.12. 00시 기준, '20.1.3. 이후 누계

시도를 클릭하시면 상세 현황을 확인할 수 있습니다.

지역 내 상세단계 있음



전국

2.5단계

- 수도권 3개 (서울, 인천, 경기)

2단계

- 충청권 4개(세종, 대전, 충북, 충남)
- 호남권 3개 (광주, 전북, 전남)
- 경북권 2개 (대구, 경북)
- 경남권 3개 (부산, 울산, 경남)
- 강원 1개 (강원)
- 제주 1개 (제주)

- 설 연휴 임시선별검사소 운영 현황
- 코로나19 백신·치료제 정보를 한눈에
- 코로나19 국민제안
- 지자체용 대응지침
- 선별진료소 · 국민안심병원 · 호흡기전담클리닉 찾기
- 대상별 피해지원 정책

COVID-19 in Korea

확진자 성별 현황 (2.12 00시 기준)

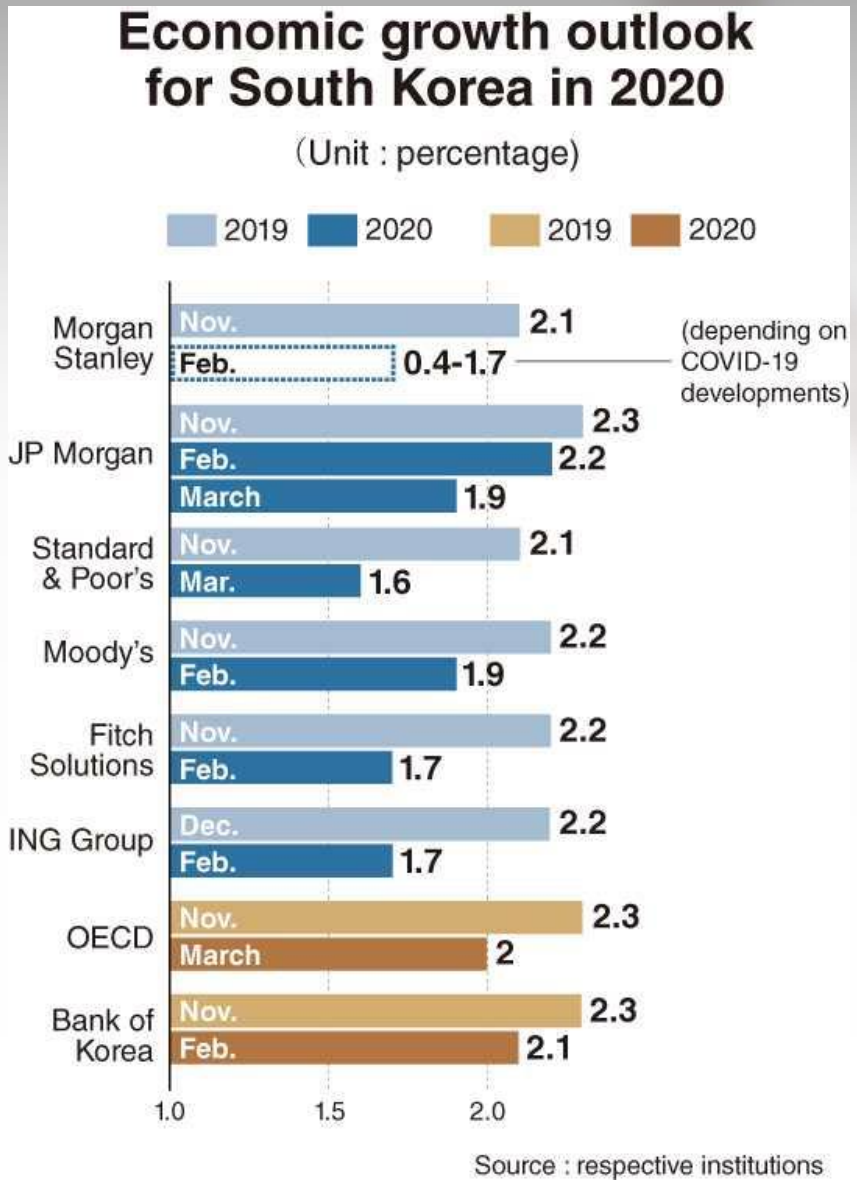
구분	확진자(%)	사망자(%)	치명률(%)
남성	40,776 (49.22)	749 (49.70)	1.84
여성	42,061 (50.78)	758 (50.30)	1.8

* 치명률 = 사망자수 / 확진자수 × 100

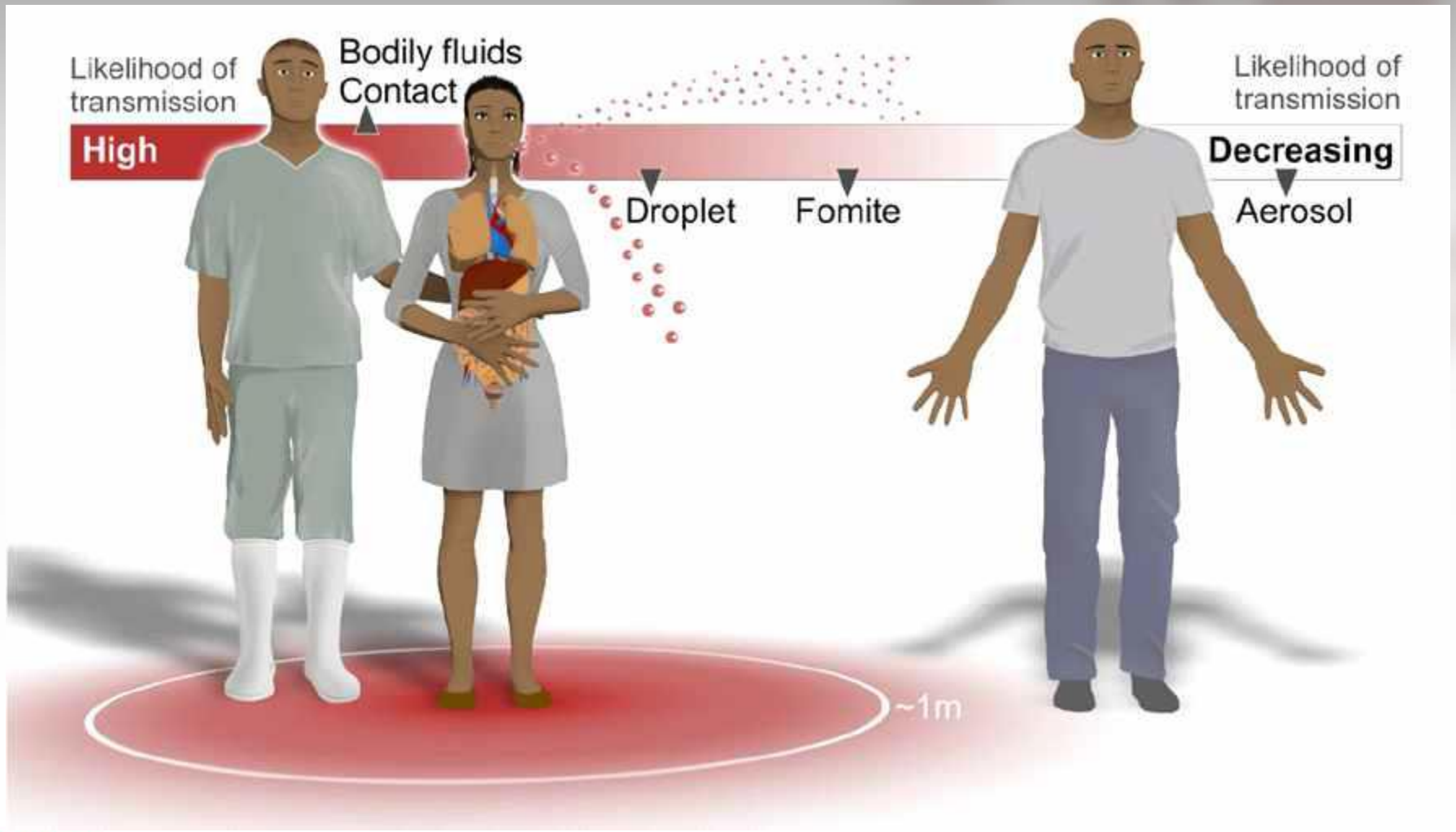
확진자 연령별 현황 (2.12 00시 기준)

구분	확진자(%)	사망자(%)	치명률(%)
80 이상	4,102 (4.95)	857 (56.87)	20.89
70-79	6,353 (7.67)	409 (27.14)	6.44
60-69	13,022 (15.72)	174 (11.55)	1.34
50-59	15,533 (18.75)	49 (3.25)	0.32
40-49	11,904 (14.37)	12 (0.80)	0.1
30-39	10,596 (12.79)	6 (0.40)	0.06
20-29	12,525 (15.12)	0 (0.00)	-
10-19	5,561 (6.71)	0 (0.00)	-
0-9	3,241 (3.91)	0 (0.00)	-

COVID-19 in Korea



Transmission



Mask-wearing

Recommended

Medical procedure masks (sometimes referred to as surgical masks or disposable face masks)

Masks that fit properly (snugly around the nose and chin with no large gaps around the sides of the face)

Masks made with breathable fabric (such as cotton)

Masks made with tightly woven fabric (i.e., fabrics that do not let light pass through when held up to a light source)

Masks with two or three layers

Masks with inner filter pockets

Not Recommended

Masks that do not fit properly (large gaps, too loose or too tight)

Masks made from materials that are hard to breathe through (such as plastic or leather)

Masks made from fabric that is loosely woven or knitted, such as fabrics that let light pass through

Masks with one layer

Masks with exhalation valves or vents

Wearing a scarf/ski mask

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Social distancing

Effectiveness of workplace social distancing measures in reducing influenza transmission: a systematic review

Faruque Ahmed*, Nicole Zviedrite and Amra Uzicanin

Abstract

Background: Social distancing is one of the community mitigation measures that may be recommended during influenza pandemics. Social distancing can reduce virus transmission by increasing physical distance or reducing frequency of congregation in socially dense community settings, such as schools or workplaces. We conducted a systematic review to assess the evidence that social distancing in non-healthcare workplaces reduces or slows influenza transmission.

Methods: Electronic searches were conducted using MEDLINE, Embase, Scopus, Cochrane Library, PsycINFO, CINAHL, NIOSHTIC-2, and EconLit to identify studies published in English from January 1, 2000, through May 3, 2017. Data extraction was done by two reviewers independently. A narrative synthesis was performed.

Results: Fifteen studies, representing 12 modeling and three epidemiological, met the eligibility criteria. The epidemiological studies showed that social distancing was associated with a reduction in influenza-like illness and seroconversion to 2009 influenza A (H1N1). However, the overall risk of bias in the epidemiological studies was serious. The modeling studies estimated that workplace social distancing measures alone produced a median reduction of 23% in the cumulative influenza attack rate in the general population. It also delayed and reduced the peak influenza attack rate. The reduction in the cumulative attack rate was more pronounced when workplace social distancing was combined with other nonpharmaceutical or pharmaceutical interventions. However, the effectiveness was estimated to decline with higher basic reproduction number values, delayed triggering of workplace social distancing, or lower compliance.

Conclusions: Modeling studies support social distancing in non-healthcare workplaces, but there is a paucity of well-designed epidemiological studies.

Systematic review registration number: PROSPERO registration # CRD42017065310.

Keywords: Influenza, Distancing, Community mitigation, Non-pharmaceutical, Systematic review, Telework, Workplace

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BMC Public Health 2018;18:518

Social Distancing

Level	Situation	Measures for Prevention and Control			
		Gatherings/ Events	Public Facilities	School	Work Pattern
Level 1	Repeated spread and mitigation of small-scale sporadic cases under the control of the healthcare system	Compliance with quarantine rules at gatherings, events, and sporting events (with audience restriction)	Use of publicly used facilities is allowed in principle, but in case of high-risk facilities, it is mandatory to comply with the core quarantine rules	Compliance with the quarantine rules while attending both regular and remote classes	The public sector utilizes flextime and telecommuting at an appropriate rate per department. The private sector is encouraged to follow the same measures as the public sector.
Level 2	The community's COVID-19 epidemic continues to spread beyond what can be afforded by conventional healthcare systems.	Enforcement of an administrative order banning all private and public gatherings and events with 50 or more indoors and 100 or more outdoors people. Sporting events continue with no spectators.	In principle, public facilities are closed (operation is possible when contact-free service is available). Among private facilities, high-risk facilities such as entertainment facilities are suspended and are required to take preventive measures to mitigate the risk of mass infection.	Combination of attending school and distance learning to minimize density to reduce the number of students attending school	Flextime, telecommuting, and staggered lunch hours for public sector employees. The private sector is encouraged to follow the same measures as the public sector.
Level 3	Multiple cases of mass infection in the community, COVID-19 is spreading rapidly and on a large scale.	All meetings where 10 or more people meet face-to-face are banned. All sporting events are suspended.	All public, private, and high to mid-risk facilities are suspended.	Suspension of classes at school. Distance learning and telelearning to continue or close down.	Except for essential personnel, all public sector employees to work from home. Similarly, private sector employees are recommended to work from home.

