# COVID-19 글로벌 상황과 향후 전망

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## 보건사회연구원 국제보건 세미나 PART I

*2022. 7.21-*



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# FUTURE PROSPECTS

## (TRANSITION TOWARDS ENDEMICITY)

# 5 STAGES OF PANDEMIC

**A.Fauci, Davos, WEF, 18 Jan 2022**

## 1. PANDEMIC

- Acute pan-epidemic
- Till now

## 2. DECELERATION

- Slowdown in new cases

## 3. CONTROL

- Endemic stage*
- Integrated into broad range of infectious diseases like flu

## 4. ELIMINATION

- Eradicated or semi-eradicated from certain countries
- Measles or polio, etc
- Very unlikely

## 5. ERADICATION

- Nearly impossible
- Smallpox

- New variants emerging
- Shortage of vaccine/therapeutics

- Increased immunity by vaccination or natural infection
- Therapeutics widely available

* Virus present, but does not disrupt society


HEALTH • OMICRON

**Fauci says there are 5 stages of the COVID pandemic—and we are still in phase 1**

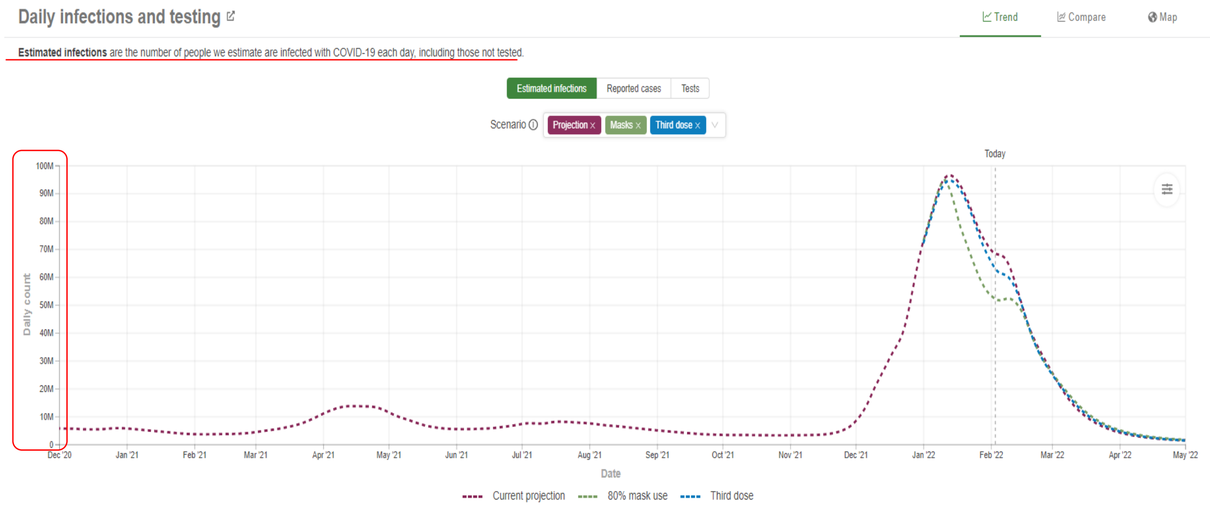
BY SOPHIE MELLOR

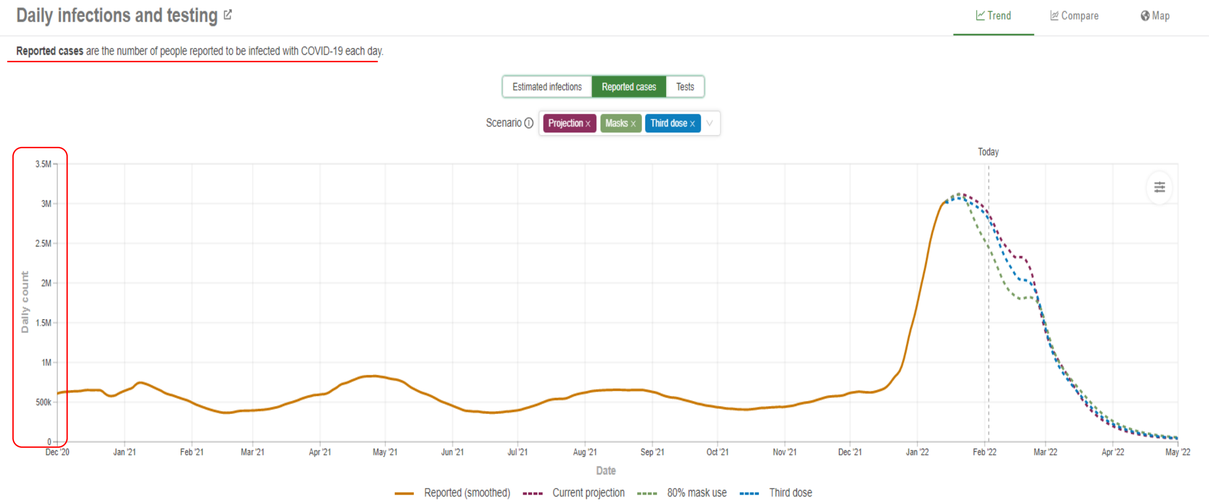
January 19, 2022 2:26 AM GMT+9

# CORONA-19 PROJECTION

## Global

C Murray(IHME), Lancet 19 Jan, 2022




COVID-19 will continue but the end of the pandemic is near

The world is experiencing a huge wave of infection with the omicron variant of SARS-CoV-2. Estimates South Africa enrolling in a clinical trial, 71 (31%) were PCR positive for SARS-CoV-2 and had the omicron

Published Online January 19, 2022

# CORONA-19 PROJECTION

## Global

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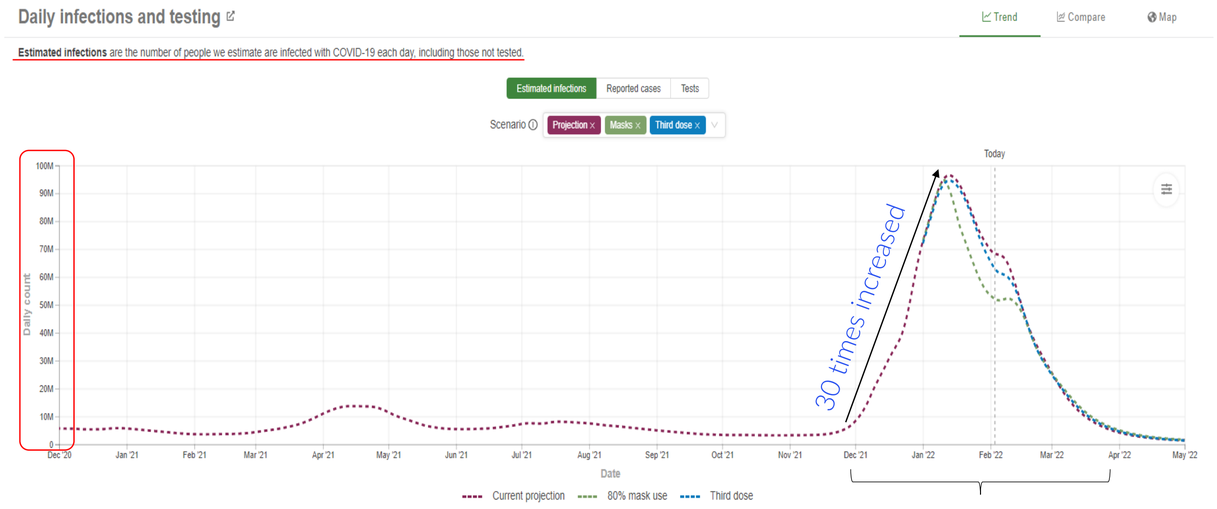
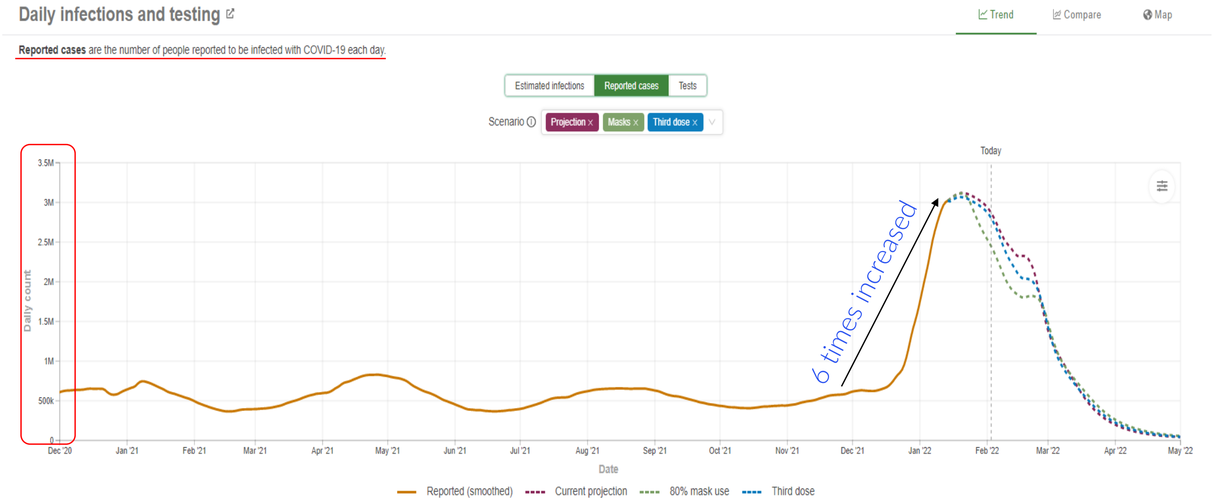



more than 50% of the world population
to be infected with Omicron
(btwn end of Nov 2021 to end of Mar 2022)




Cf.
- Asymptomatic infection of Omicron: 80-90%
- Point prevalence of UK on 6 Jan 2022: 6.9%

COVID-19 will continue but the end of the pandemic is near

The world is experiencing a huge wave of infection with the omicron variant of SARS-CoV-2. Estimates South Africa enrolling in a clinical trial, 71 (31%) were PCR positive for SARS-CoV-2 and had the omicron

Published Online January 19, 2022

# ‘Corona-19 will continue, but the end of the pandemic* is near’

**Murray(IHME), Lancet 19 Jan, 2022**

## BIG PICTURE 1:

**Large proportion** of the world to be infected with Omicron (by early to mid 2022)
→ Together with continued increases in vaccination, global levels of Corona-19 **immunity to be high** for some period (weeks or months)
→ **Low levels of virus transmission**

## BIG PICTURE 2:

**New variants** will surely emerge and some may be more severe than Omicron, & immunity above 1 to be waned.
→ Creating opportunity for **continued virus transmission** (after some period of low transmission). However, **impacts** of future transmission on health **will be less** because of broad previous exposure to virus & regularly adapted vaccines to new variants

Conclusion: After the Omicron wave, Corona-19 will return but the pandemic will not.


COVID-19 will continue but the end of the pandemic is near

The world is experiencing a huge wave of infection with the omicron variant of SARS-CoV-2. Estimates

South Africa enrolling in a clinical trial, 71 (31%) were PCR positive for SARS-CoV-2 and had the omicron

Published Online January 19, 2022

* Term ‘endemic’ not used (to avoid confusion or not yet to reach endemic)?!

# FUTURE PROSPECTS (b4 Omicron)


글로벌케어 특집 리포트

'세계화 시대의 감염병, 감염병의 세계화'

2020년 1월 7일 중국에서 처음 발견된 신종 감염병인 코로나19는 무서운 속도로 퍼져 나가 아시아는 물론 유럽을 거쳐 불과 한달여 만에 아프리카 대륙에까지 확산되면서 실질적인 팬데믹(Pandemic) 상황이 되었고, 지구촌은 코로나 패닉에 빠져 들었습니다. 2020년 1월말 코로나 감염병으로 인한 국제적 공중보건 비상사태를 선언하였던 WHO는 이 somewhat 3월 11일 공식적으로 팬데믹 상황임을 선포하였습니다.

2. 코로나 대응 전략과 향후 시나리오

2020년 4월 2일

안동일 (글로벌케어 시니어 컨설턴트 / 연세대학원 객원 교수)

Brian Resmick & DI Ahn, Apr 2020 → Oct 2021

| | |
|---|---|
| • Ex: SARS / Ebola<br>• China (O)<br>• New Zealand (?) | • Ex: Polio/Measles<br>• Sweden (X)<br>• India (O)<br>• Some European countries? (incl Portugal *) | • Ex: Seasonal flu<br>• Some European countries (incl UK) |
| **Scenario 1**<br>**Containment** | **Scenario 2**<br>**Natural infection/vaccine → Herd immunity** | **Scenario 3**<br>**Failure of herd immunity → Endemicity (Live with corona)** |

*98% of those eligible fully vaccinated/86% of total population

THE CORONAVIRUS WILL BECOME ENDEMIC

A Nature survey shows many scientists expect SARS-CoV-2 is here to stay, but it could pose less danger over time. By Nicky Phillips

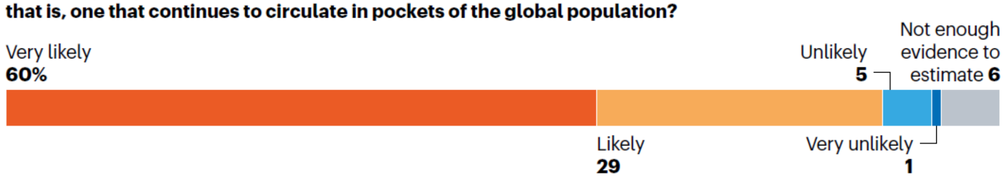
# FUTURE OF COVID-19 PANDEMIC

Nature, 18 Feb 2021

## ENDEMIC FUTURE

In a *Nature* poll, 89% of scientists felt that SARS-CoV-2 was either very likely or likely to become an endemic virus.

