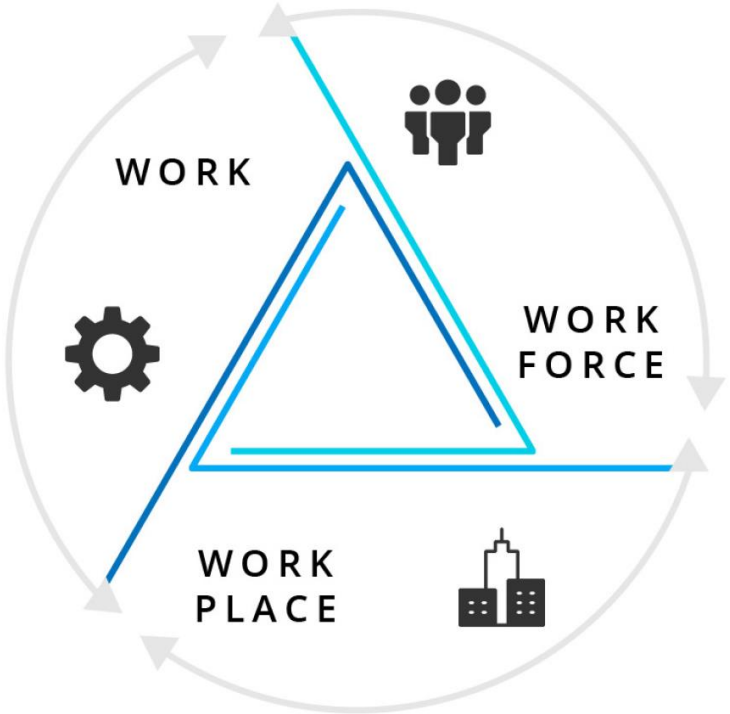
The Coronanormal Future of Work



John Howard

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Centers for Disease Control and Prevention

U.S. Department of Health and Human Services

Yuma-Pacific Chapter

American Industrial Hygiene Association

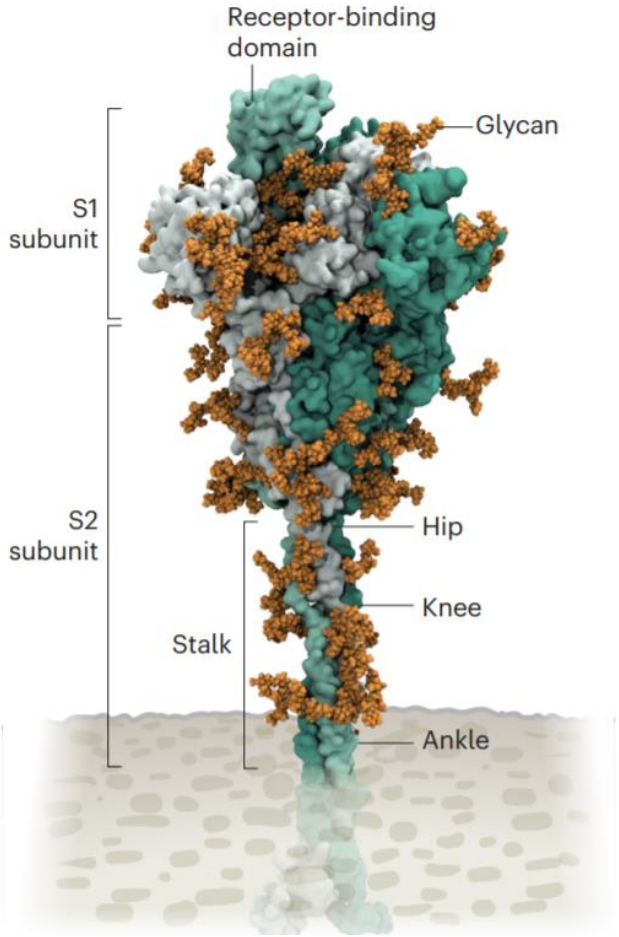
20 January 2022

NOTE:

Presentation does not represent the official position of the U.S. Department of Health and Human Services or the Centers for Disease Control and Prevention