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Social Distancing

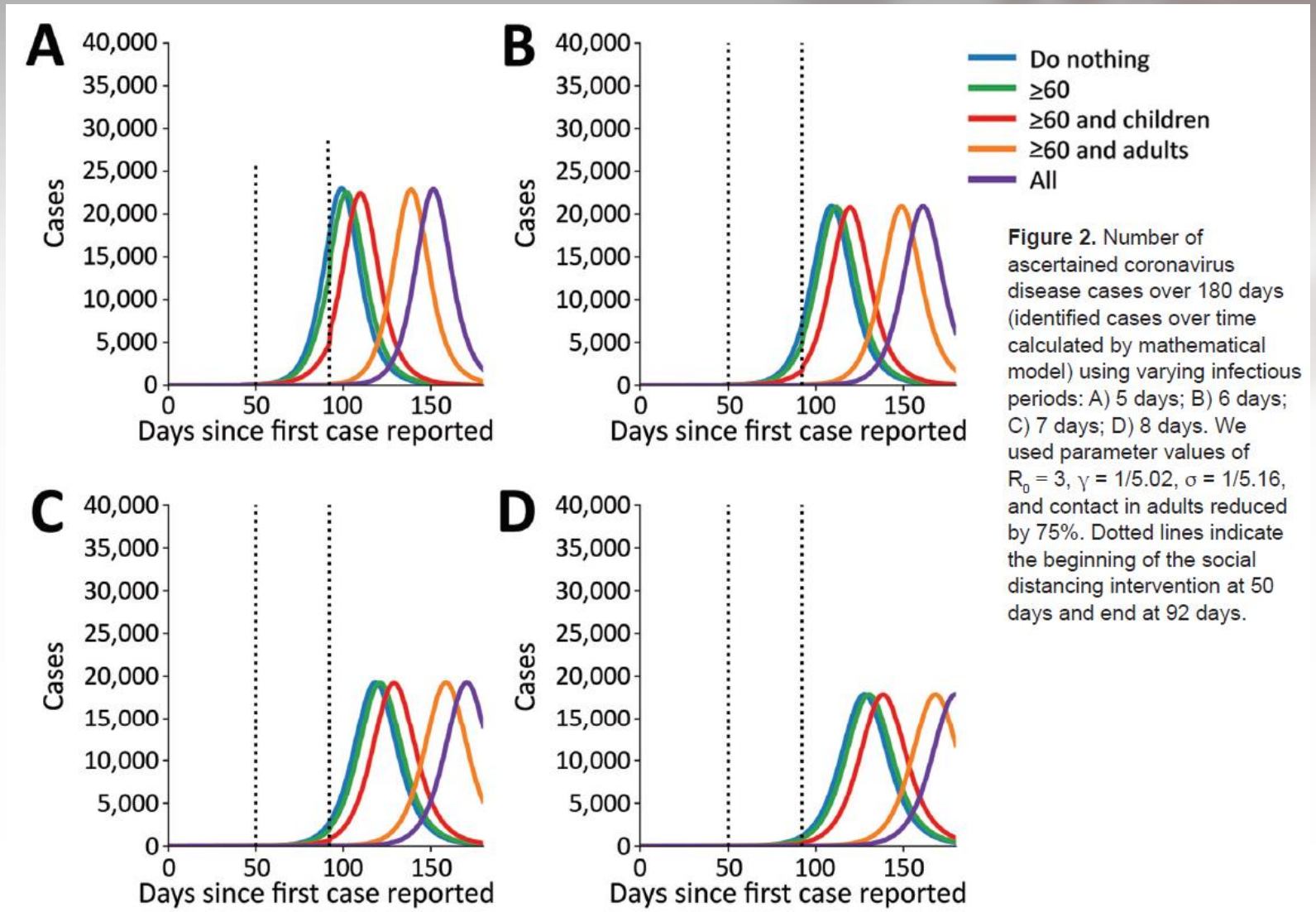

Figure 2. Number of ascertained coronavirus disease cases over 180 days (identified cases over time calculated by mathematical model) using varying infectious periods: A) 5 days; B) 6 days; C) 7 days; D) 8 days. We used parameter values of $R_0 = 3$, $\gamma = 1/5.02$, $\sigma = 1/5.16$, and contact in adults reduced by 75%. Dotted lines indicate the beginning of the social distancing intervention at 50 days and end at 92 days.

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Emerg Infect Dis 2020;26:1740-48

Social Distancing

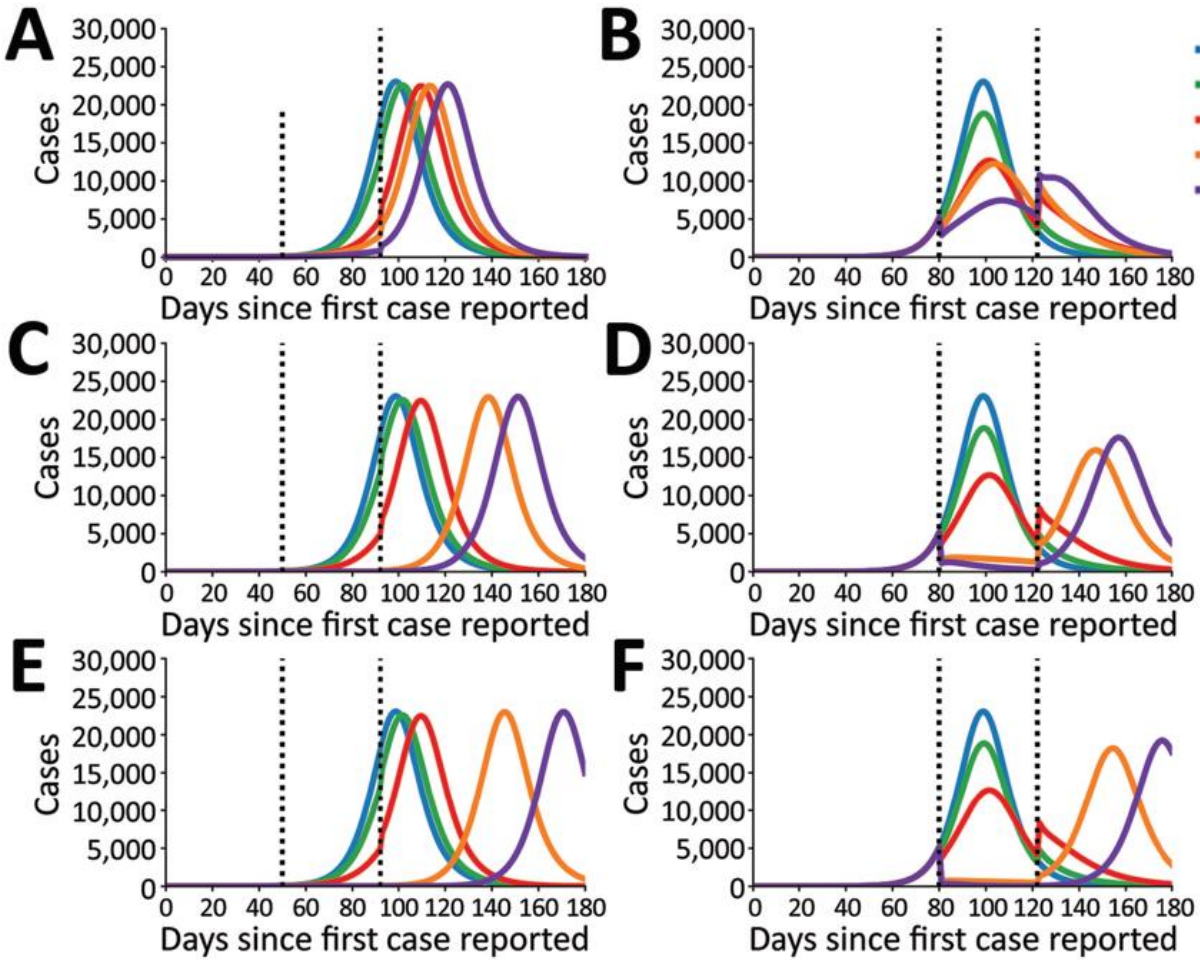

Figure 3. Number of ascertained coronavirus disease (identified cases over time calculated by mathematical model) with adults reducing their contact by 25% (A, B); 75% (C, D); and 95% (E, F). We used parameter values of R_0 = 3, γ = 1/5.02, σ = 1/5.16. Dotted lines represent the beginning and end of the 6-week social distancing interventions, after which contact rates return to normal. For panels A, C, and E, intervention starts at day 50 after identification of first case; for panels B, D, and F, intervention starts at day 80 after identification of first case.