**How likely do you think it is that SARS-CoV-2 will become an endemic virus: that is, one that continues to circulate in pockets of the global population?**

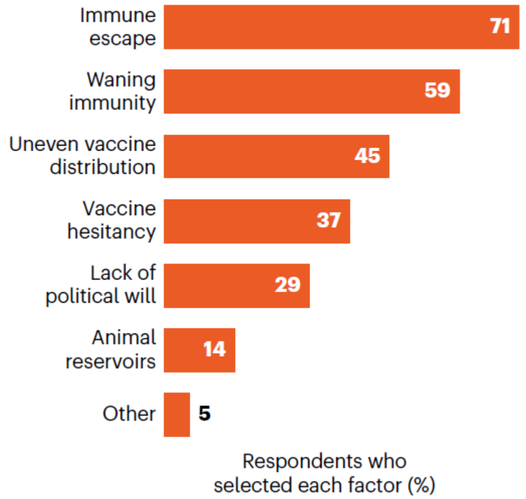



**How likely do you think it is that SARS-CoV-2 can be eliminated from some regions?**


119 immunologists, infectious-disease researchers and virologists from 23 countries. Percentages do not add up to 100% because of rounding.

## DRIVING FACTORS

*Nature* asked scientists to pick three of the biggest factors that would drive SARS-CoV-2 circulation in people if it became endemic.




Re-infected by mutated virus

"The virus becoming endemic is likely, but the pattern that it will take is hard to predict."

# WHY DIFFICULT TO PREDICT
# HOW THE PANDEMIC WILL END

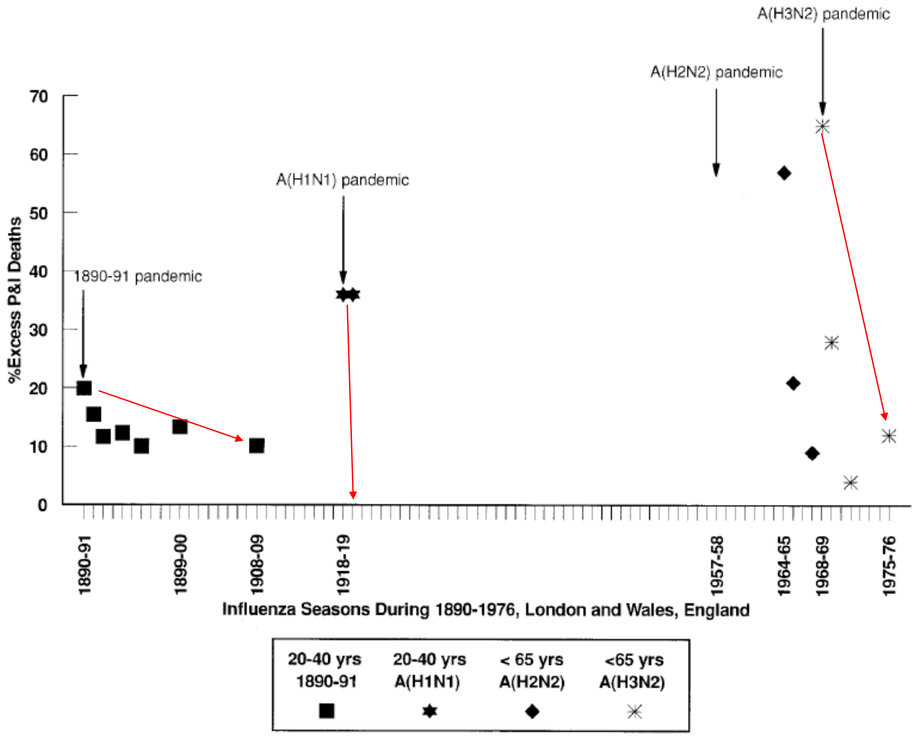


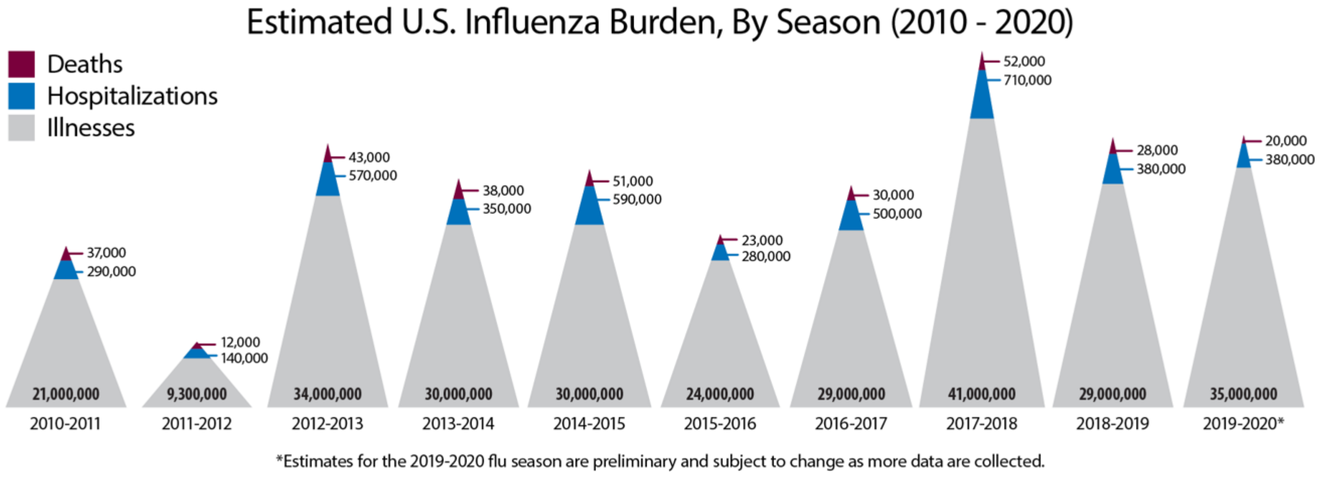

**Figure 3.** Age distribution of deaths related to influenza pandemics and epidemics in England, 1890–1976. Data on proportional impact of influenza on pneumonia and influenza (P&I) mortality for 20- to 40-year-old age group in London following 1890 pandemic and through 1918–1919 pandemic [21]. For England and Wales, proportion of influenza-related all-cause deaths was calculated for <65-year-old age group [22].

Pandemic versus Epidemic Influenza Mortality: A Pattern of Changing Age Distribution

Lone Simonsen,* Matthew J. Clarke, Lawrence B. Schonberger, Nancy H. Arden, Nancy J. Cox, and Keiji Fukuda

*Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, US Department of Health & Human Services, Atlanta, Georgia*

# SEASONAL FLU IN US

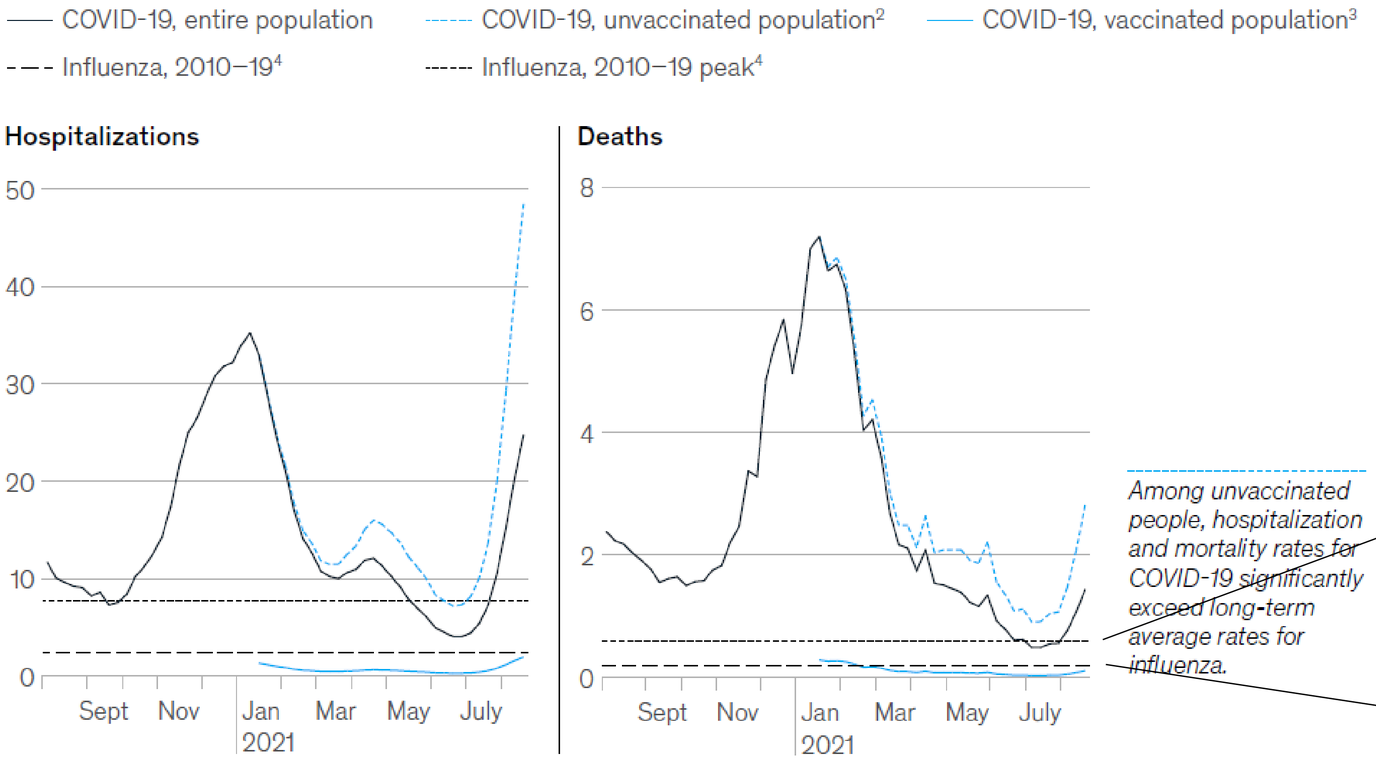




US population: 330 M → around 3-12% (annual average)

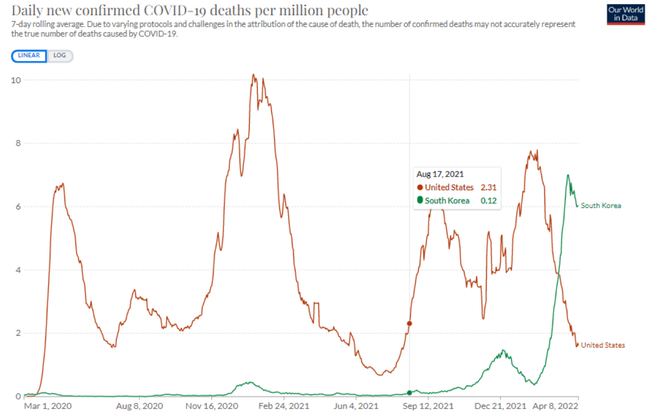
# COVID-19 vs SEASONAL FLU IN US

**In the United States, incidence of COVID-19 cases in June and July was similar to long-term incidence of influenza cases, but now exceeds it.**

**Weekly incidence of COVID-19 and influenza cases,[1] rate per 100,000**




*Among unvaccinated people, hospitalization and mortality rates for COVID-19 significantly exceed long-term average rates for influenza.*




0.5 deaths/million people (daily mortality)
Cf. COVID-19: 1-10 deaths/million people (daily mortality) since early 2020

0.1 deaths/million people (daily mortality)

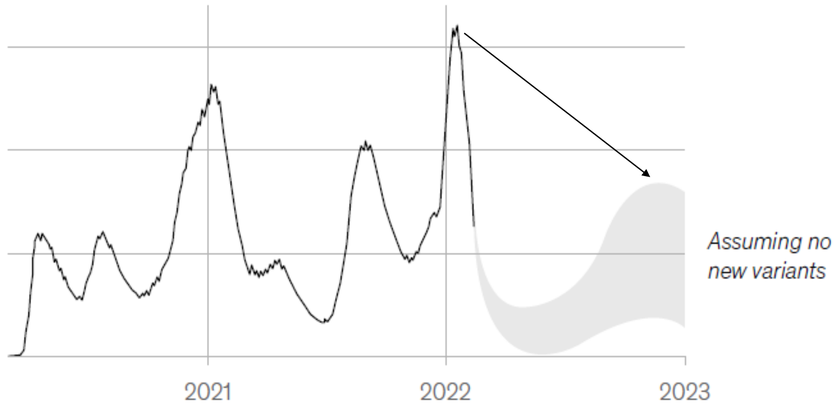
# NEXT 10 MONTHS AFTER OMICRON: US

**2 Mar 2022**

Exhibit 2

**If Omicron remains the dominant variant, US hospitalizations will likely stay low throughout 2022.**

**Scenario for US COVID-19 hospitalizations (Omicron only) through December 2022 (illustrative)**




- Omicron-related hospitalization: low levels thru spring and summer

→ seasonality–driven wave in next fall and winter, but still much lower than recent wave

# NEXT 10 MONTHS AFTER OMICRON: US

**2 Mar 2022**

1. **Six-months outlook** in many countries is **brighter** than any time in the past two years.