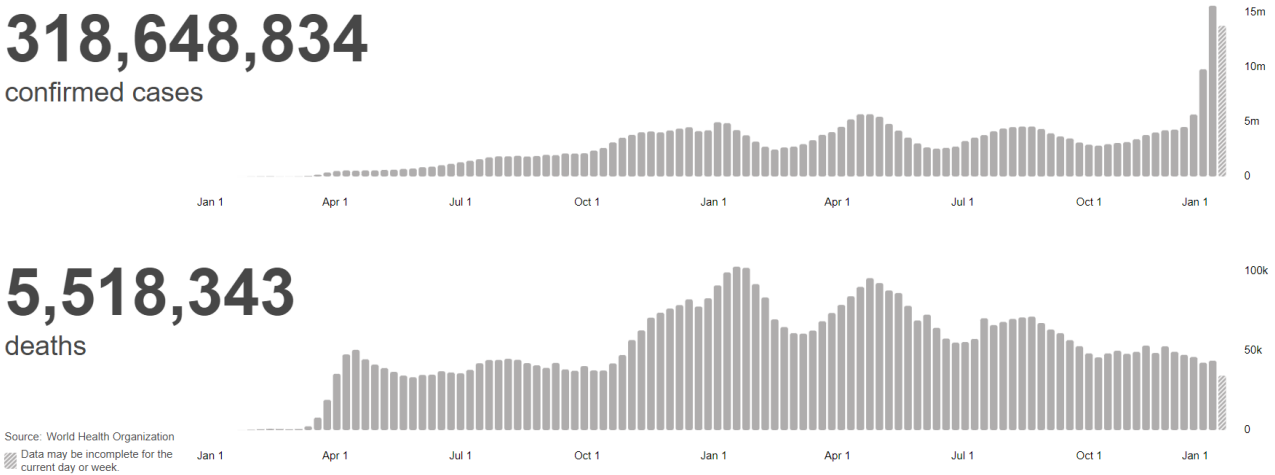
Overview

- **Pandemic Challenges**
  - Global
  - Domestic
- **Pandemic Futures**
  - Strategic Foresight
  - SARS-CoV-2 Trajectory
- **Work Futures**
  - Accelerating Trends
  - *Coronanormal* Futures
    - As You Were
    - Fully Virtual
    - Hybrid



Pandemics: Past and Present

- **World Pandemics**
  - In the cholera outbreak of the 1830s, nearly 3% of Parisians died from cholera in a single month.
  - At the end of the 19th century, around 1 million people may have died from Russian flu, which experts think was caused by a coronavirus.
  - The Spanish flu that struck in 1918 killed around 50 million people in just a couple of years.
- **WHO COVID-19 Dashboard**
  - https://covid19.who.int



Pandemic: International Challenges

Kahl & Wright (2021); Maçães (2021)

- Pandemic might have been a moment for global co-operation.

- Has not turned out that way so far:
  - Border Closures
  - Vaccine Nationalism
  - Competition Opportunities
    - U.S. and Europe discovered its dependency on exports from China
    - China discovered economic leverage by restricting exports
  - Pandemic treated more as a national security threat than a public health emergency

- World economy is so interconnected that it will not fully recover until every country is able to bring the virus under control.
  - 59.7% of world population has received one dose of a COVID-19 vaccine
  - Only 9.5% of people in low-income countries have received at least one dose of a COVID-19 vaccine
    - https://ourworldindata.org/covid-vaccinations
  - Idea of vaccinating everyone on the planet every six months is not feasible

Pandemic: Domestic Challenges

- In the 2011 movie *Contagion*, fearful nurses walked off the job at the start of the viral pandemic, but once vaccines were available, people enthusiastically lined up and the pandemic was over.

- In the real-life pandemic, the opposite has occurred.

  - From the outset, nurses and other healthcare workers exhibited heroic dedication, as seen in New York City and in cities across the U.S., and they have maintained that dedication throughout the pandemic despite mental and physical stress.

  - While vaccines are now available, millions of Americans have chosen not to get a COVID-19 vaccination.