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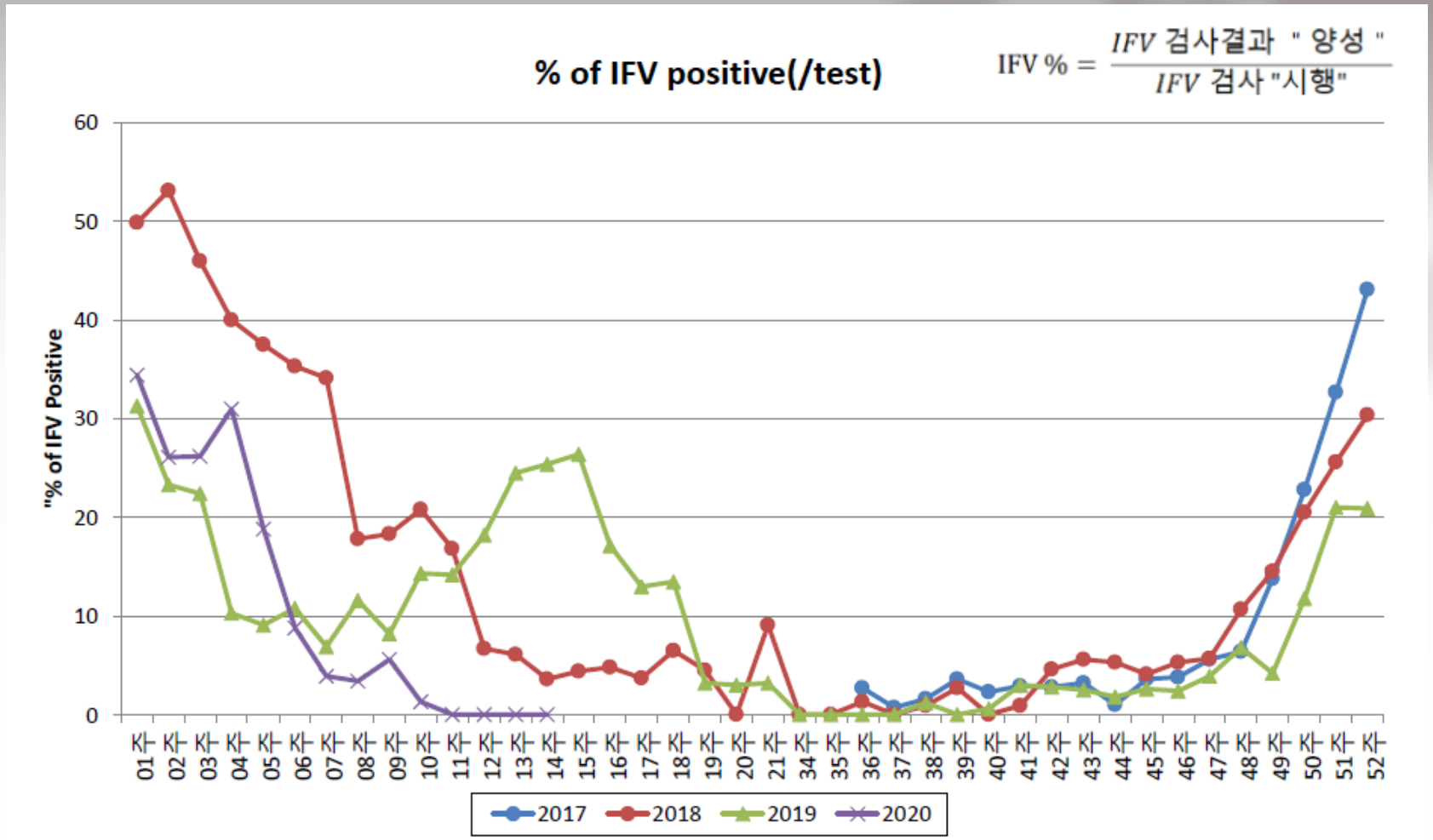
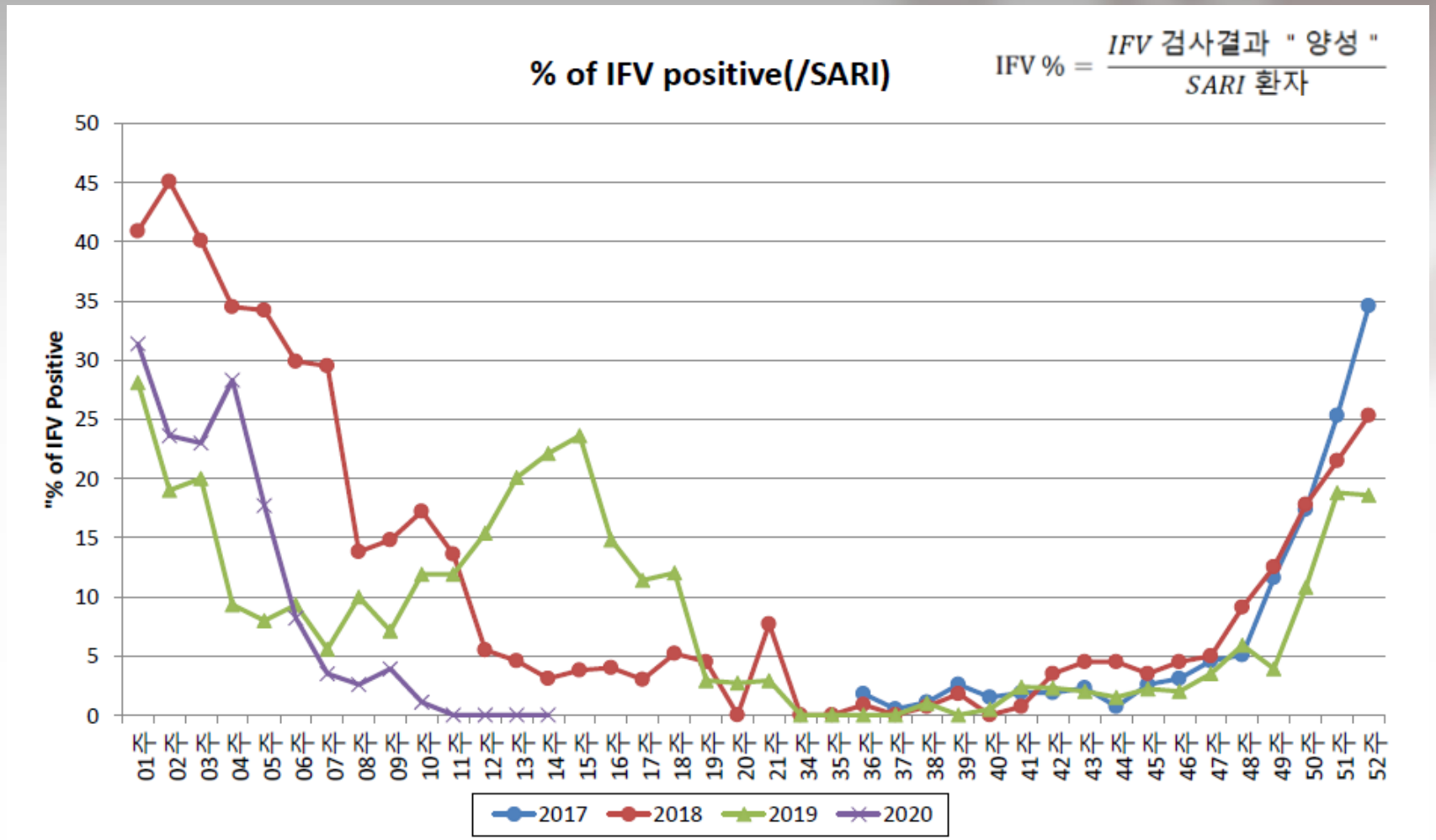
Emerg Infect Dis 2020;26:1740-48

COVID-19 초기


% of IFV positive(/test)
IFV % = IFV 검사결과 " 양성 " / IFV 검사 "시행"
"% of IFV Positive
60
50
40
30
20
10
0
01 주 02 주 03 주 04 주 05 주 06 주 07 주 08 주 09 주 10 주 11 주 12 주 13 주 14 주 15 주 16 주 17 주 18 주 19 주 20 주 21 주 34 주 35 주 36 주 37 주 38 주 39 주 40 주 41 주 42 주 43 주 44 주 45 주 46 주 47 주 48 주 49 주 50 주 51 주 52 주
2017
2018
2019
2020

COVID-19 초기



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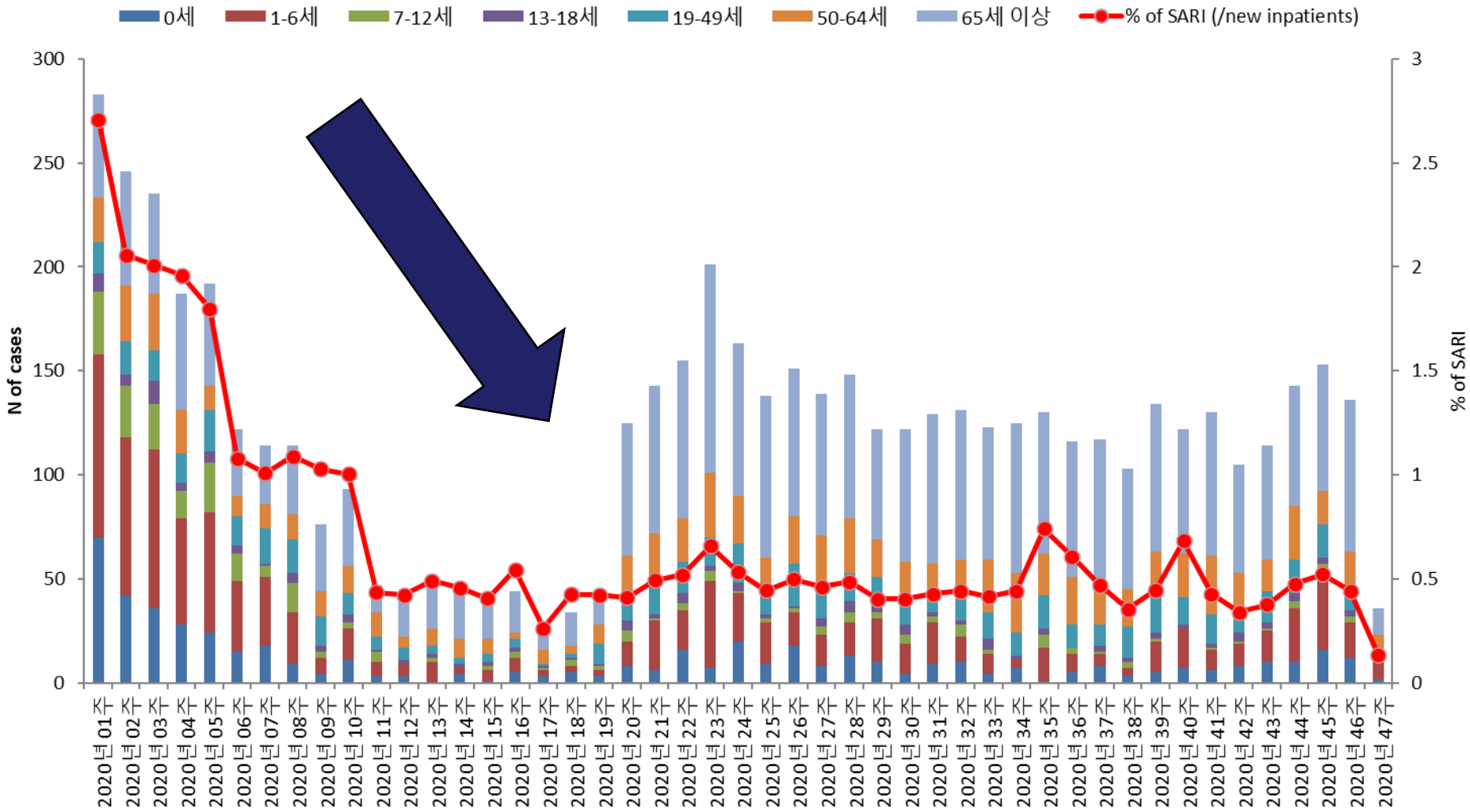
2020년 SARI

	SARI (n=5,683)	SARI in ICU (n=594)	SARI Death (n=293)
임신여부	2 (0.04)	0 (0)	0 (0)
만성심장질환 여부	688 (12.11)	119 (20.03)	62 (21.16)
천식 여부	220 (3.87)	19 (3.2)	6 (2.05)
만성호흡기질환 여부	677 (11.91)	77 (12.96)	60 (20.48)
만성간질환 여부	144 (2.53)	18 (3.03)	14 (4.78)
당뇨 여부	990 (17.42)	190 (31.99)	92 (31.4)
만성신경질환 여부	540 (9.5)	105 (17.68)	59 (20.14)
만성콩팥질환 여부	320 (5.63)	49 (8.25)	23 (7.85)
만성혈액질환 여부	80 (1.41)	10 (1.68)	10 (3.41)
면역손상 여부	346 (6.09)	64 (10.77)	39 (13.31)
인간면역결핍바이러스 에이즈 여부	6 (0.11)	2 (0.34)	0 (0)
결핵 여부	102 (1.79)	12 (2.02)	9 (3.07)
기타질병 여부	2,275 (40.03)	317 (53.37)	191 (65.19)

2020년 SARI


0세
1-6세
7-12세
13-18세
19-49세
50-64세
65세 이상
% of SARI (/new inpatients)
N of cases
% of SARI
300
250
200
150
100
50
0
3
2.5
2
1.5
1
0.5
0
2020년 01주
2020년 02주
2020년 03주
2020년 04주
2020년 05주
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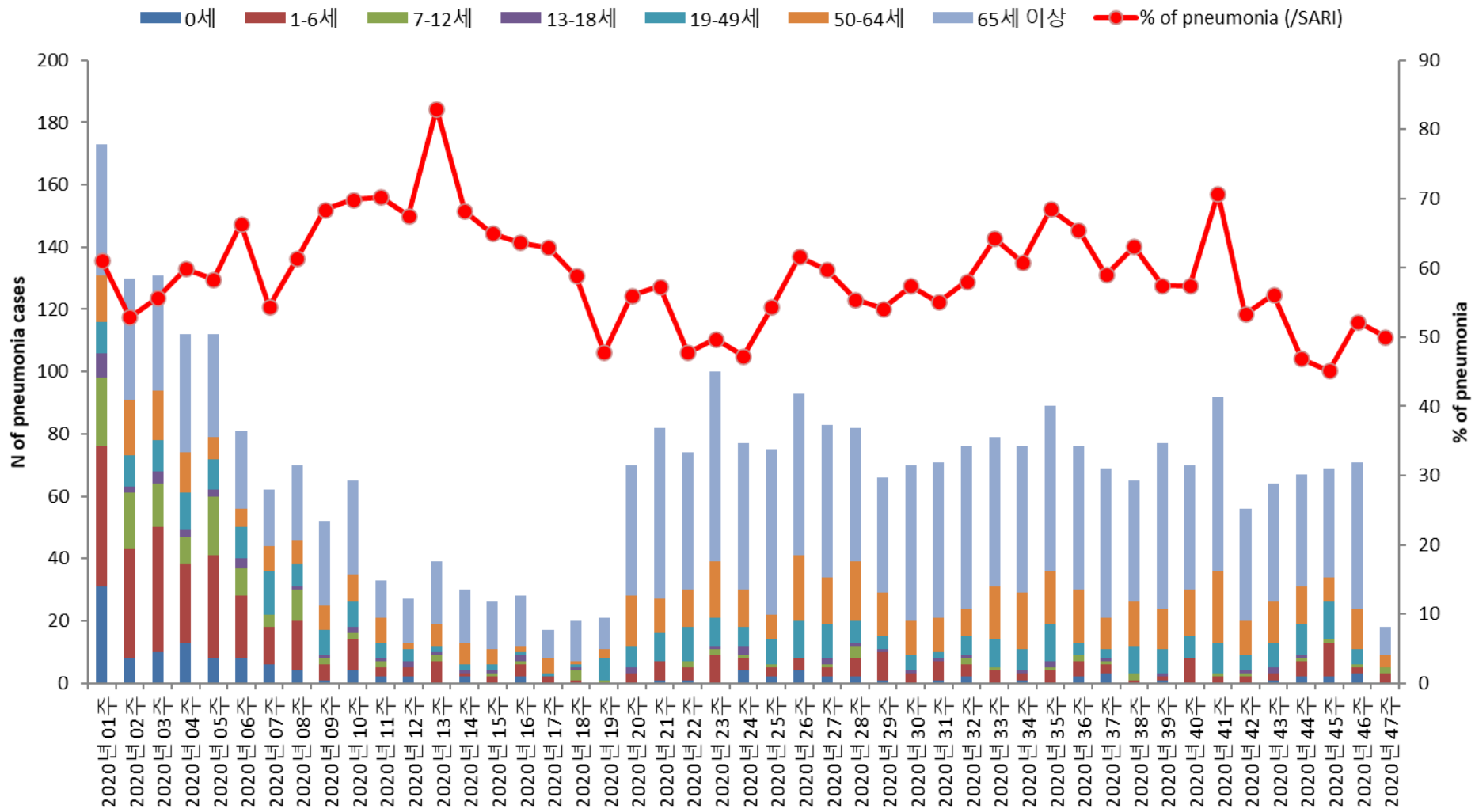
2020년 47주