2. Four strains in two years → extraordinary progression → **'No new variant'** scenario is **dangerous** to plan

3. Human beings remain **observer** as the virus evolves

4. But for now, the pandemic phase looks **to be ending**.

# Queen's PlatInum JubIlee: 2nd June 2022

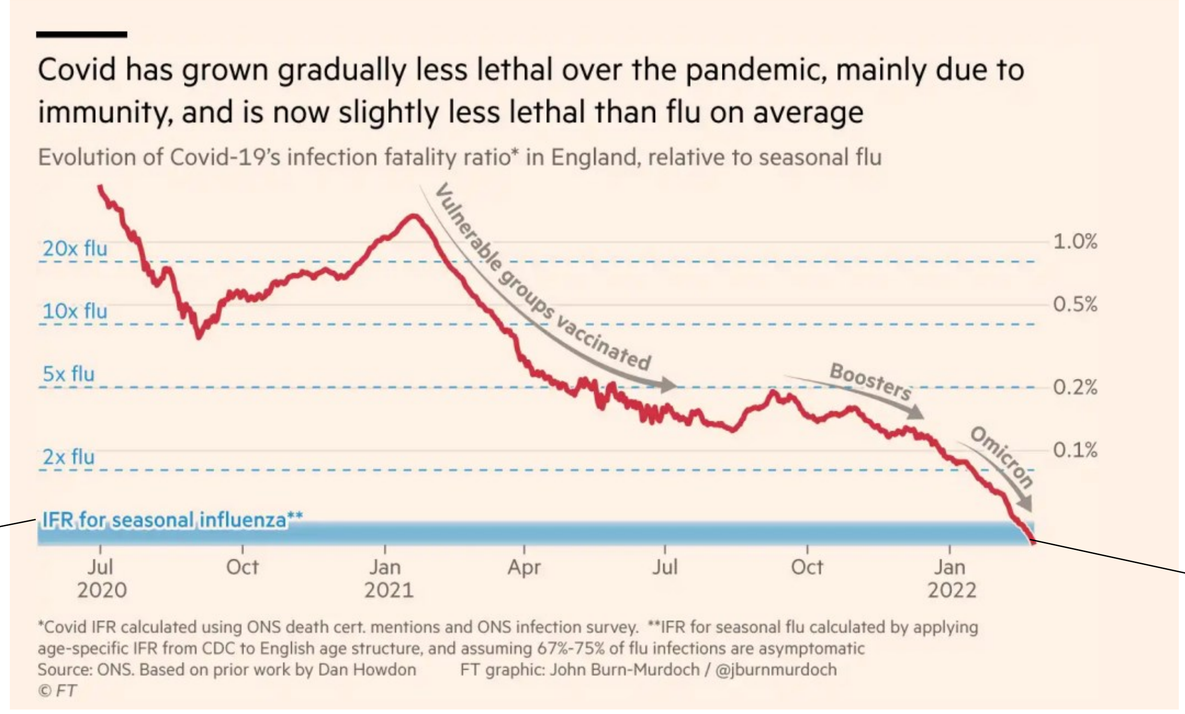
▲ Images of the Queen are projected on to Stonehenge to mark her platinum jubilee. Photograph: Jim Holden/English Heritage/PA

▲ A crowd pack out the Mall on Thursday as they wait for the royal family to appear on the balcony of Buckingham Palace. Photograph: Richard Pohle/AP

# PATH TO ENDEMICITY

## WITH VACCINATION & OMICRON: UK

### Financial Times, Mar 2022




0.05 %

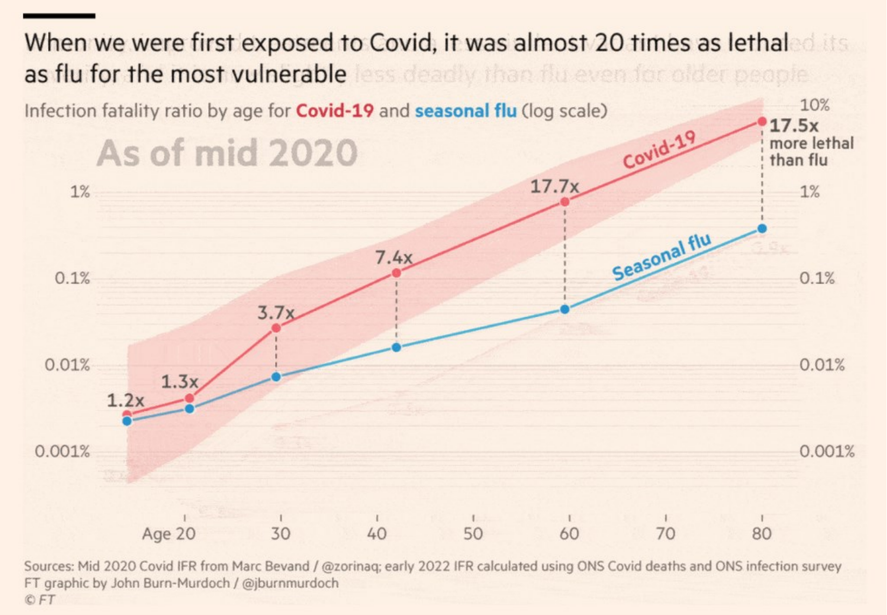
0.04 %

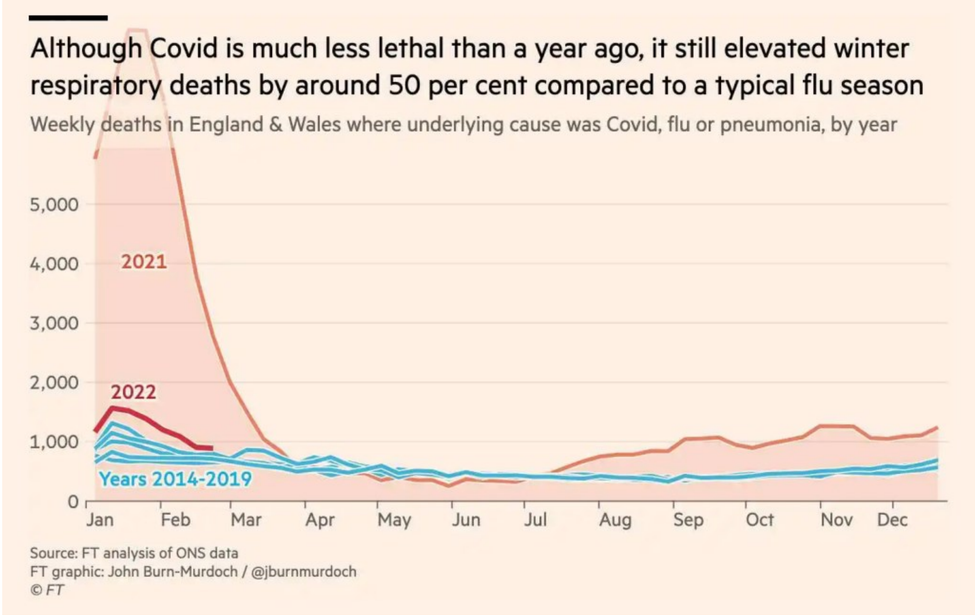
Vaccines and Omicron mean Covid now less deadly than flu in England

# PATH TO ENDEMICITY

## WITH VACCINATION & OMICRON: UK

### Financial Times, Mar 2022




Vaccines and Omicron mean Covid now less deadly than flu in England

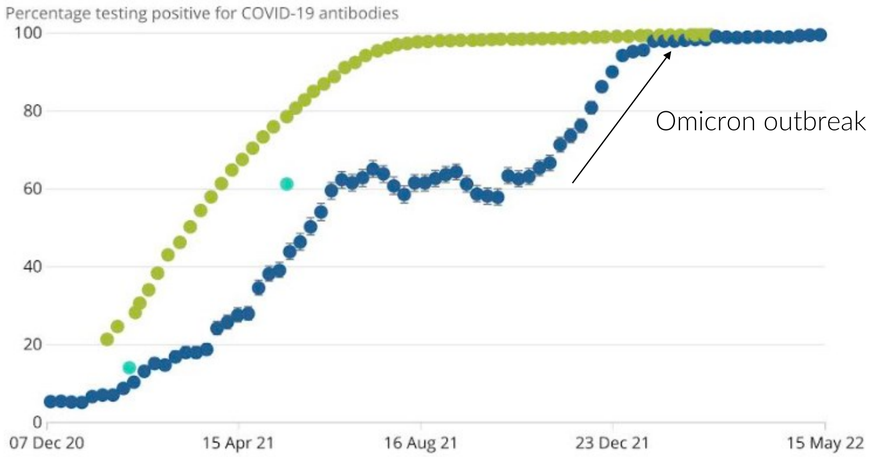
# TRENDS OF ANTIBODY IN UK

**Dec 2020 - May 2022**

**Antibody positivity remains high across data sources**

Estimated percentage of adults testing positive for antibodies against SARS-CoV-2, 7 December 2020 to 15 May 2022, England

- Coronavirus (COVID-19) Infection Survey, ONS
- Real-time Assessment of Community Transmission (REACT) study
- UK Health Security Agency sero-surveillance programme, NHS Blood and Transplant Collection




**Source: Office for National Statistics, UK Health Security Agency and Real-time Assessment of Community Transmission study**

# COVID-19 RISK & CFR DURING OMICRON

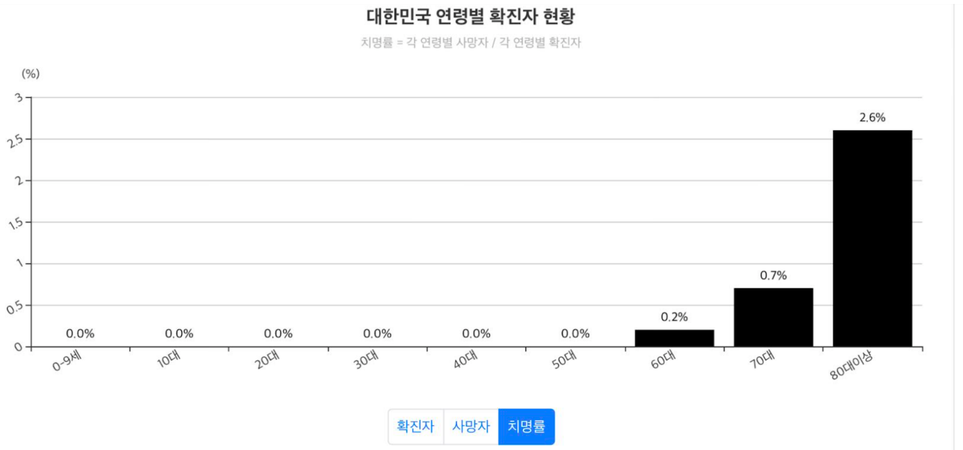
## Apr-May 2022, 코로나 실시간 상황판

### Risk for COVID-19 Infection, Hospitalization, and Death By Age Group

Updated Mar. 28, 2022 Print

| Rate compared to 18-29 years old[1] | 0-4 years old | 5-17 years old | 18-29 years old | 30-39 years old | 40-49 years old | 50-64 years old | 65-74 years old | 75-84 years old | 85+ years old |
|---|---|---|---|---|---|---|---|---|---|
| Cases[2] | <1x | 1x | Reference group | 1x | 1x | 1x | 1x | 1x | 1x |
| Hospitalization[3] | <1x | <1x | Reference group | 2x | 2x | 3x | 5x | 8x | 10x |
| Death[4] | <1x | <1x | Reference group | 4x | 10x | 25x | 65x | 140x | 340x |

All rates are relative to the 18- to 29-year-old age category. This group was selected as the reference group because it has accounted for the largest cumulative number of COVID-19 cases compared to other age groups. Sample interpretation: Compared with 18- to 29-year-olds, the rate of death is four times higher in 30- to 39-year-olds, and 340 times higher in those who are 85 years and older. (In the table, a rate of 1x indicates no difference compared to the 18- to 29-year-old age category.)