- Pandemic challenges continue 25 months years after COVID-19 first described in December 2019

Daily Change in COVID-19 Cases, United States

January 22, 2020* - January 17, 2022

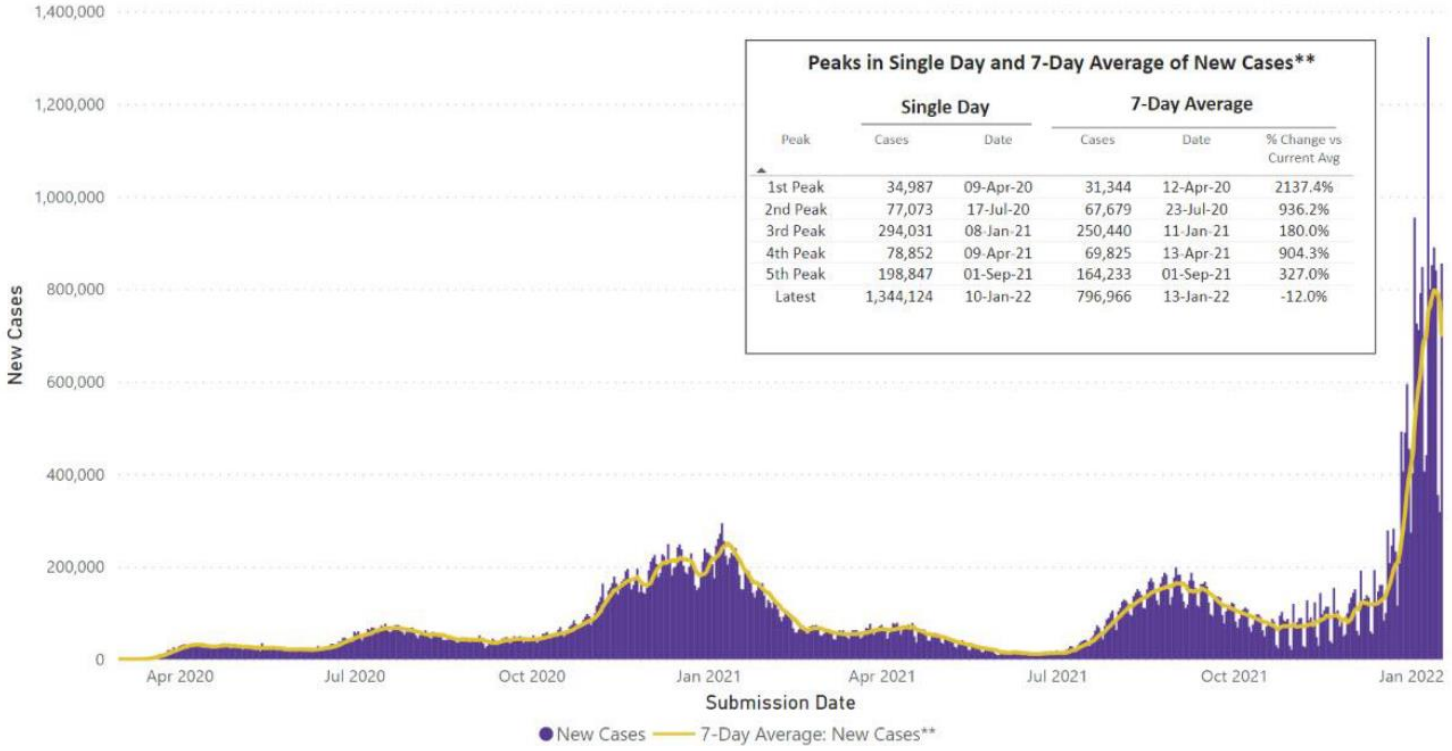
66,715,937
Total Cases Reported

855,149
New Cases Reported**

701,278
Current 7-Day Average**
Jan 11, 2022 - Jan 17, 2022

752,343
Prior 7-Day Average**
Jan 04, 2022 - Jan 10, 2022

-6.8%
Change in 7-Day Average



Peaks in Single Day and 7-Day Average of New Cases**

Peak	Single Day Cases	Single Day Date	7-Day Average Cases	7-Day Average Date	% Change vs Current Avg
1st Peak	34,987	09-Apr-20	31,344	12-Apr-20	2137.4%
2nd Peak	77,073	17-Jul-20	67,679	23-Jul-20	936.2%
3rd Peak	294,031	08-Jan-21	250,440	11-Jan-21	180.0%
4th Peak	78,852	09-Apr-21	69,825	13-Apr-21	904.3%
5th Peak	198,847	01-Sep-21	164,233	01-Sep-21	327.0%
Latest	1,344,124	10-Jan-22	796,966	13-Jan-22	-12.0%