SARI 환자 중 폐렴


0세
1-6세
7-12세
13-18세
19-49세
50-64세
65세 이상
% of pneumonia (/SARI)
N of pneumonia cases
% of pneumonia
0
20
40
60
80
100
120
140
160
180
200
0
10
20
30
40
50
60
70
80
90
2020년 01주
2020년 02주
2020년 03주
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2020년 05주
2020년 06주
2020년 07주
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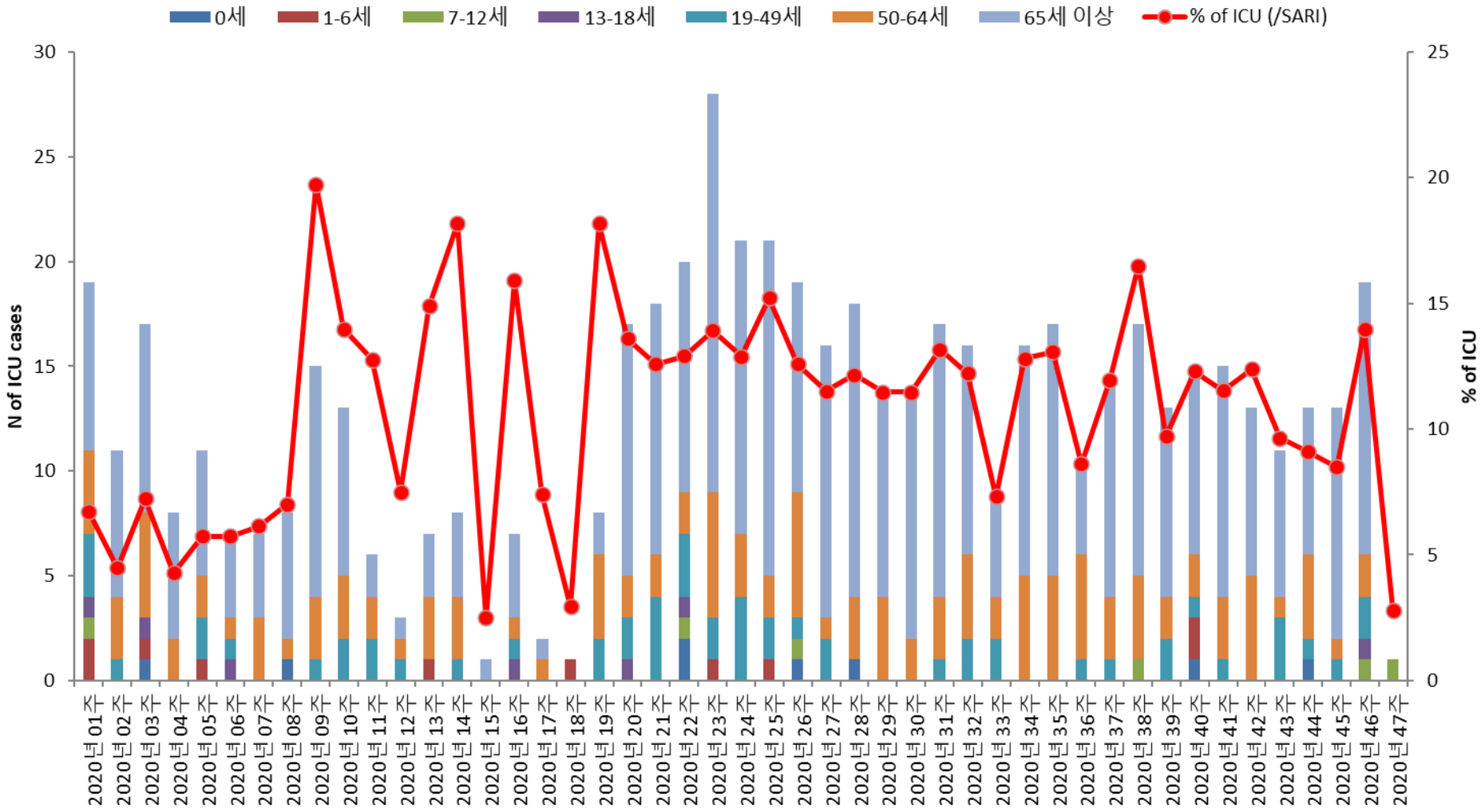
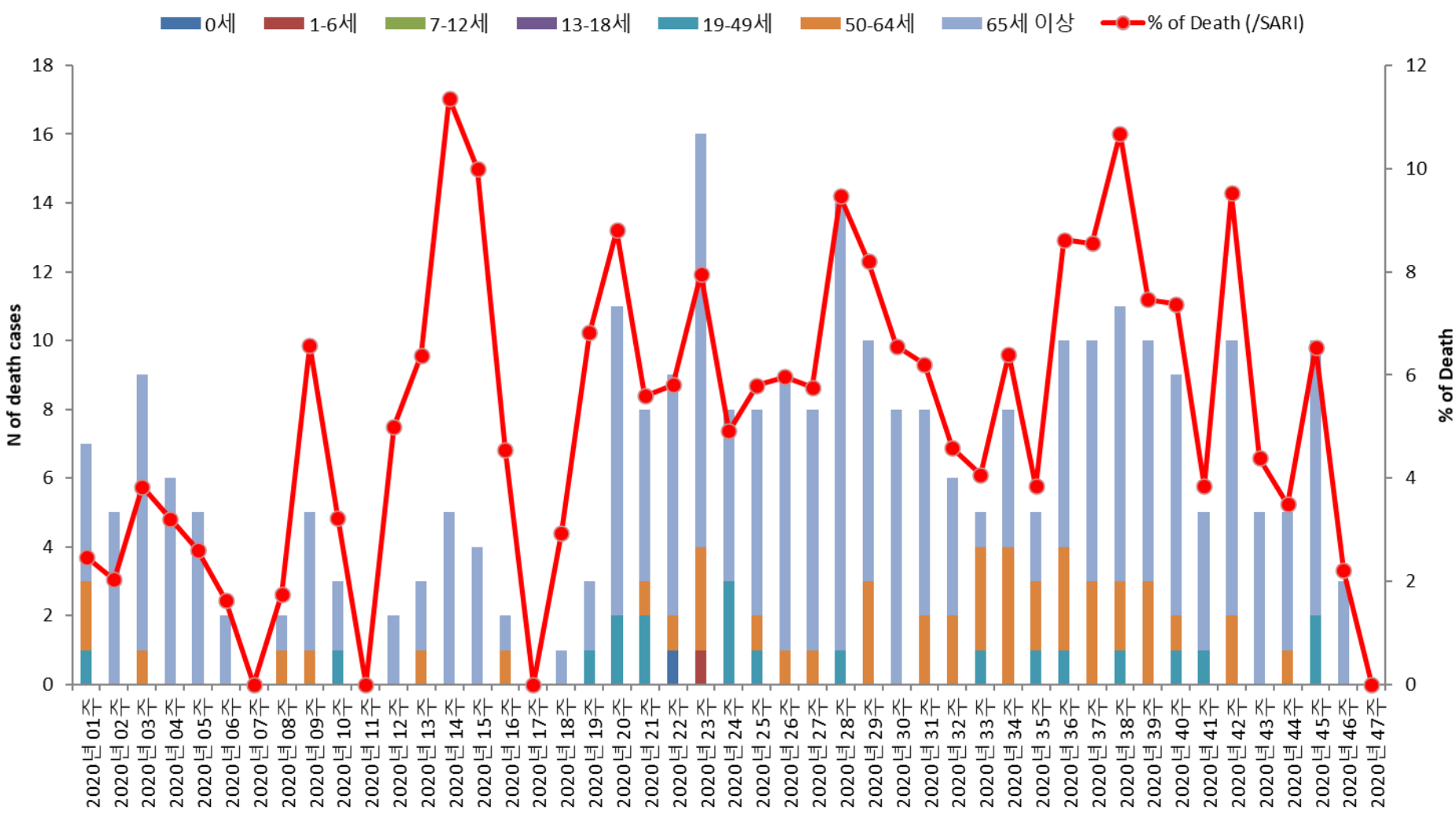
2020년 47주