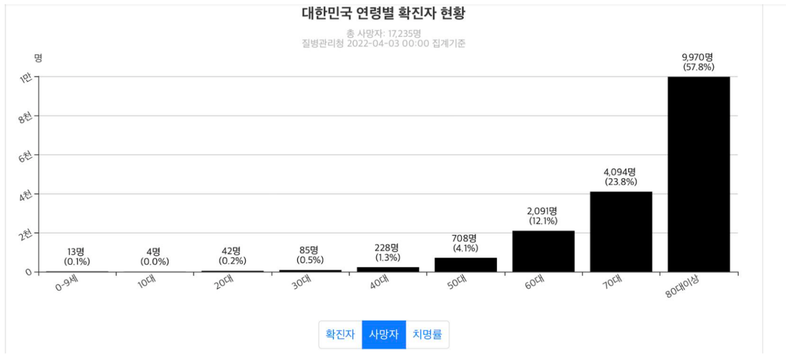



### "5월엔 독감 수준 치명률" 발톱 무뎌진 오미크론

장현은 기자 +구독

한겨레

5월 단기치명률 0.07%...2020년 8월 2.1%서 30분의 1 수준
중대본 "계절독감 0.05~0.1%와 유사"
유행 규모 확산 땐 긴장 늦추기 어려워
"고령층·기저질환자 치명률은 여전히 높아"




CDC Centers for Disease Control and Prevention

COVID-19

Risk for COVID-19 Infection, Hospitalization, and Death By Age Group

Updated Mar. 28, 2022



코로나19(COVID-19) 실시간 상황판

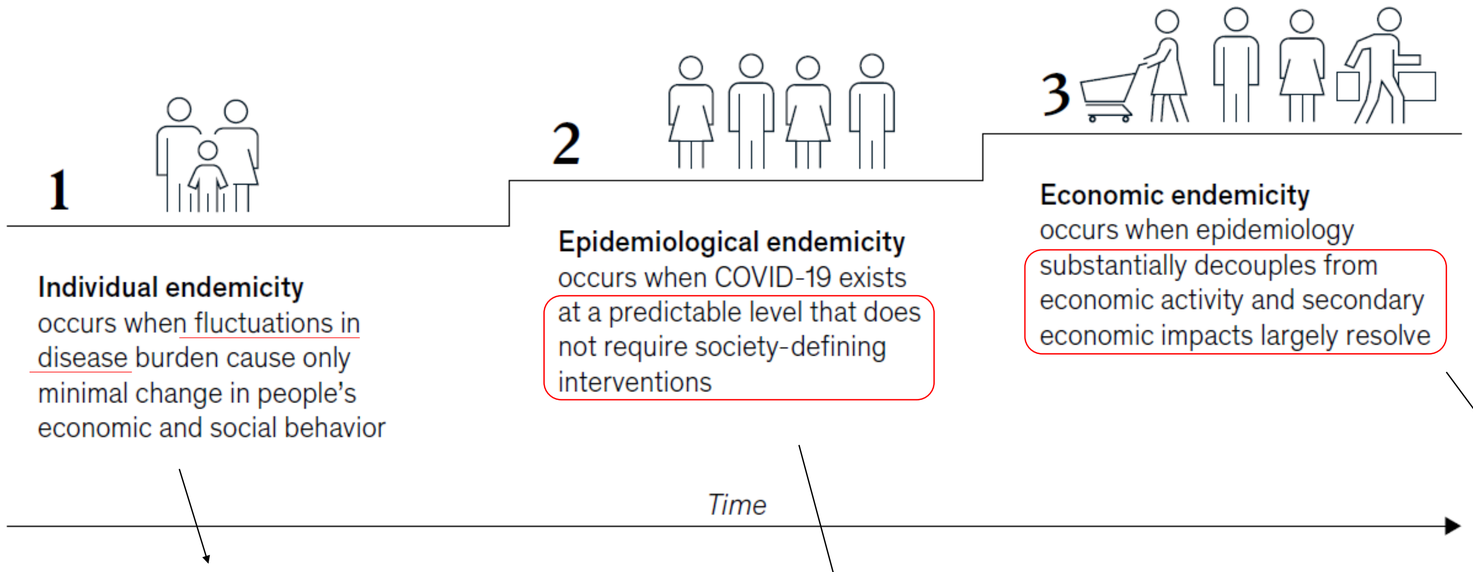
# PATH TO COVID-19 BECOMING ENDEMIC

**2 Mar 2022**

Exhibit 4

**Three distinct definitions for COVID-19 endemicity are emerging.**

**The path to COVID-19 becoming endemic**




- Still public health measures in place
- Health risks need to be managed individually(aged people, etc)

US: Roadmap for living with COVID

- Business normalized
- No more labor market disrupted, travel and trade fully recovered, etc

McKinsey & Company

Healthcare Systems & Services Practice

When will the COVID-19 pandemic end? March 2022 update

# NEXT VARIANT

**TIME, 26 Jan 2022**

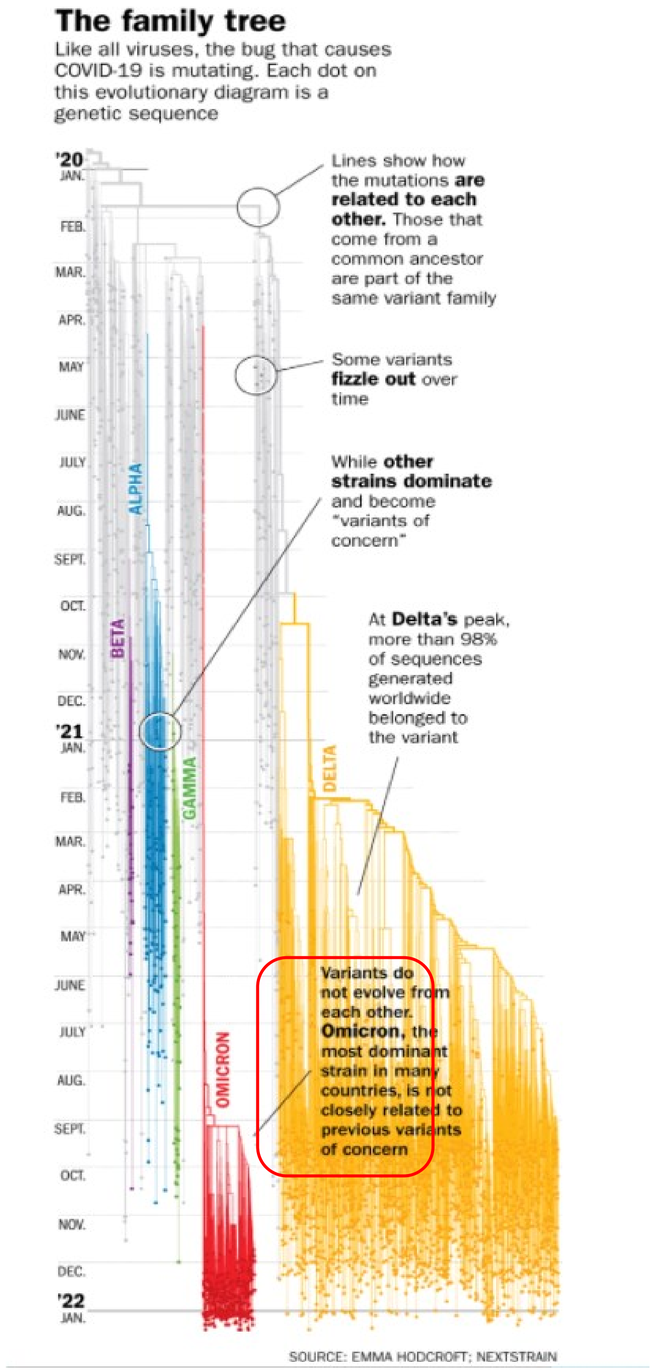
Omicron: not come from Delta variant

Next variant: not daughter or son of Omicron
→ hard to predict its nature(transmissibility/virulence)


HEALTH COVID-19

Omicron Could Be the Beginning of the End of the COVID-19 Pandemic

Alice Park @aliceparkny | Jan. 26, 2022



# SELECTION PRESSURE ON A VIRUS

**Lancet, Jul 2022**

To generate as many onward infection **as many onwards infections as possible** thru

1. changes in its ***intrinsic transmissibility*** or
2. ***immune evasion***

→**Future variants** would be more contagious and far better at evading immunity from vaccines/earlier infection

→**Virulence** is not a primary focus of natural selection, just its by-product, and is thus **complex to predict**



Decoding the next SARS-CoV-2 variant

# THREE PHASES OF PANDEMIC: 미국

**N.Christakis, Nov 2020**

2020-2021

**팬데믹 진행기**
(Immediate pandemic)

급변하는 사회속의 삶
(마스크, 사회적 거리두기등)

2021년초까지 백신개발 안되면
2022년까지 전인구의 40-50%
감염

2022-2023

**팬데믹 이행기**
(Intermediate pandemic)

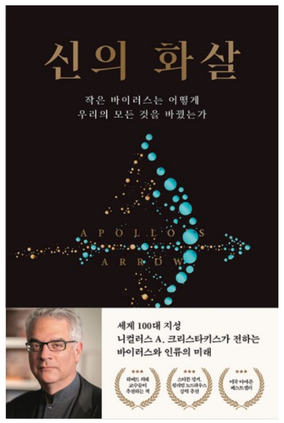
팬데믹 쇼크로부터 회복기

위드 코로나

2024-

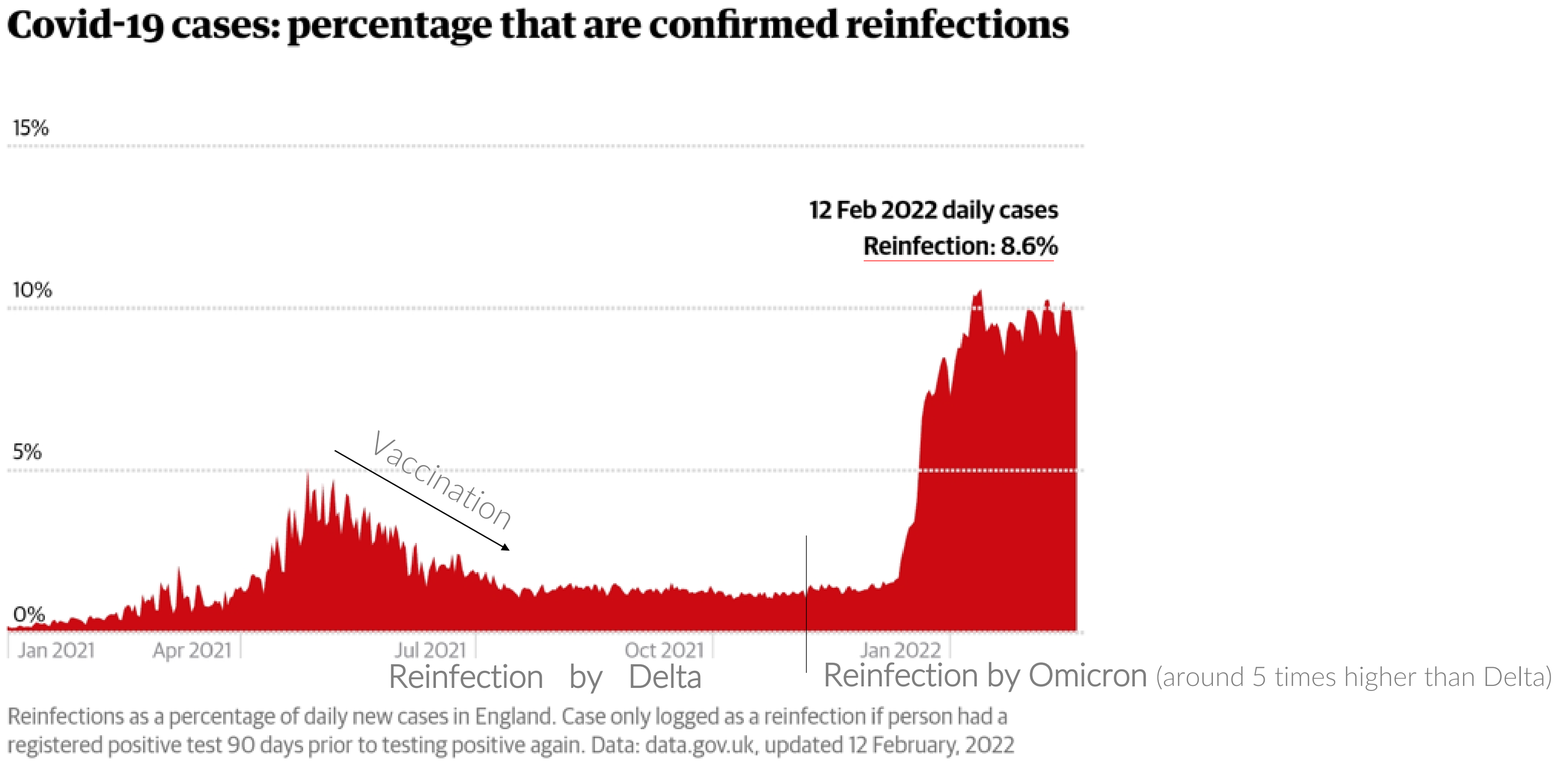
**포스트 팬데믹**
(Post-pandemic)

점진적으로 정상으로
돌아옴(일부 변화는 지속됨: 뉴-노멀)



# THE AGE OF REINFECTION

# MORE REINFECTION BY OMICRON



# SEVERITY OF REINFECTION: MUCH LIGHTER

**NEJM, Qutar,** February 2020 – April 2021

**Table 1. Severity of SARS-CoV-2 Reinfections as Compared with Primary Infections in the Population of Qatar.**

| Disease Outcome* | Reinfection†‡ | Primary Infection†‡ | Odds Ratio (95% CI) |
|---|---|---|---|
| | *no. of persons with outcome/no. of persons with infection that was not severe, critical, or fatal* | | |
| Severe disease | 4/1300 | 158/6095 | 0.12 (0.03–0.31) |
| Critical disease | 0/1300 | 28/6095 | 0.00 (0.00–0.64) |
| Fatal disease | 0/1300 | 7/6095 | 0.00 (0.00–2.57) |
| Severe, critical, or fatal disease | 4/1300 | 193/6095 | 0.10 (0.03–0.25) |

*"Reinfections had 90% lower odds of resulting in hospitalization or death than primary infections."*

**Table S1. Demographic characteristics of the cohort of persons with reinfection and the cohort of persons with primary infection.**

| Characteristics | Persons with reinfection* | Persons with primary infection* | p-value |
|---|---|---|---|
| **Variant type** | | | |
| B.1.351 | 413 (31.7) | 2,364 (37.6) | |
| B.1.1.7 | 57 (4.4) | 813 (12.9) | |
| Wild-type | 213 (16.3) | 991 (15.8) | |
| Unknown status | 621 (47.6) | 2,120 (33.7) | |

**Severity of SARS-CoV-2 Reinfections as Compared with Primary Infections**

# CLINICAL OUTCOME OF REINFECTION: UK

## UK Health Security Agency, Jan 2020-Mar 2021

**Table 2**
Alive and death status 28 days after testing positive for SARS-CoV-2 by sex, age, ethnicity and episode of infection in the population crude and adjusted odds ratio, January 2020 until April 2021, England.