New Admissions of Patients with Confirmed COVID-19, United States

August 01, 2020 – January 16, 2022

4,023,704

Total New Admissions

Aug 01, 2020 – Jan 16, 2022

16,882

New Admissions

Jan 16, 2022

20,808

Current 7-Day Average

Jan 10, 2022 – Jan 16, 2022

19,965

Prior 7-Day Average

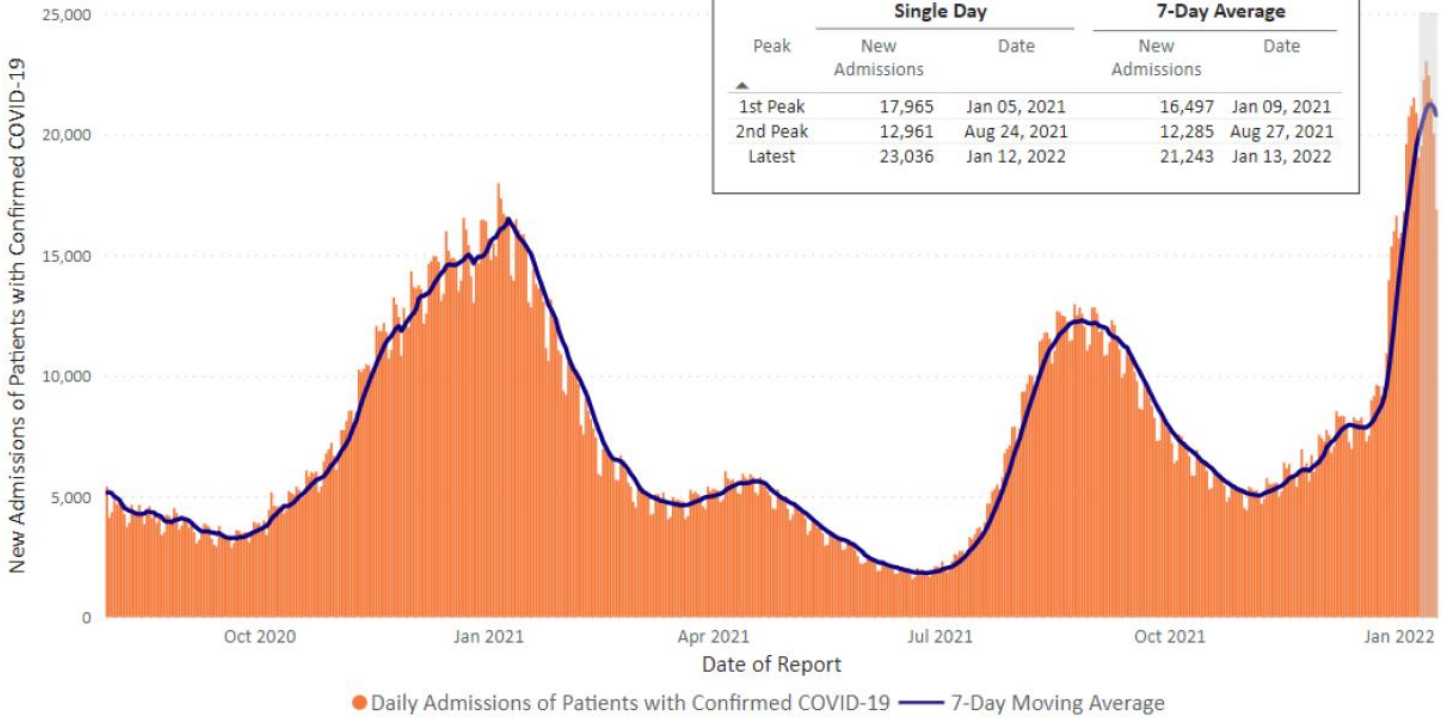
Jan 03, 2022 – Jan 09, 2022

+4.2%

Change in 7-Day Average

Peak in New Admissions and Highest 7-Day Moving Average*