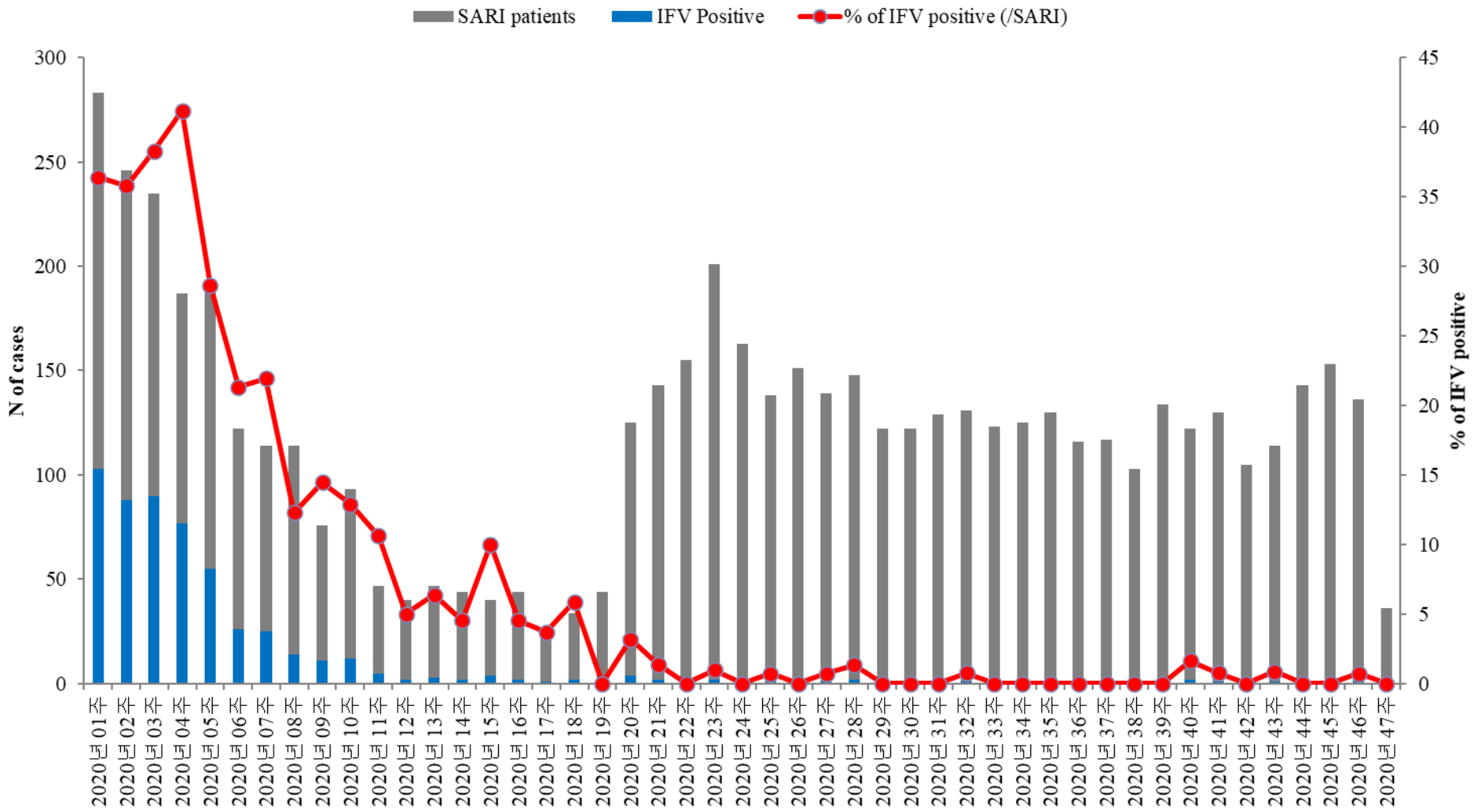
SARI related ICU admission



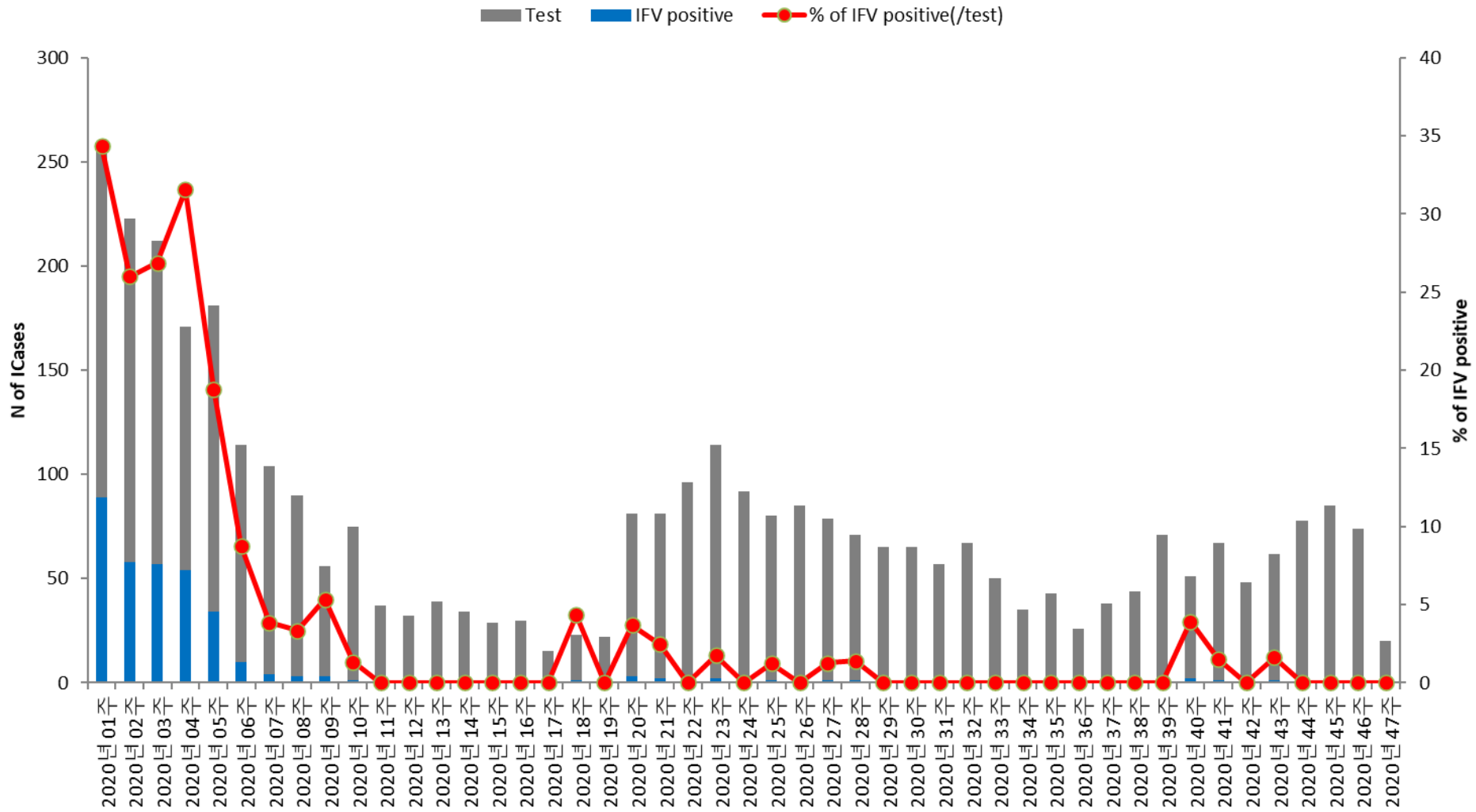
SARI related Death



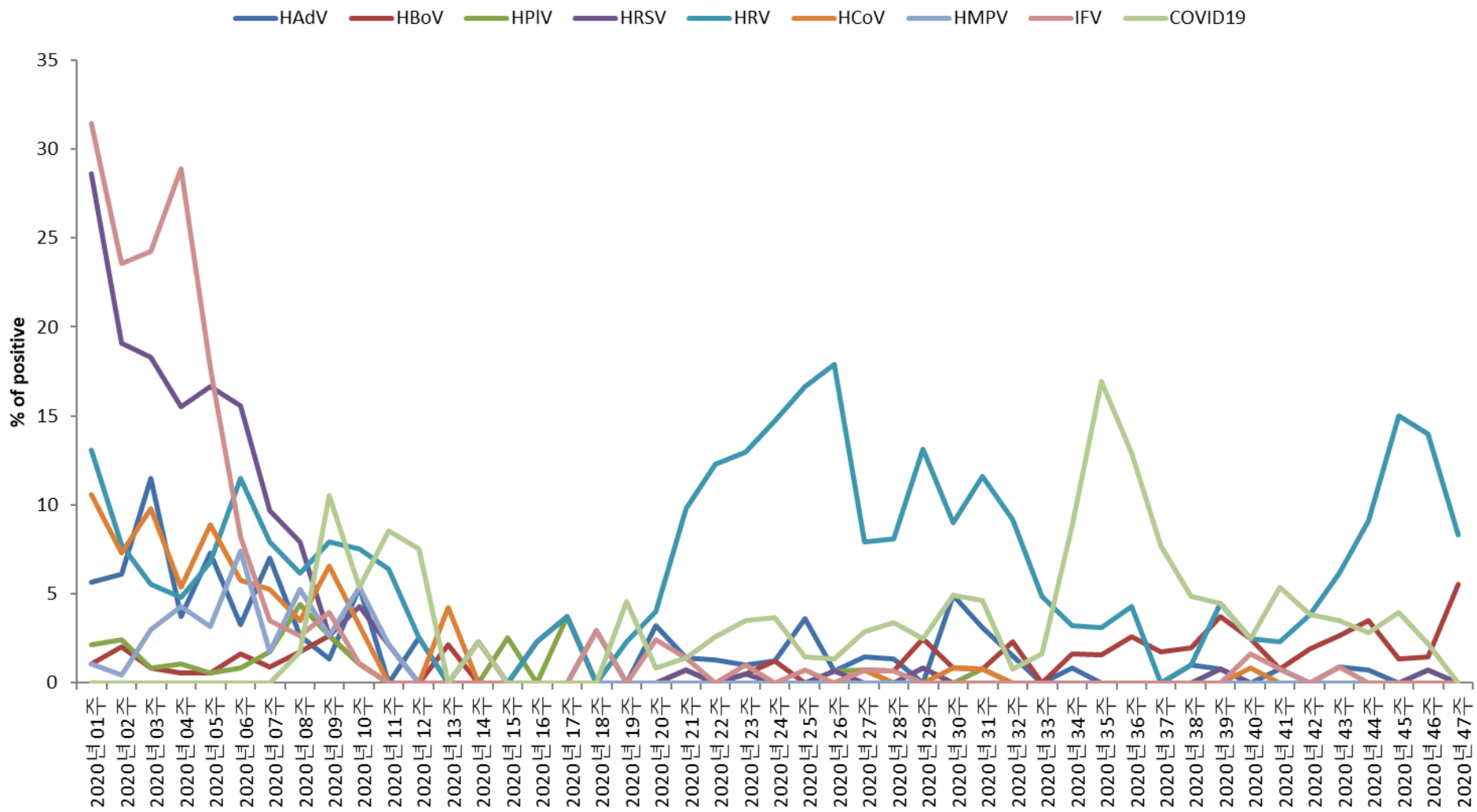
Influenza infection



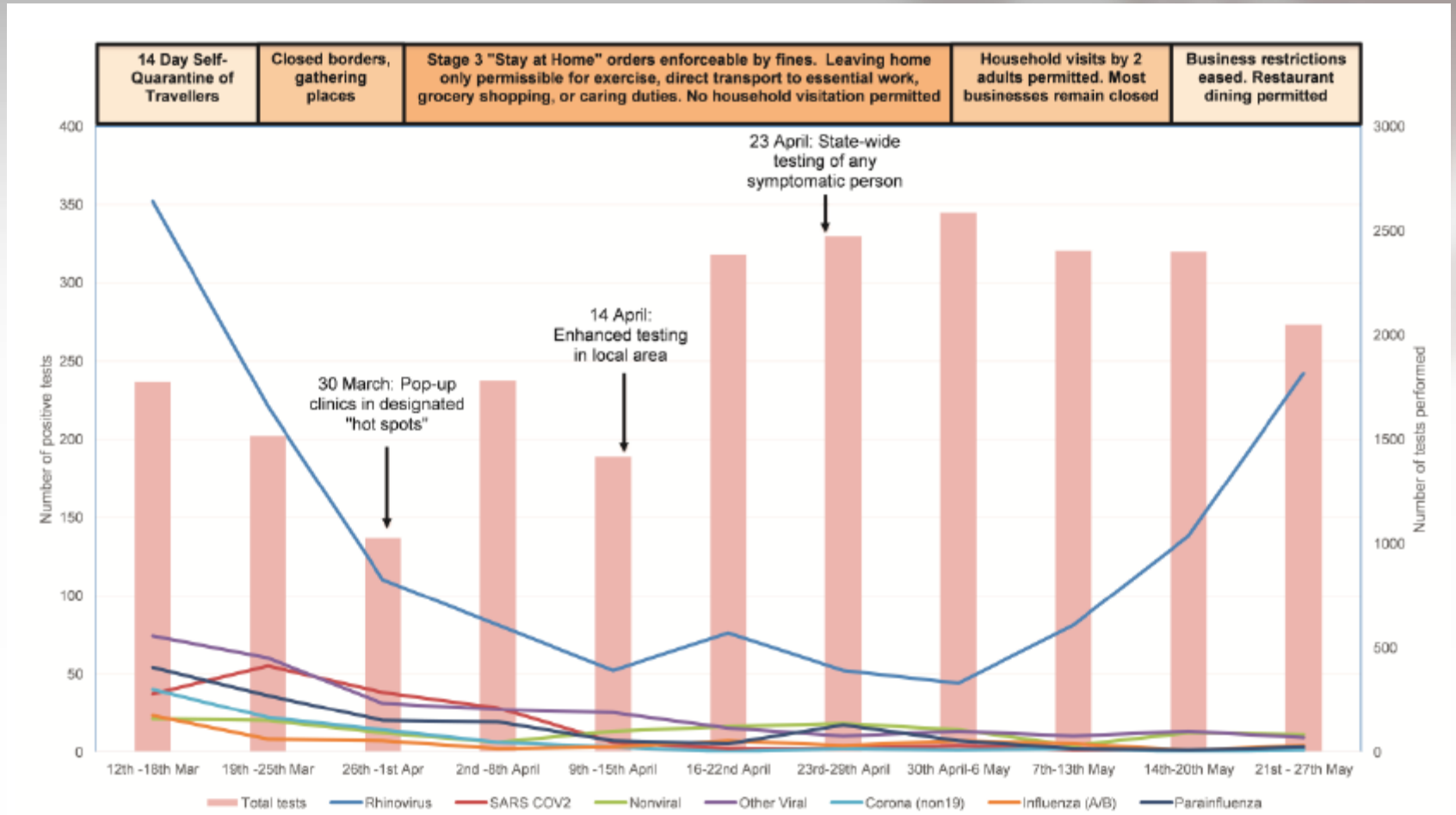
Influenza infection



Respiratory Virus



Social distancing and SARI epidemiology



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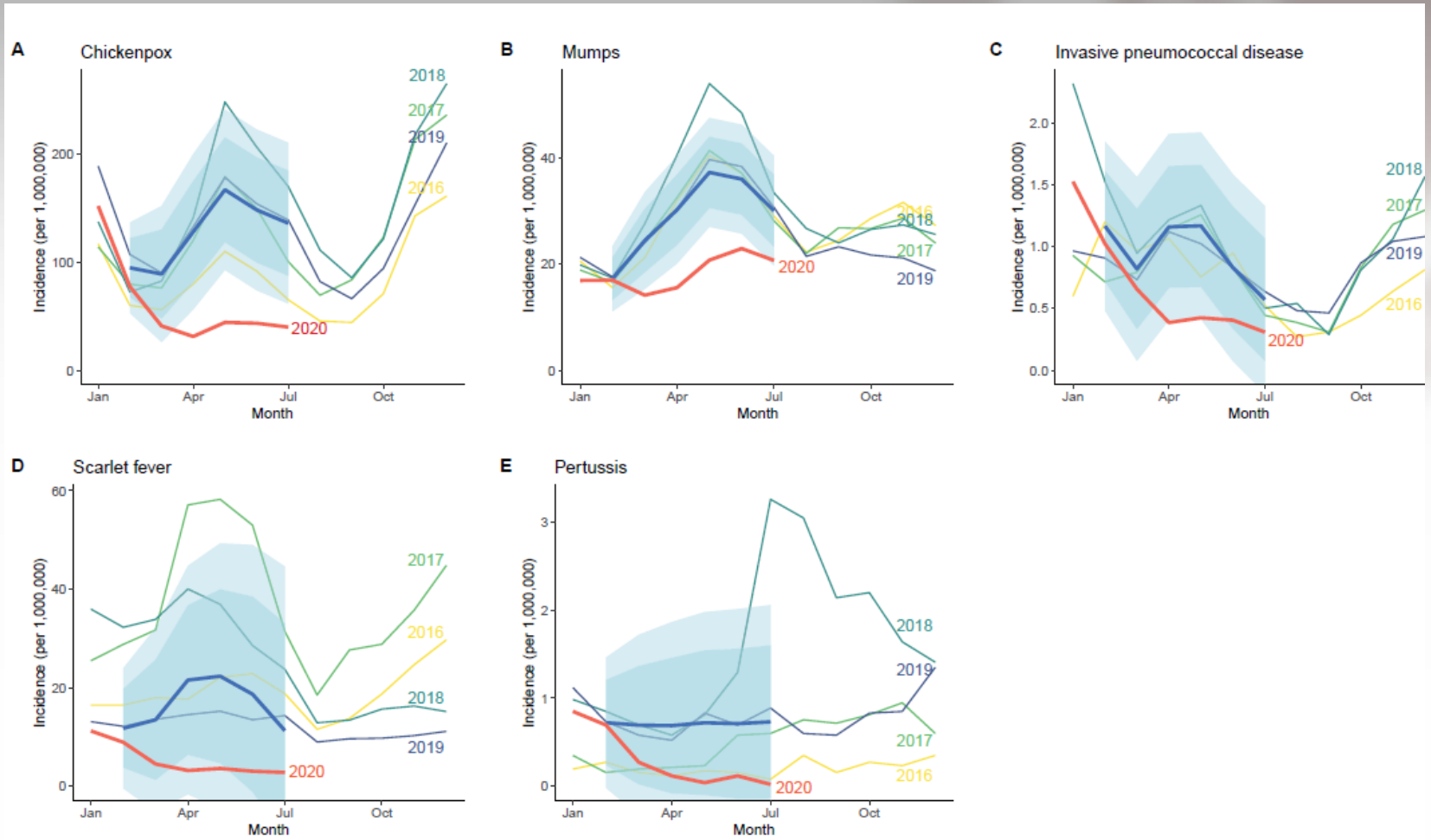
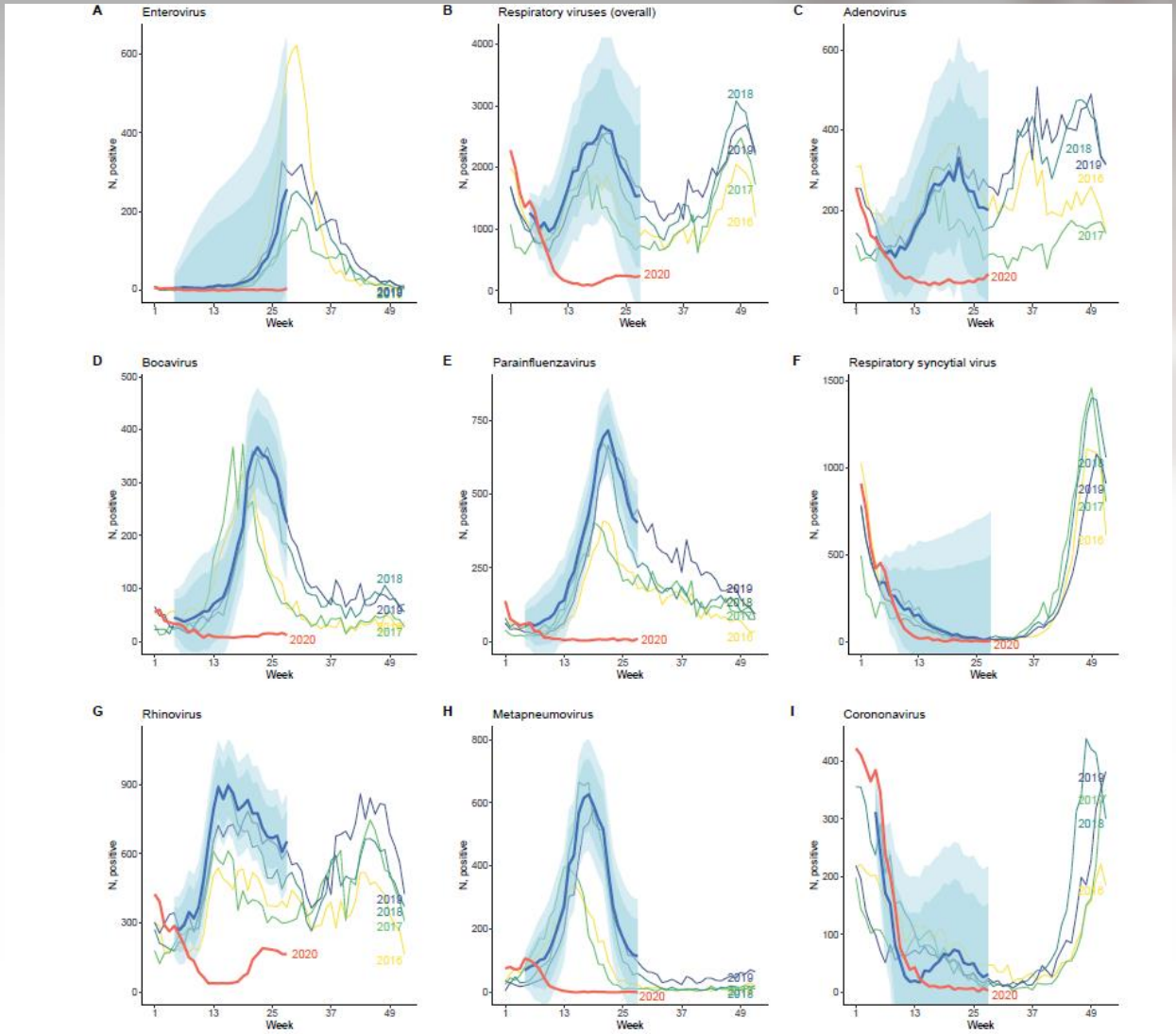
Clin Infect Dis 2020 Aug 25

Social distancing and SARI epidemiology (Korea)



Clin Infect Dis 2020