| COVID-19 deaths 28 days after testing positive | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Category | Alive n(%) | Deceased n(%) | Crude OR(95% CI) | Adjusted OR(95% CI) | LRT *p*-value |
| Sex $n$ = 3845,990 | Women | 2011,881 (97.65) | 48,364 (2.35) | 1 | 1 | |
| | Men | 1726,349 (96.67) | 59,396 (3.33) | **1.43 (1.41–1.45)** | **1.83 (1.81–1.86)** | ***p*<0.0001** |
| Age group (Years) | <20 | 587,841 (99.99) | 69 (0.01) | **0.48 (0.36–0.63)** | **0.47 (0.36–0.62)** | ***p*<0.0001** |
| $n$ = 3865,600 | 20 to 29 | 707,250 (99.98) | 173 (0.02) | 1 | 1 | |
| | 30 to 39 | 688,816 (99.92) | 536 (0.08) | **3.18 (2.68–3.78)** | **3.18 (2.67–3.77)** | |
| | 40 to 49 | 599,655 (99.73) | 1624 (0.27) | **11.07 (9.46–12.95)** | **11.04 (9.43–12.92)** | |
| | 50 to 59 | 571,075 (99.12) | 5070 (0.88) | **36.29 (31.18–42.25)** | **36.15 (31.05–42.08)** | |
| | 60 to 69 | 296, 811 (96.27) | 11,493 (3.73) | **158 (136–184)** | **155 (133–180)** | |
| | 70 to 79 | 149,456 (85.48) | 25,392 (14.52) | **695 (592–815)** | **685 (590–797)** | |
| | 80+ | 156,867 (71.19) | 63,472 (28.81) | **1654 (1395–1962)** | **1785 (1536–2073)** | |
| Ethnicity | Asian | 453,693 (99.68) | 1474 (0.32) | **0.46 (0.43–0.48)** | | 0.15 |
| $n$ = 3016,037 | Black | 131,447 (99.72) | 363 (0.28) | **0.39 (0.35–0.43)** | | |
| | Mixed | 71,997 (99.92) | 55 (0.08) | **0.11 (0.08–0.14)** | | |
| | Other | 56,926 (99.83) | 97 (0.17) | **0.24 (0.20–0.29)** | | |
| | White | 2283,810 (99.30) | 16,175 (0.70) | 1 | | |
| Episode | Primary infection | 3752,595 (97.22) | 107,459 (2.78) | 1 | 1 | |
| $n$ = 3874,014 | Reinfection | 13,573 (97.23) | 387 (2.77) | 1.0 (0.90- 1.10) | **0.39 (0.35–0.44)** | ***p*<0.0001** |

*Odd ratios adjusted for all variable in table provided the *p*-value for the likelihood ratio test is <0.05.

Deaths were 61% lower in COVID-19 reinfection than primary infection cases. (주로 **백신미접종자의 사망률 감소**에 의함/백신접종자는 감소폭이 적음)
Cf. ICU admission at reinfection compared to primary infection decreased 76%(supplementary table 1)

Journal of Infection
journal homepage: www.elsevier.com/locate/jinf

Disease severity during SARS-COV-2 reinfection: a nationwide study

# SUGGESTIONS
# IN THE AGE OF COVID REINFECTION

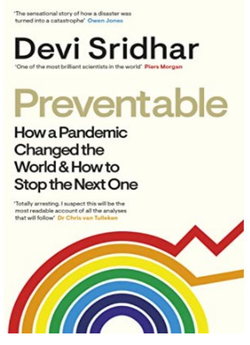
**Devi Sridhar, Apr 2022**

1. Use triad of **testing, therapeutics(esp, rapid antiviral pills) & vaccines** replacing cruder NPIs of 2020: 70% of global roll out of vaccines

2. Rapid response plan to react to a game-changing new variant

3. Rapid testing & one-way mask

4. Developing Tx for long Covid




McKinsey & Company

Healthcare Systems & Services Practice

When will the COVID-19 pandemic end? August 2021 update

# WHEN WILL THE PANDEMIC END?

*'Almost everyone will be either infected or vaccinated before the pandemic ends.'*

*Michael Osterholm,*
*(Director of the Center for Infectious Disease Research and Policy, Univ. of Minnesota, Adviser to President Joe Biden)*


Bloomberg

When Will the Pandemic End? Here's Scientists Six Month Outlook on COVID-19 - Bloomberg

**Pandemic Will Bring**
**The race between vaccinations and new variant strains won't end until Covid-19 has touched almost everyone.**

By **Michelle Fay Cortez** +Follow
September 13, 2021, 6:00 AM GMT+9

# thanks

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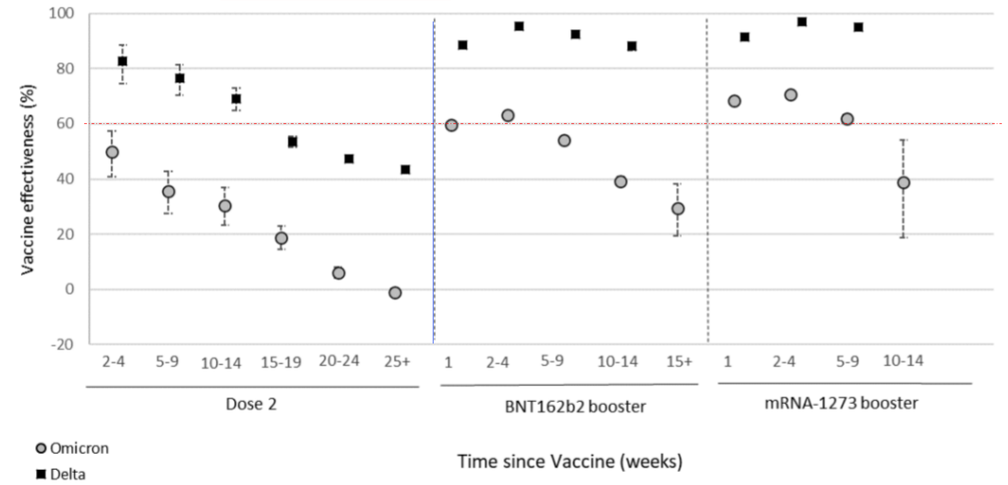
# Annex

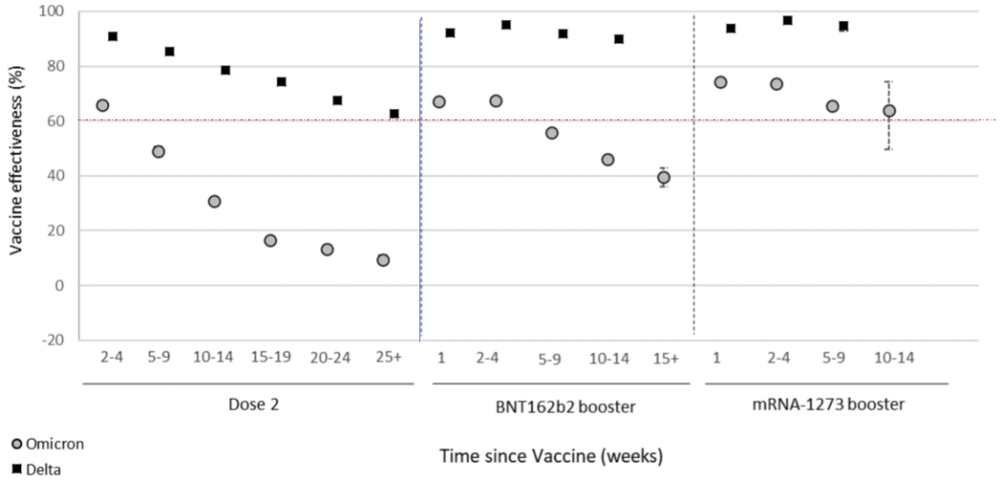
# VACCINE EFFECTIVENESS: Against Symptomatic disease

UK Health Security Agency, 27 Jan 2022

a)




b)

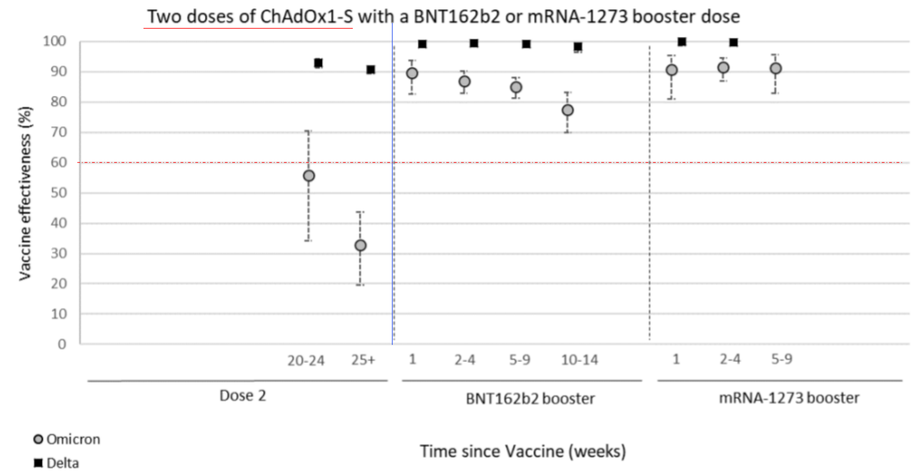



BNT 1622b2: Pfizer, mRNA-1273: Moderna

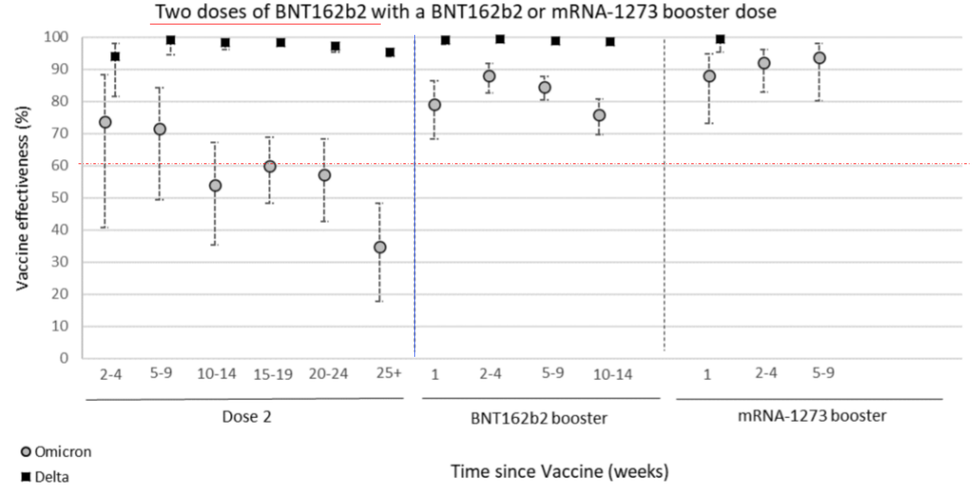
# VACCINE EFFECTIVENESS: Against Hospitalisation

## UK Health Security Agency, 27 Jan 2022

a)




b)




Booster shot made big differences!

NT 1622b2: Pfizer, mRNA-1273: Moderna

# WANING IMMUNITY AFTER BOOSTER SHOT AGAINST DELTA & OMICRON

CDC, 11 Feb 2022

**TABLE 2. mRNA COVID-19 vaccine effectiveness* against laboratory-confirmed COVID-19–associated† emergency department and urgent care encounters and hospitalizations among adults aged ≥18 years, by number and timing of vaccine doses§ — VISION Network, 10 states,¶ August 2021–January 2022****

| Characteristic | Total | SARS-CoV-2 positive test result no. (%) | VE fully adjusted % (95% CI)* | Waning trend p value†† |
|---|---|---|---|---|
| **Hospitalizations** | | | | |
| **Delta-predominant period** | | | | |
| Unvaccinated (Ref) | 36,214 | 14,445 (40) | — | — |
| **Any mRNA vaccine, 2 doses** | 38,707 | 3,315 (9) | 85 (84–85) | <0.001 |
| <2 mos | 1,574 | 49 (3) | 94 (92–96) | |
| 2–3 mos | 2,790 | 154 (6) | 91 (89–92) | |
| 4 mos | 3,129 | 192 (6) | 90 (89–92) | |
| ≥5 mos | 31,214 | 2,920 (9) | 82 (82–83) | |
| **Any mRNA vaccine, 3 doses** | 8,124 | 195 (2) | 95 (95–96) | <0.001 |
| <2 mos | 6,071 | 118 (2) | 96 (95–97) | |
| 2–3 mos | 2,030 | 74 (4) | 93 (91–95) | |
| ≥4 mos | 23 | 3 (13) | 76 (14–93) | |
| **Omicron-predominant period** | | | | |
| Unvaccinated (Ref) | 3,911 | 1,890 (48) | — | — |
| **Any mRNA vaccine, 2 doses** | 3,619 | 979 (27) | 55 (50–60) | 0.01 |
| <2 mos | 88 | 22 (25) | 71 (51–83) | |
| 2–3 mos | 294 | 69 (23) | 65 (53–74) | |
| 4 mos | 150 | 42 (28) | 58 (38–71) | |
| ≥5 mos | 3,087 | 846 (27) | 54 (48–59) | |
| **Any mRNA vaccine, 3 doses** | 2,833 | 276 (10) | 88 (86–90) | <0.001 |
| <2 mos | 1,261 | 103 (8) | 91 (88–93) | |
| 2–3 mos | 1,383 | 137 (10) | 88 (85–90) | |
| ≥4 mos | 189 | 36 (19) | 78 (67–85) | |

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Early Release / Vol. 71
February 11, 2022