Peak	Single Day		7-Day Average	
	New Admissions	Date	New Admissions	Date
1st Peak	17,965	Jan 05, 2021	16,497	Jan 09, 2021
2nd Peak	12,961	Aug 24, 2021	12,285	Aug 27, 2021
Latest	23,036	Jan 12, 2022	21,243	Jan 13, 2022



Daily Change in COVID-19 Deaths, United States

January 22, 2020* - January 17, 2022

850,575
Total Deaths Reported

1,127
New Deaths Reported**

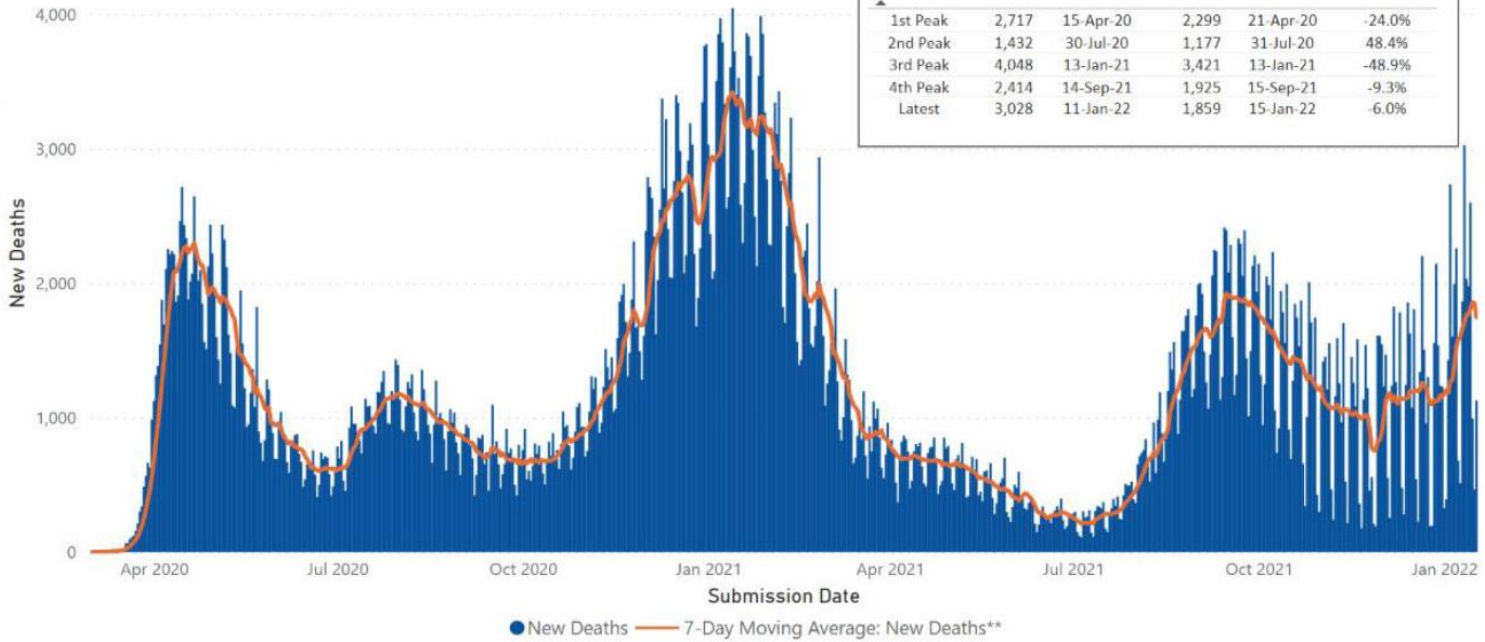
1,746
Current 7-Day Average**
Jan 11, 2022 - Jan 17, 2022