Social distancing and SARI epidemiology (Korea)



Clin Infect Dis 2020

Social distancing and SARI epidemiology

북부권역 (7)
- 건국대학교병원
- 고려대학교 구로병원
- 삼성서울병원
- 상계백병원
- 서울대학교병원
- 순천향대학교부천병원
- 일산백병원

중부권역 (2)
- 충남대학교병원
- 영남대학교

남부권역 (4)
- 부산백병원
- 양산부산대병원
- 전북대학교병원
- 제주대학교병원

전국 13개 병원

2018: 402,357 명

2019: 406,110 명

2020: 503,060 명

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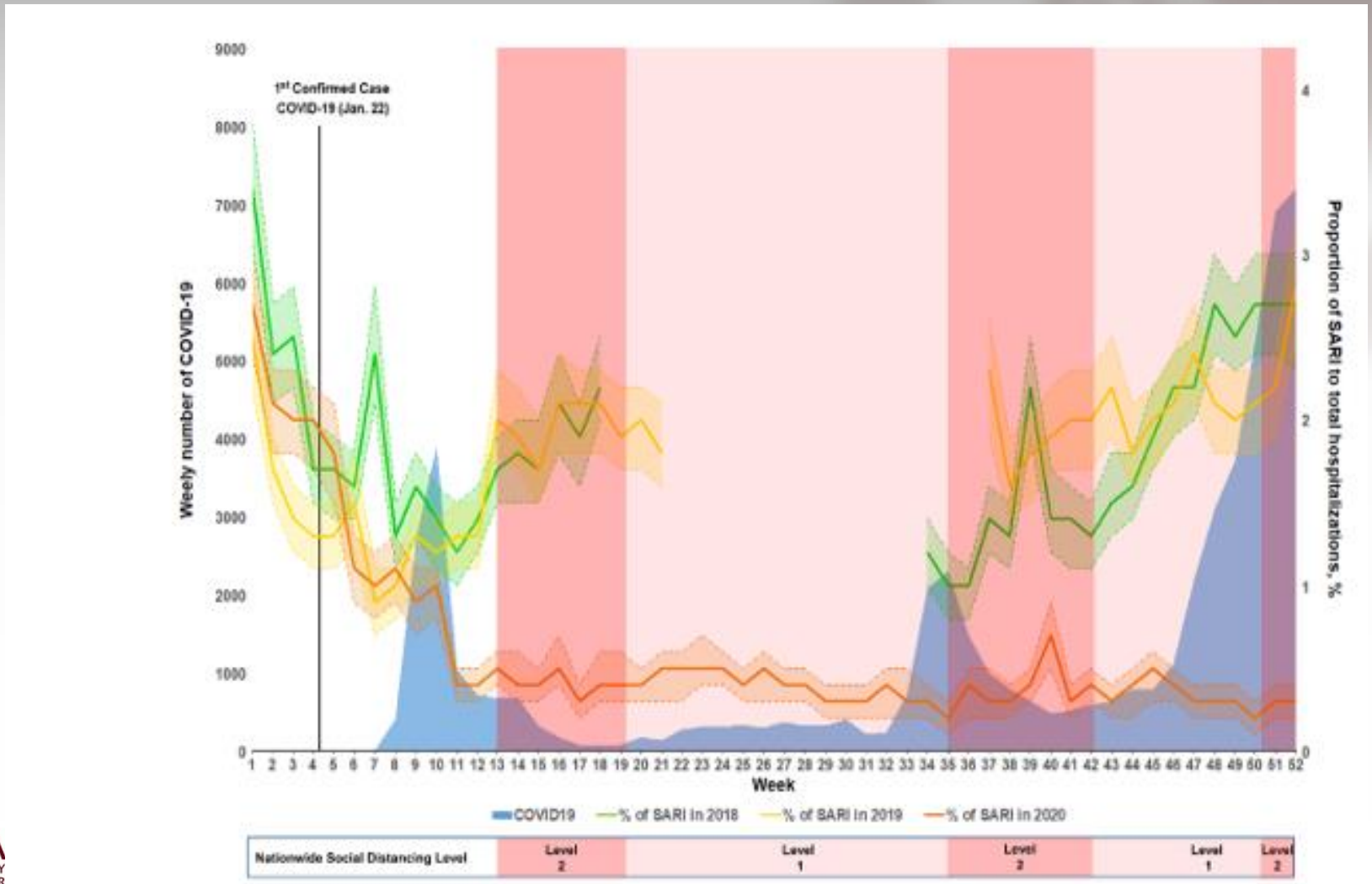
Social distancing and SARI epidemiology



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Social distancing and SARI epidemiology