2020년 1월 7일 중국에서 처음 발견된 신종 감염병인 코로나19는 무서운 속도로 퍼져 나가 아시아

2. 코로나 대응 전략과 향후 시나리오

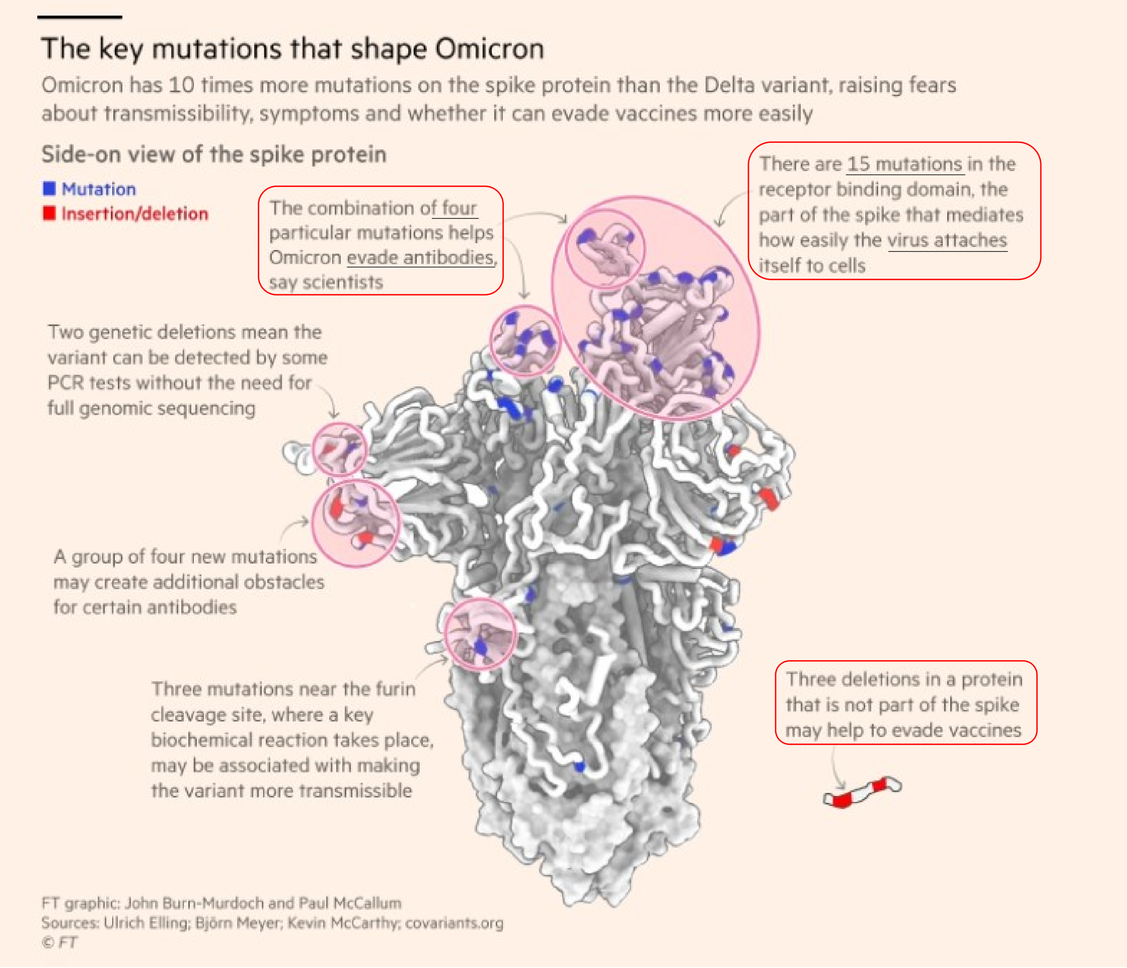
# FUTURE SCENARIOS

| 시나리오 | 내용 | 가능성 | 과거의 예 | 정책/비고 |
|---|---|---|---|---|
| 1. 퇴치 | 감염병의 확산이 멈추고, 환자가 더 이상 발병하지 않게 됨<br><br>통상적으로 잠복기 기간의 두배에 해당되는 기간동안 (코로나의 경우는 14x2=28일)<br>신환자 발생이 없으면, 일단 퇴치된 것으로 봄 | 일단 팬데믹 상황이 되면 퇴치는 (거의) 불가능하다고 알려져 있음<br><br>예외적으로 중국의 퇴치 가능성을 완전 배제할 수는 없겠으나, 만약 퇴치된다 하더라도 외국에서 유입되는 환자로 인해, 아니면 지속적 격리로 인한 경제 및 사회적 비용으로 인해 일시적 퇴치 상황 후 결국에는 제 2, 3의 웨이브가 올 것으로 예상하는 전문가가 다수<br>중국 전역의 퇴치가 어려우면, 베이징 등 특정 지역을 퇴치 상태로 유지하려 할 수도 있을 것임 | a) SARS: 2002년 11월에 발생하여 26개 국가로 확산되었는데 2004년 5월 전 세계적으로 퇴치되었음<br>b) 에볼라: 1976년 아프리카에서 첫 발생 이 후 수년을 주기로 발병과 퇴치를 반복 | 퇴치를 위해선 중국의 경우 현재와 같은 지역 격리/봉쇄 및 사회적 거리두기 등을 상당기간동안 유지해야 하는데, 경제 사회적 비용, 정치적 부담, 보건학적 가능성 등을 고려하여 시나리오 3이나 2로의 전환 여부를 결정해 나갈 것으로 여겨짐. |
| 2. 장기화 + 감염에 따른 집단면역 + 토착화 | 팬데믹 상황이 계속 확산되어 인구의 50-60%[12] 가량이 감염되면 집단면역이 형성되면서 확산이 그치고, 그 후에는 계절에 따라 간헐적으로 나타나게 됨 | 시나리오 3의 백신 개발이 지연되는 경우, 지연되는 만큼 시나리오 2로 전개될 것으로 보여짐<br>백신 개발의 시기에 따라 시나리오 2와 3의 하이브리드(중간 형태)가 나타날 것으로 보여 짐 | 백신이나 치료제가 없었던 근대 이전에 발생했던 많은 감염병들이 이 과정을 밟았음<br><br>1918 스페인 인플루엔자 팬데믹 때, 감염에 의한 집단면역이 생기기 전까지 4-5000만명이 사망한 것으로 추정 | 앞에서 자세히 언급했던 **억제와 완화 정책** 중 각 국가가 선택해야 함<br><br>아프리카나 아시아의 많은 저소득 국가들의 경우, 백신이 개발되어도 저렴한 가격에 공급되는게 아니면 시나리오 3 대신 2로 남게 되는 상황에 직면할 수 있어 국제적 공조가 필요한 상황임 |
| 3. 장기화 + 백신에 의한 면역 + 토착화 | 팬데믹 상황은 계속 확산되지만, 백신의 대량생산이 가능해지면, 백신 접종에 의한 (집단)면역이 형성되어 확산은 중지되고, 그 후에는 계절에 따라 간헐적으로 나타나게 됨 | 현재 코로나 백신의 개발을 위해 전세계적으로 치열한 경쟁이 전개되고 있는데, 백신개발에 통상적으로 1-1.5년이 소요되므로 2021에나 가능할 것으로 예상(보수적 전망)하는 그룹과 임상실험이 곧 시작되므로 금년 내에 가능할 것으로 내다보는 낙관적 견해가 공존 | 2009년 4월에 시작한 H1N1 신종 인플루엔자 팬데믹 때, 백신이 그해 9월에 개발되어 상용화가 이루어짐 | **억제와 완화 정책** 중 각 국가가 선택해야 함<br><br>2009년 팬데믹 당시 WHO가 국제적 제약회사들과 사전 협의를 통해 5천만명분의 백신을 WHO가 기증받아 개발도상국에 배포하여, 산모나 기저질환이 있는 고위험군에 우선적으로 예방접종을 하도록 하였음 |

표3. 각 시나리오의 과거 사례와 관련된 정책들 (출처: Vox에 실린 세가지 시나리오를 토로해서 필자 작성)

# MUTATIONS OF OMICRON

Dec 2021





FINANCIAL TIMES

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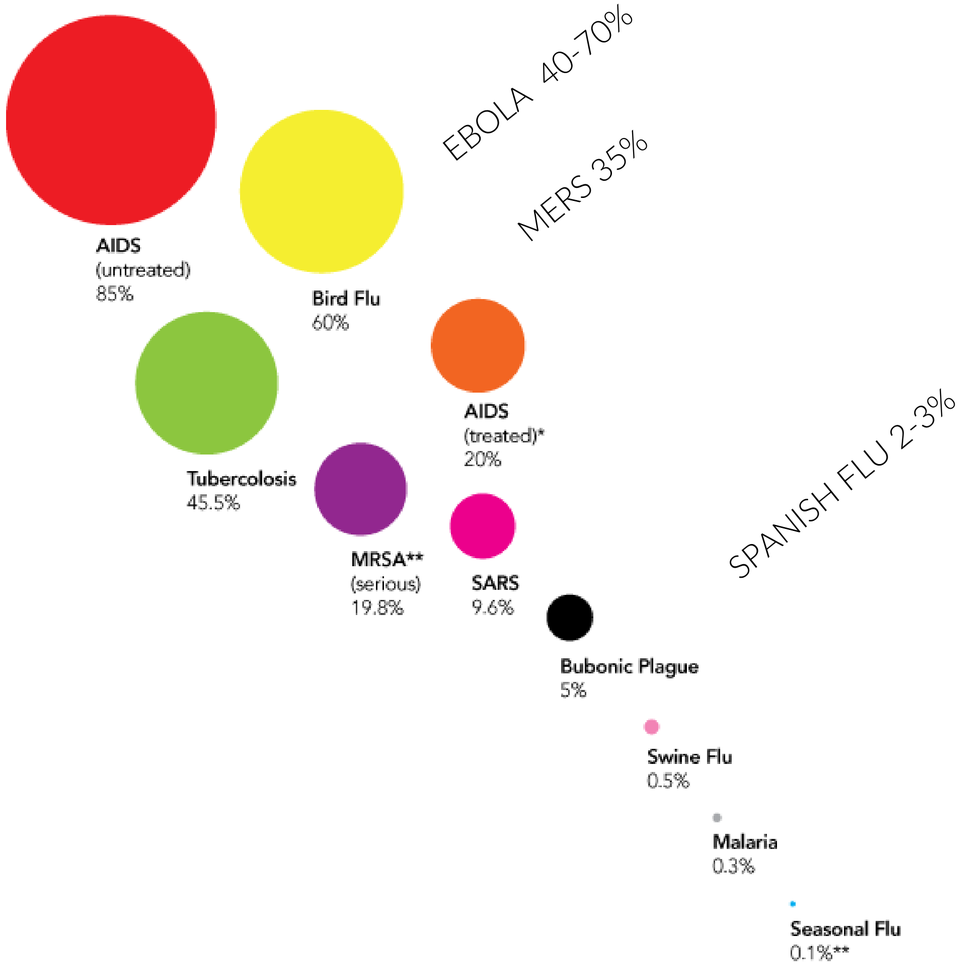
Coronavirus pandemic + Add to myFT

Omicron: What we know about Covid strain prompting fresh global restrictions

# CASE FATALITY




**IMPACT =**

**TRANSMISSIBILITY**

**x**

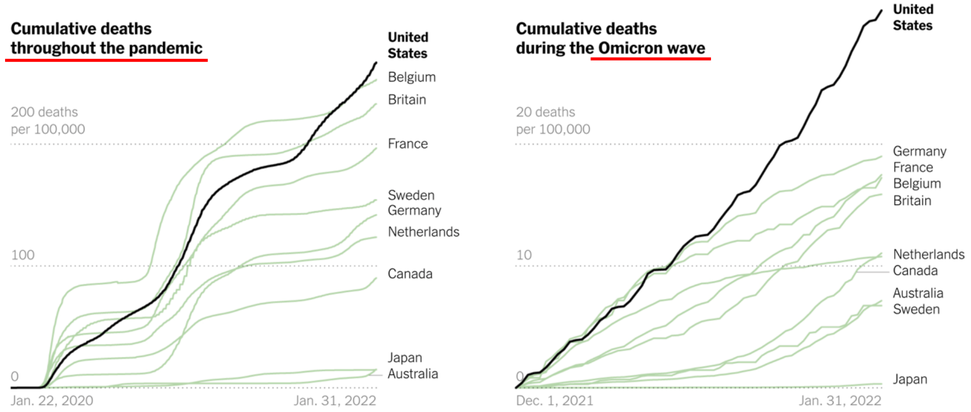
**CASE FATALITY RATES**

# WHY US HAS HIGHER COVID DEATH?

**1 Feb 2022**

**Cumulative U.S. Covid-19 deaths per capita are highest among other large, high-income countries**

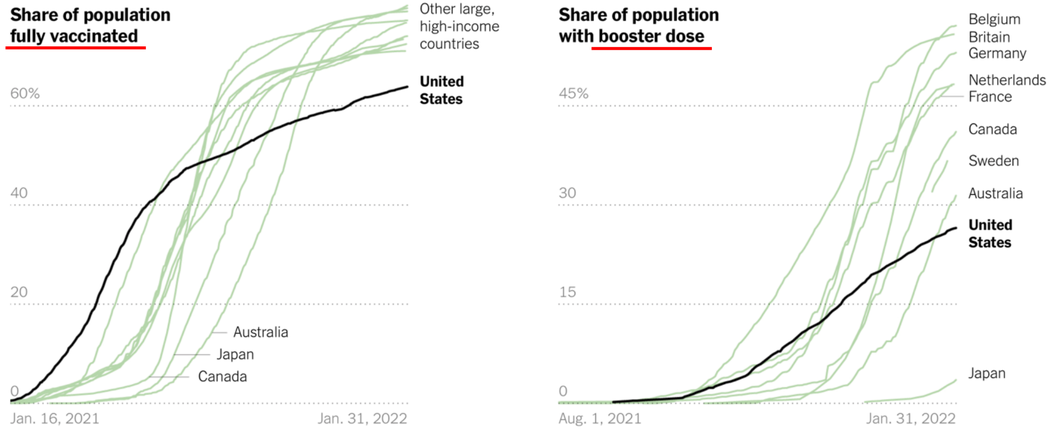
Several countries had higher per capita Covid-19 deaths earlier in the pandemic, but the U.S. death toll now exceeds that of peer nations.