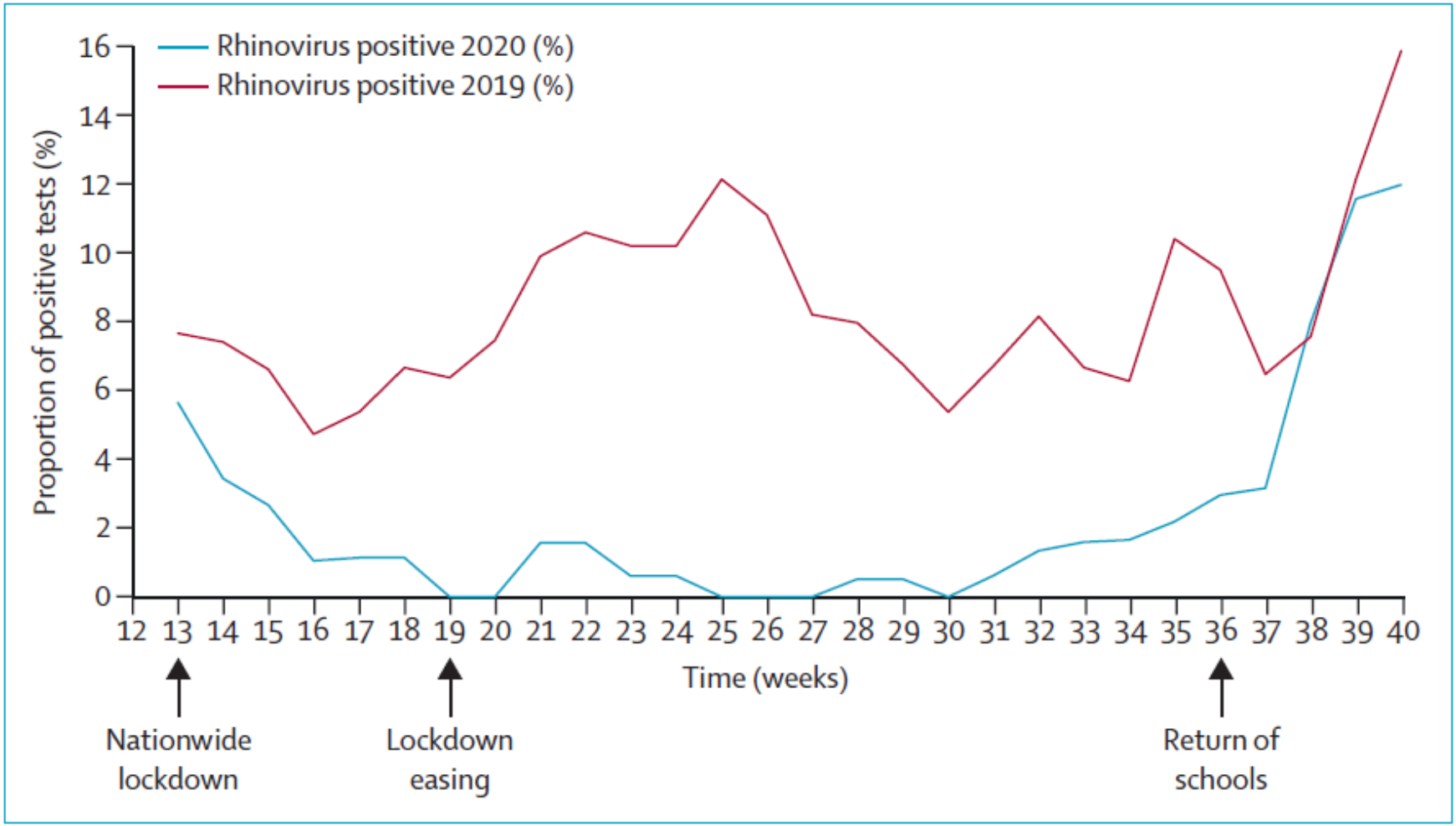
Variables	Year			P value for trends
	2018	2019	2020	
Number of SARI per 1,000 hospitalized patients	18.61	18.15	6.25	<0.001
Number of ICU admission associated with SARI per 1,000 hospitalized patients	0.83	0.69	0.54	<0.001
Number of mortalities associated with SARI per 1,000 patients	0.42	0.29	0.27	<0.001

Social distancing and Respiratory virus

Virus	Year			P value
	2018	2019	2020	
HAdV	16.6	17.4	2.4	<0.001
HBoV	3.5	3.4	13.0	0.001
HPIV	7.0	8.4	0.0	0.052
HRSV	22.4	13.1	0.0	<0.001
HRV	26.3	29.1	18.0	0.723
HMPV	0.7	1.4	0.0	0.014
IFV	4.5	2.5	0.4	0.017

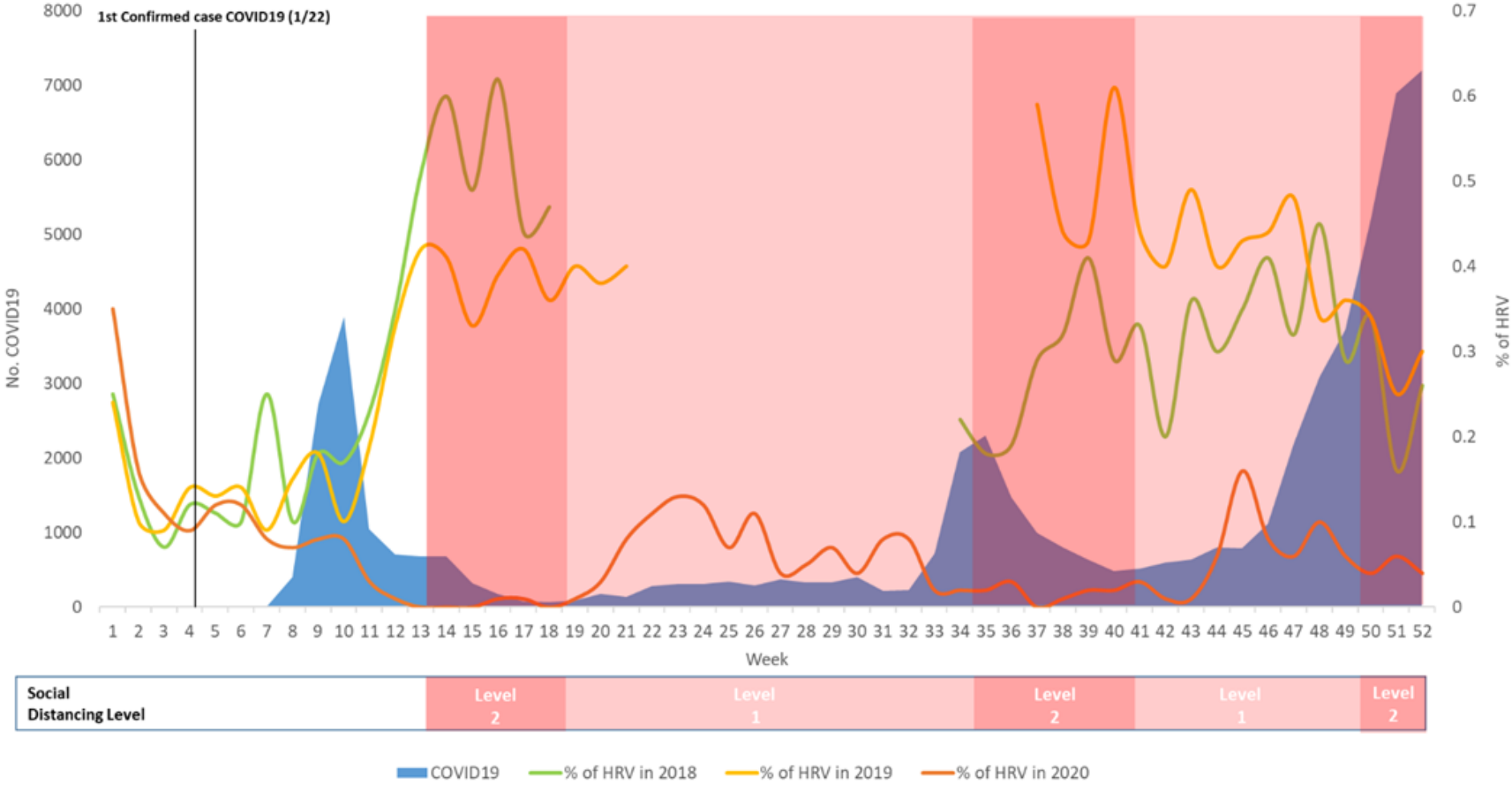
각 셀 값은 해당 연도의 **virus positive %** 임 **(Cochran-Armitage trend test)**