Sources: New York Times database of reports from state and local health agencies (U.S. deaths); The Center for Systems Science and Engineering at Johns Hopkins University (world deaths); World Bank (world populations); United States Census Bureau (U.S. population) • Note: Countries shown are those with the highest gross national income per capita among countries with a population of more than 10 million people.

**U.S. vaccinations lag behind other large, high-income countries**

Despite beginning Covid-19 vaccinations months earlier than countries like Japan and Australia, a smaller share of people in the United States are now fully vaccinated.




Sources: Our World in Data (world vaccinations); Centers for Disease Control and Prevention (U.S. vaccinations) • Note: Vaccination and booster data in some countries are available infrequently. Sweden data for booster doses is available only from Jan. 20, 2022.

1. Majority of hospitalized patients are unvaccinated people
2. Unvaccinated people among older people lag behind certain European countries
   US: 12% of aged >65 → not fully vaccinated (Cf. UK: only 4%)
   US: 43% of aged > 65 → no booster shot (Cf. UK only 9%)
3. Lower booster shot → large proportion of people immunity faded when Omicron sweeps across country

The New York Times

U.S. Has Far Higher Covid Death Rate Than Other Wealthy Countries

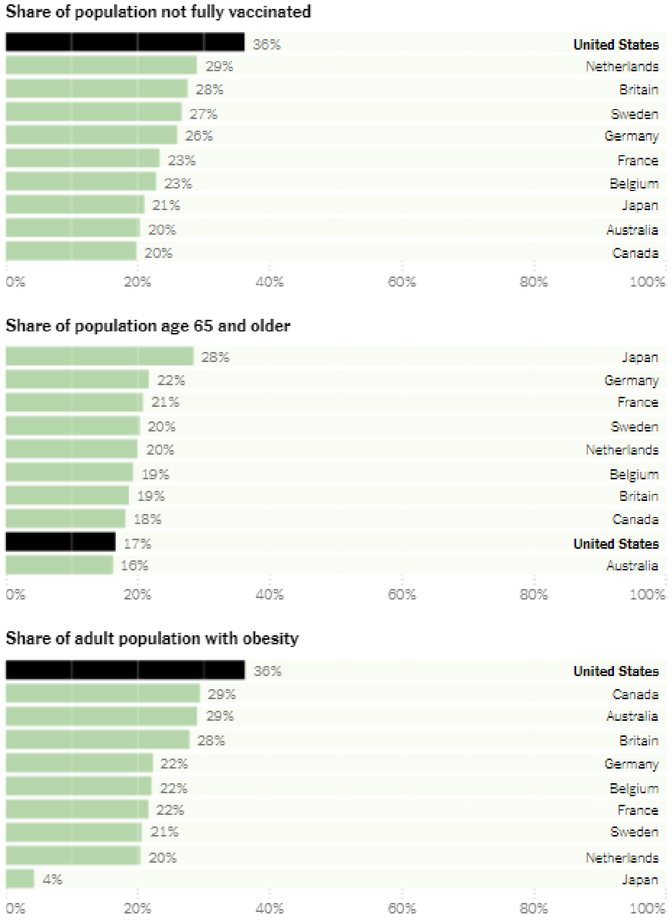
By Benjamin Mueller and Eleanor Lutz Feb. 1, 2022

# WHY US HAS HIGHER COVID DEATH?

**1 Feb 2022**

**Risk Factors for Severe Covid-19**

The population of these 10 high-income countries differ in many demographic factors that are associated with an increased likelihood of severe Covid-19 illness or death.




| | Variation in infections per capita explained by each factor, % (95% UI) | Variation in IFR explained by each factor, % (95% UI) | Reduction in global infections each country's level of trust had exceeded 75th percentile across countries, % (95% UI) | Reduction in global IFR if each county's mean BMI was less than the 25th percentile across all countries, % (95% UI) |
|---|---|---|---|---|
| Seasonality | 2·1% (1·7–2·7)* | .. | .. | .. |
| Age structure | .. | 46·7% (18·1–67·6)* | .. | .. |
| GDP per capita | 4·2% (1·8–6·6)* | 3·1% (0·3–8·6)* | .. | .. |
| Population density | 1·8% (0·8–3·2) | 1·7% (0·3–5·6) | .. | .. |
| Altitude | 5·4% (4·0–7·9)* | .. | .. | .. |
| Pre-exposure to betacoronavirus | 2·1% (1·1–3·1) | 0·7% (0·1–2·1) | .. | .. |
| Body-mass index | .. | 1·1% (0·2–2·6)* | .. | 11·1% (2·1–20·6)* |
| Smoking prevalence | .. | 0·3% (0·1–3) | .. | .. |
| Air pollution | .. | 0·3% (0·1–2·1) | .. | .. |
| COPD prevalence | .. | 0·2% (0·0–0·7) | .. | .. |
| Cancer prevalence | .. | 1·6% (0·1–4·8) | .. | .. |
| Trust in government† | 7·4% (5·4–9·6)* | .. | 12·9% (5·7–17·8)* | .. |
| Interpersonal trust† | 16·5% (12·3–19·5)* | .. | 40·3% (24·3–51·4)* | .. |
| Unexplained variation | 60·6% (55·6–65·2) | 44·4% (29·2–61·7) | .. | .. |

BMI=body-mass index. COPD=chronic obstructive pulmonary disease. IFR=infection-fatality ratio. UI=uncertainty interval. *Estimated parameters that are statistically different from zero. †These covariates are assumed to be independent from each other and all other covariates. Further, a few countries had incomplete reporting of these covariates. Corresponding figures reflect those countries where the respective covariate was present.

***Table 2:*** **Factors associated with variation in cross-country cumulative infections per capita, IFR, and hypothetical levels of trust and prevalence of risk factors**

The New York Times

U.S. Has Far Higher Covid Death Rate Than Other Wealthy Countries

By Benjamin Mueller and Eleanor Lutz Feb. 1, 2022

Pandemic preparedness and COVID-19: an exploratory analysis of infection and fatality rates, and contextual factors associated with preparedness in 177 countries, from Jan 1, 2020, to Sept 30, 2021

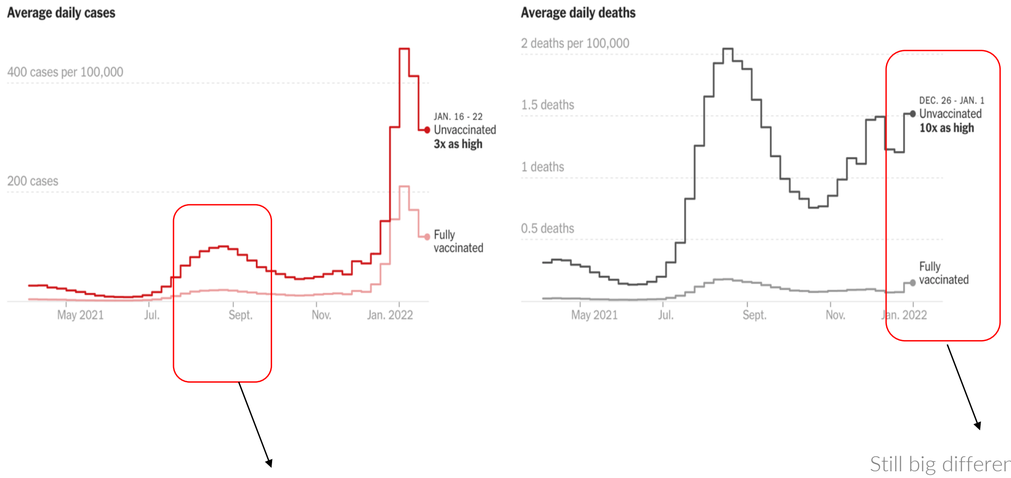
*COVID-19 National Preparedness Collaborators*

# WHO IS MOST LIKELY TO DIE FROM CORONA?

## NYT, 4 Mar 2022

### Rates for vaccinated and unvaccinated

Data from the Centers for Disease Control and Prevention shows that people who are unvaccinated are at a much greater risk than those who are fully vaccinated to die from Covid-19. These charts compare age-adjusted average daily case and death rates for vaccinated and unvaccinated people in the 26 states and two cities that provide this data.

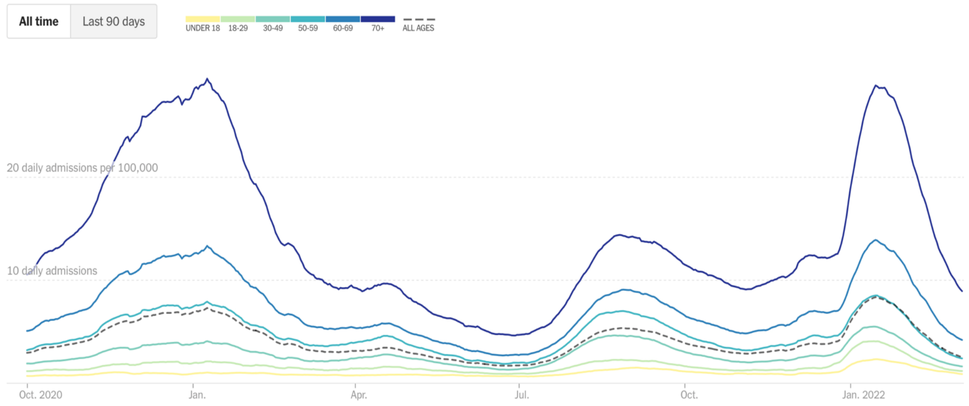



7-8 times higher during Delta period due to protection effect against infection by vaccines

Still big difference due to protection effect against hospitalization in Omicron period (Cf 3 times only for hospitalization)

### Daily new hospital admissions by age

This chart shows for each age group the number of people per 100,000 that were newly admitted to a hospital with Covid-19 each day, according to data reported by hospitals to the U.S. Department of Health and Human Services.

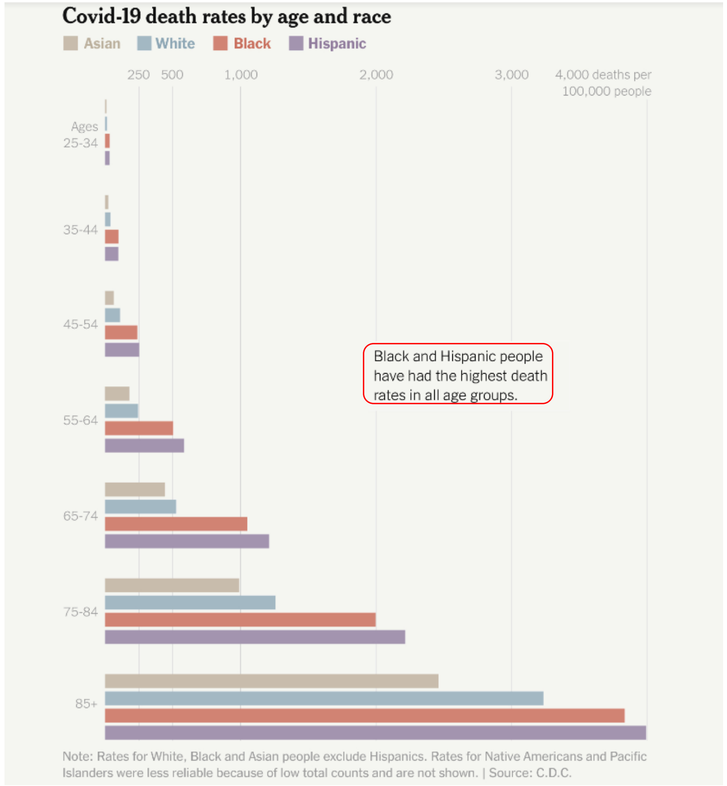


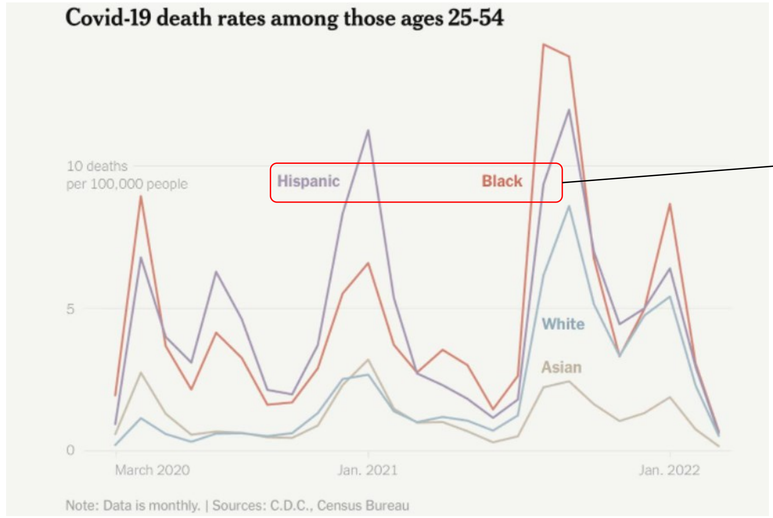

→ Old people who are not vaccinated fully (i.e booster shot)

# Supplement 1

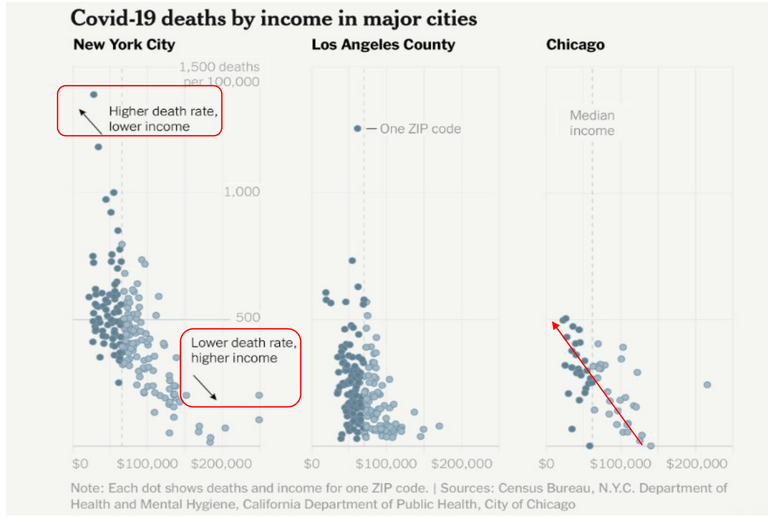
# HOW AMERICA LOST ONE MILLION PEOPLE

**New York Times, 14 May 2022**




More essential workers



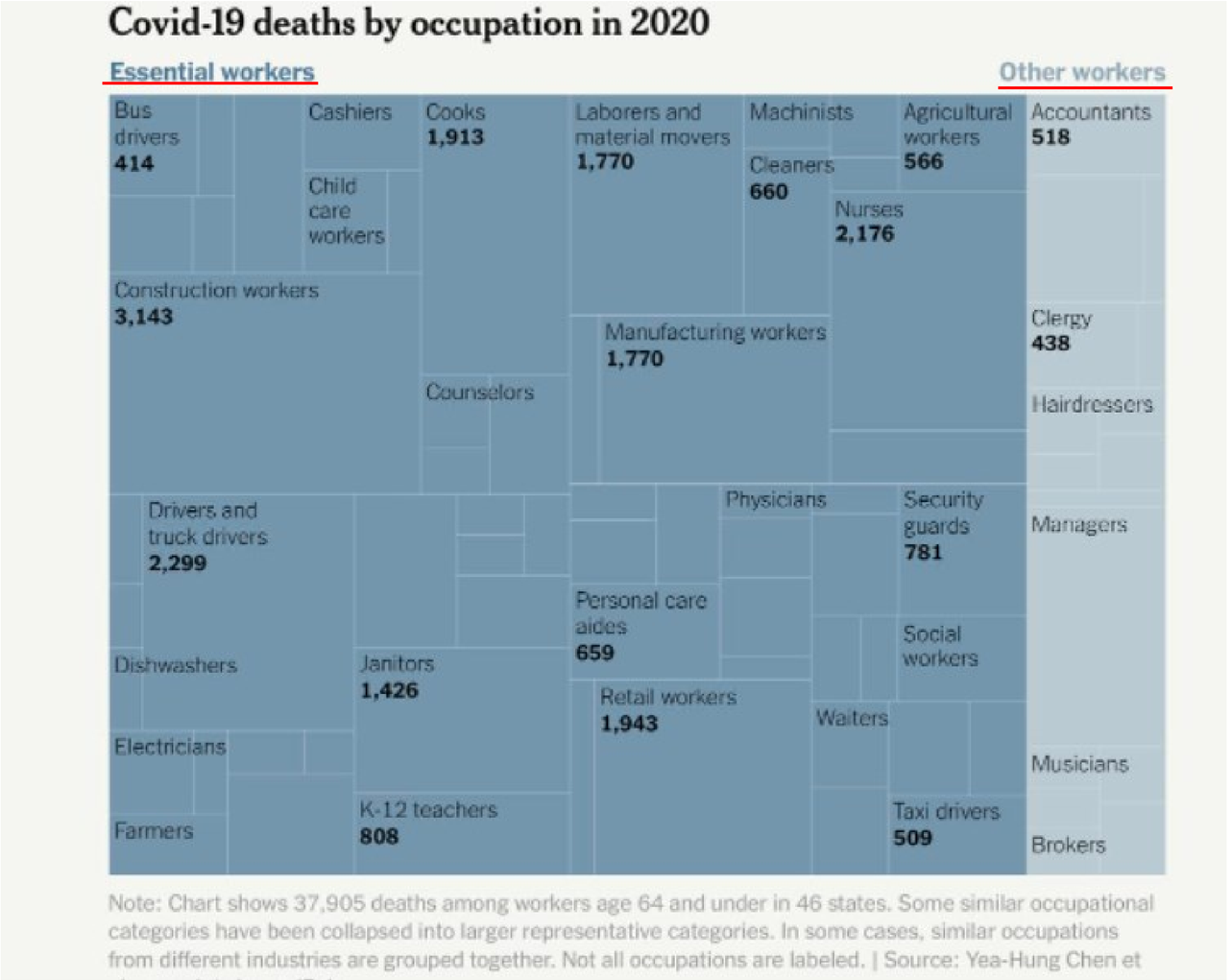

The New York Times

**How America Lost One Million People**

Understanding the coronavirus death toll — including who makes up the one million and how the country failed them — is essential as the pandemic continues.

# COVID-19 DEATH BY OCCUPATION

New York Times, 14 May, 2022




The New York Times

**How America Lost One Million People**

Understanding the coronavirus death toll — including who makes up the one million and how the country failed them — is essential as the pandemic continues.

## The Remotes. The Essentials. The Unpaid. The Forgotten: Divided, but intertwined

**Robert Reich**, professor of public policy | April 28, 2020

# 코로나-19가 초래한 새로운 계급의 분열과 불평등

**미국, Apr 2020**

| 특성 | 내용 |
|---|---|
| 원격 근무가 가능한 노동자<br>(The Remotes) | 재택근무, 화상회의, 전자문서를 다룰 수 있으며, 코로나 위기에서 비교적 안전함<br>(전문직, 관리직, 기술인력 등) |
| 필수적인 일을 하는 노동자<br>(The Essentials) | 위기상황에서도 꼭 필요한 일을 해야 함. 고용 자체는 안정적이지만 감염 위험이라는 부담이 따름<br>(의료인력, 육아노동자, 배달원 등) |
| 임금을 받지 못한 노동자<br>(The Unpaid) | 원격근무가 불가능하여 임금을 받지 못하거나 직장을 잃은 사람들. 경제적인 피해가 가장크고, 그로 인해 경제 재개 요구가 가장 큼<br>(소매점, 제조업체 직원 등) |
| 잊혀진 노동자<br>(The Forgotton) | 거리두기가 불가능한 공간에서 머무르기 때문에 감염 위험에 노출<br>(이민자, 노숙인, 원주민, 이주민 등) |

자료: Reich(2020)

**감염 및 고용으로부터 안전한 약** 35% **(미국)**

**고용은 안전하나 감염위험 높은 약** 30%

25%**에 이를 수 있음**
**레스토랑등 자영업 포함**

**요양원, 감옥등 포함**

Berkeley Blog
Economics
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# UNDERLYING MEDICAL CONDITIONS

## FOR HIGHER RISK FOR SEVERE COVID-19

CDC, July 2021

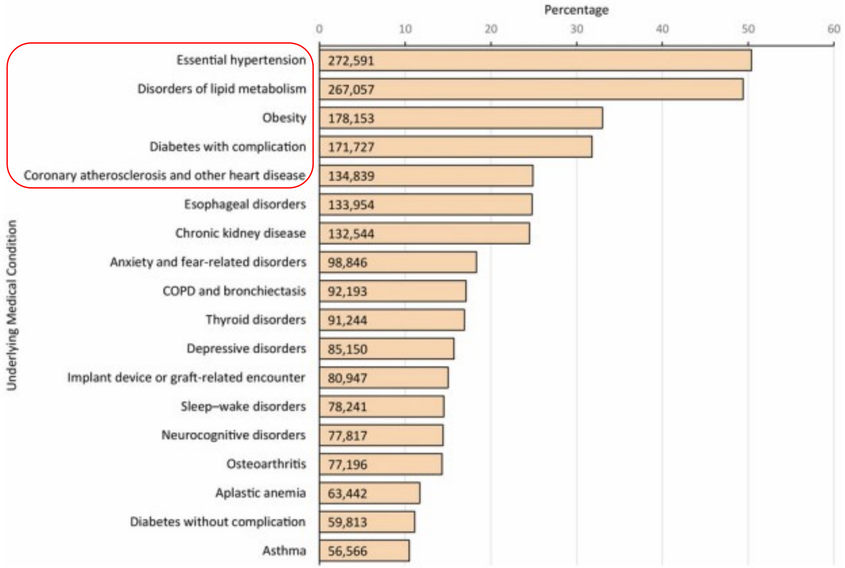
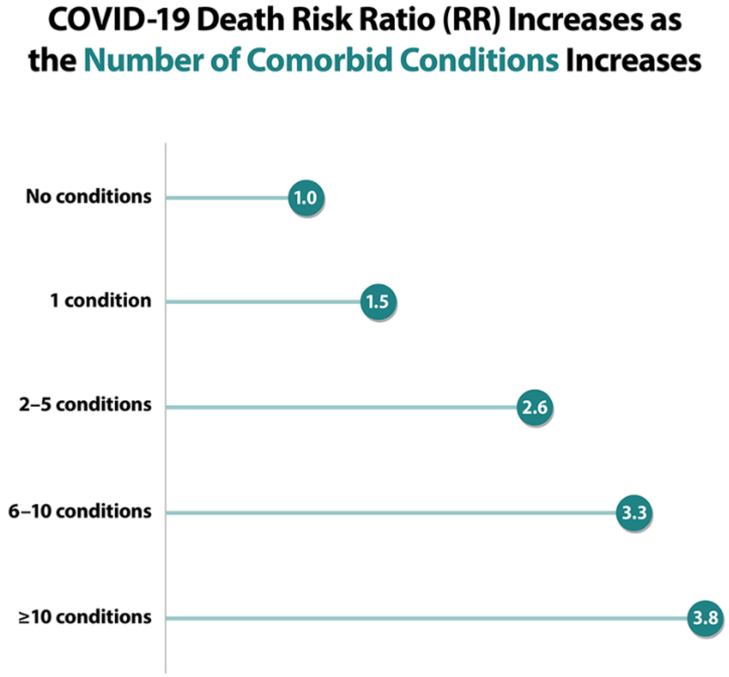



Figure 1. Prevalence of the most frequent underlying medical conditions in a sample of 540,667 adults hospitalized with COVID-19 in Premier Healthcare Database Special COVID-19 Release.

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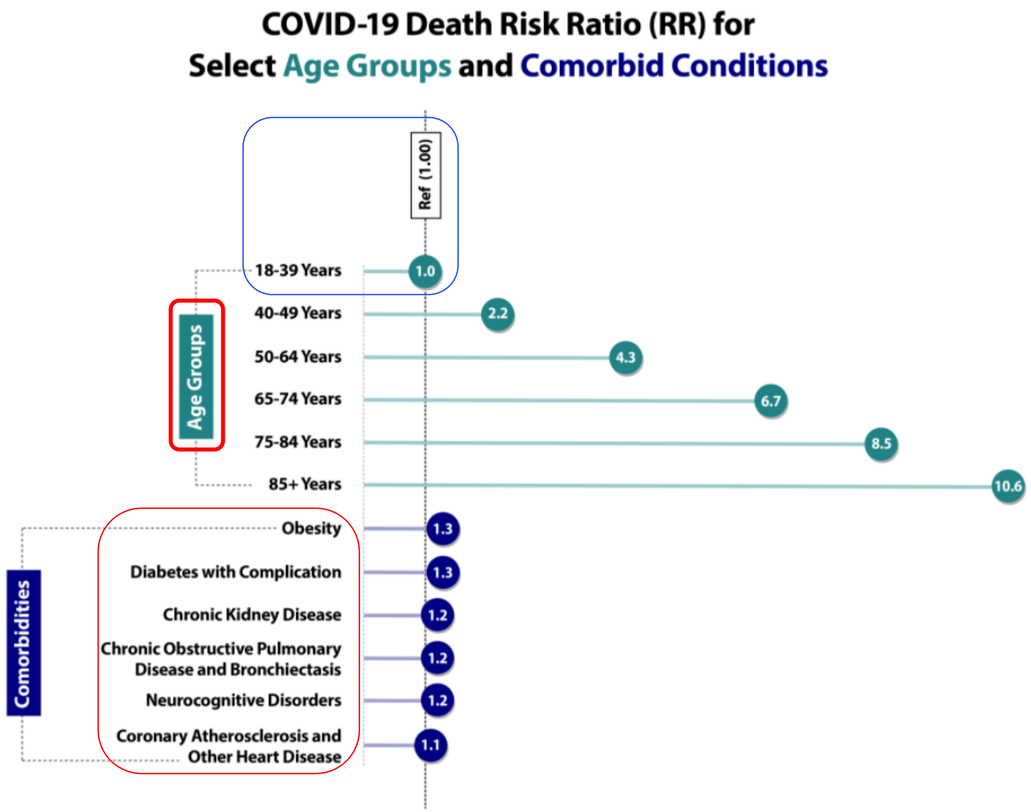


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