Social distancing and Rhinovirus

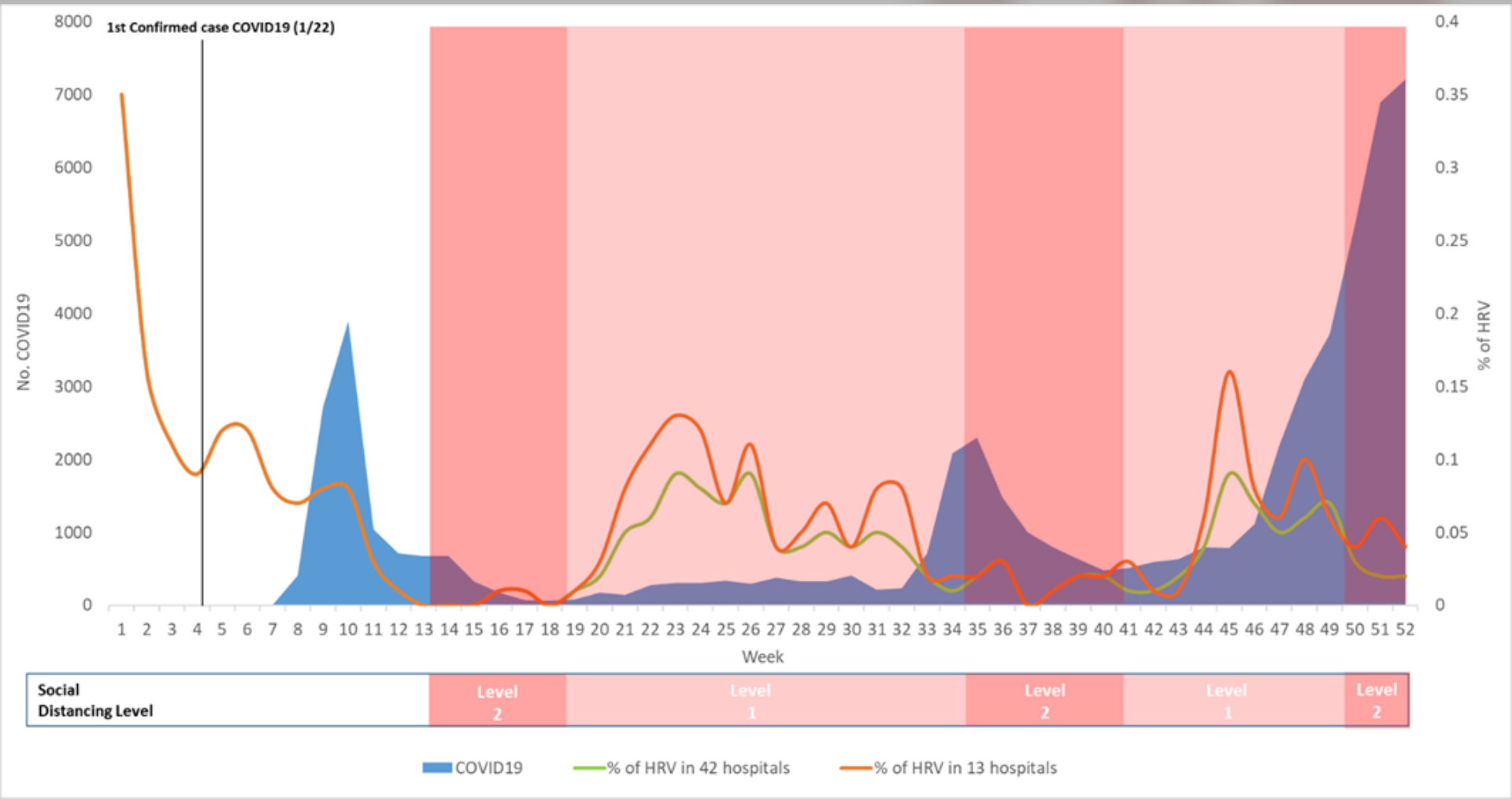


Lancet Respir Med 2020

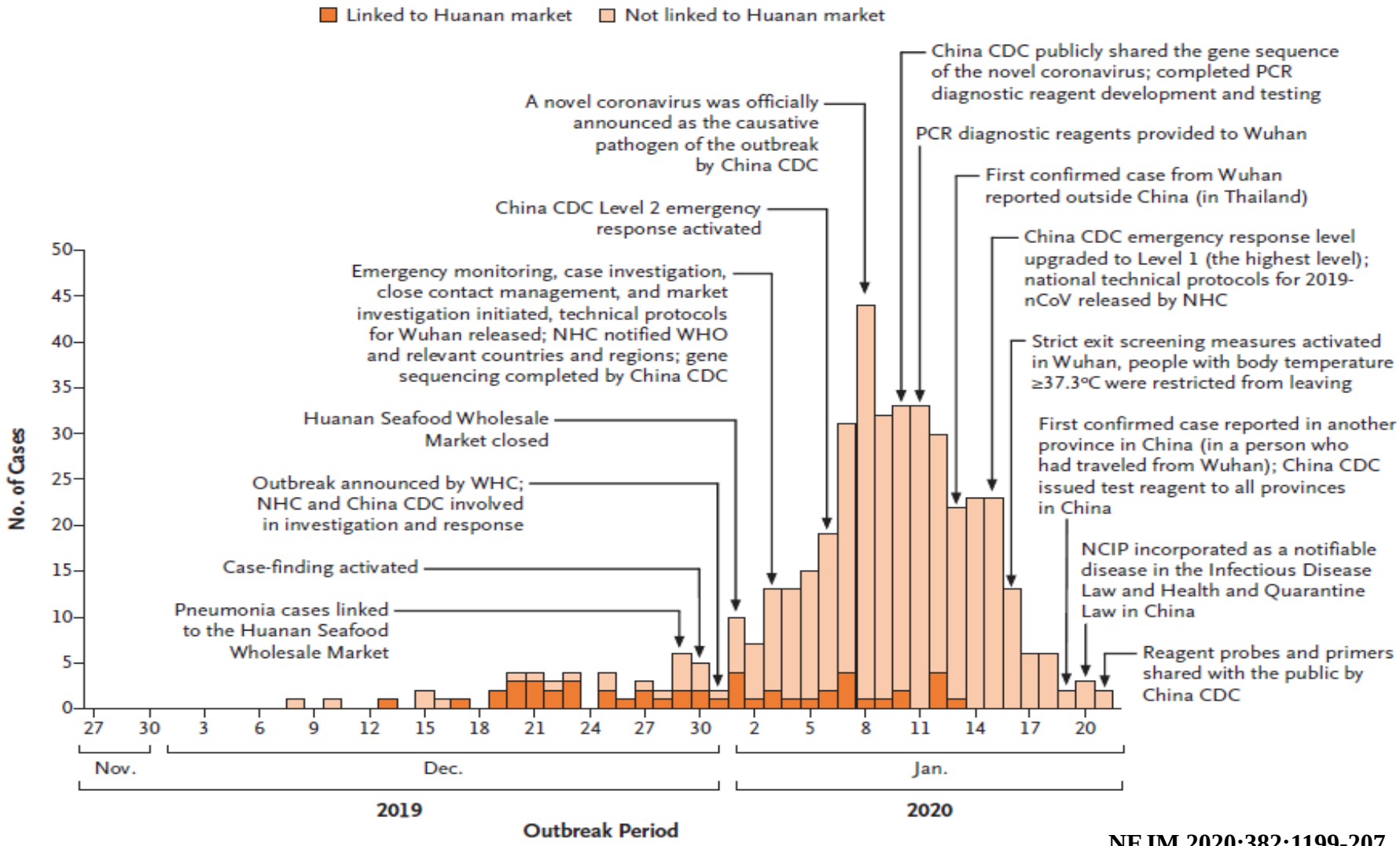
Social distancing and Rhinovirus



Social distancing and Rhinovirus

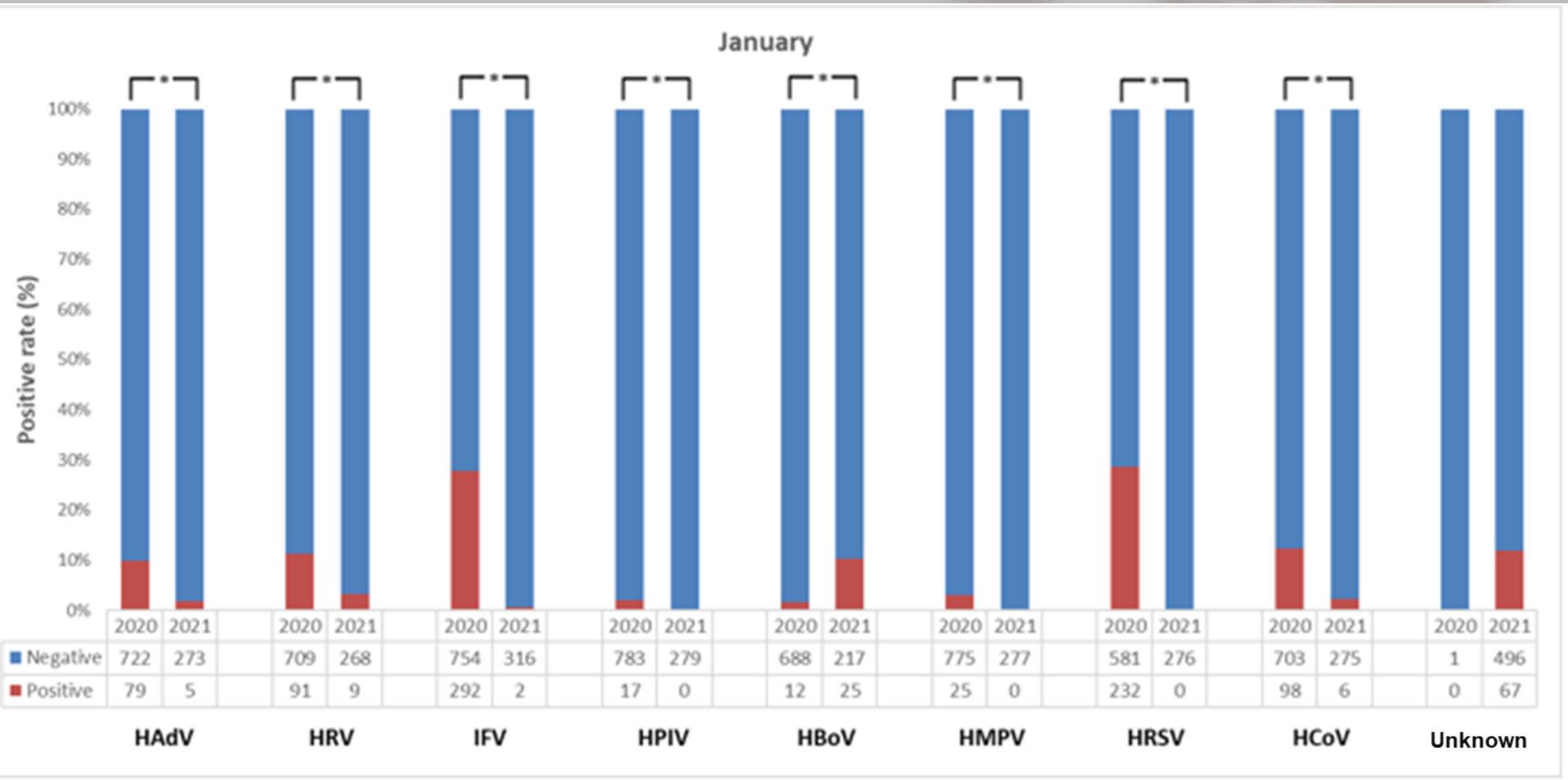


2021 SARI surveillance



NEJM 2020;382:1199-207

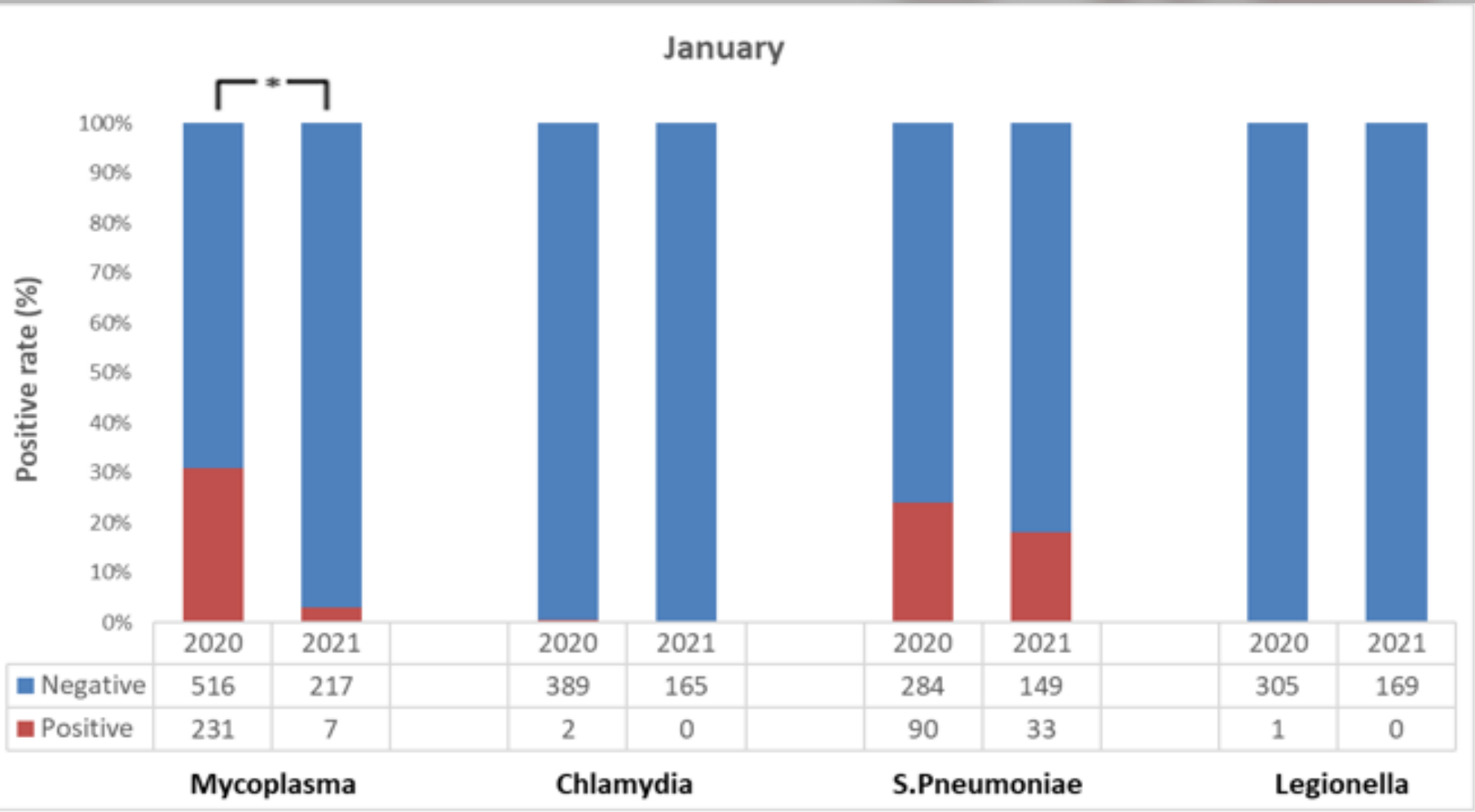
2021 SARI surveillance



	HAdV		HRV		IFV		HPIV		HBoV		HMPV		HRSV		HCoV		Unknown	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Negative	722	273	709	268	754	316	783	279	688	217	775	277	581	276	703	275	1	496
Positive	79	5	91	9	292	2	17	0	12	25	25	0	232	0	98	6	0	67

* Statistical significance. (p-value < 0.05)

2021 SARI surveillance



* Statistical significance. (p-value < 0.05)

2021 SARI surveillance

■ 원인 불명 호흡기 바이러스 병원체 감시 체계

대상: 폐렴으로 입원한 환자 중 바이러스 검사와 세균 검사에서 전부 음성인 환자

원인 불명 호흡기 바이러스 병원체 감시 사업과 연계하여 검체를 수집, 정보 분석

- 폐렴으로 입원한 환자 중 바이러스 검사와 세균 검사에서 전부 음성인 환자에 대한 월별 보고를 바탕으로 원인불명 호흡기 바이러스 병원체 감시 사업팀에 해당 환자를 보고하고, 보관된 검체를 이용하여 원인 불명 병원체의 종류를 파악함.

KOREA UNIVERSITY GLOBAL PRIDE

THANK YOU

대한결핵 및 호흡기학회 호흡기감염병연구회

KOREA UNIVERSITY MEDICAL CENTER

대한결핵 및 호흡기학회
호흡기감염병연구회