1,664
Prior 7-Day Average**
Jan 04, 2022 - Jan 10, 2022

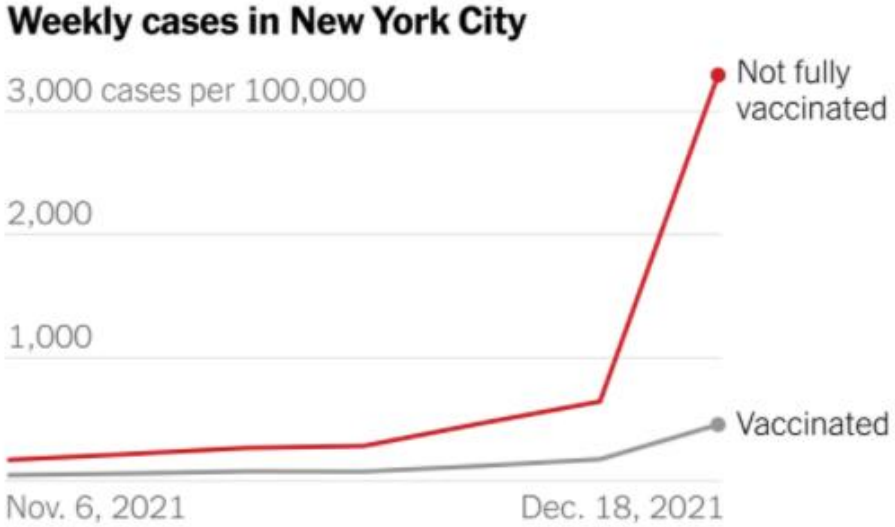
5.0%
Change in 7-Day Average

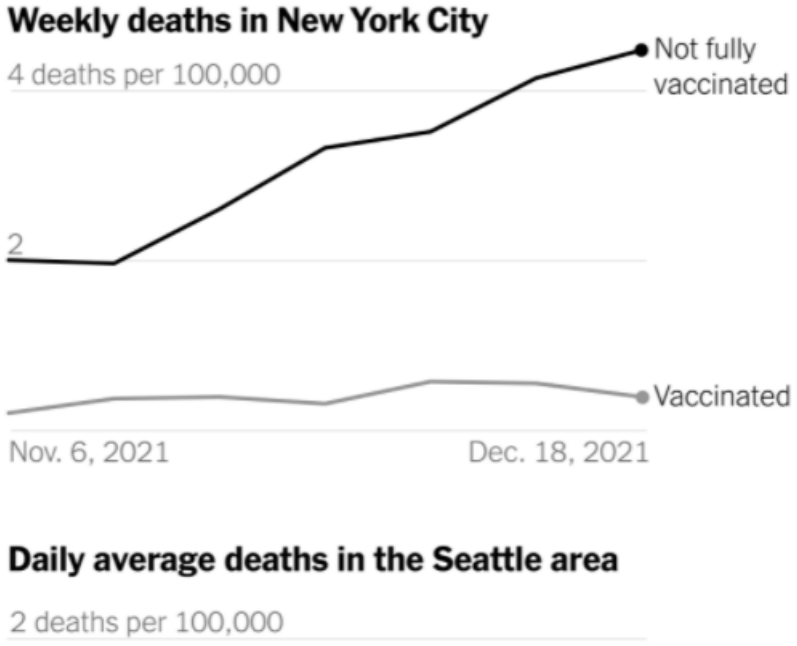
Peaks in Single Day and 7-Day Average of New Deaths**

Peak	Single Day Deaths	Single Day Date	7-Day Average Deaths	7-Day Average Date	% Change vs Current Avg
1st Peak	2,717	15-Apr-20	2,299	21-Apr-20	-24.0%
2nd Peak	1,432	30-Jul-20	1,177	31-Jul-20	48.4%
3rd Peak	4,048	13-Jan-21	3,421	13-Jan-21	-48.9%
4th Peak	2,414	14-Sep-21	1,925	15-Sep-21	-9.3%
Latest	3,028	11-Jan-22	1,859	15-Jan-22	-6.0%



Vaccinated and Non-Vaccinated Americans





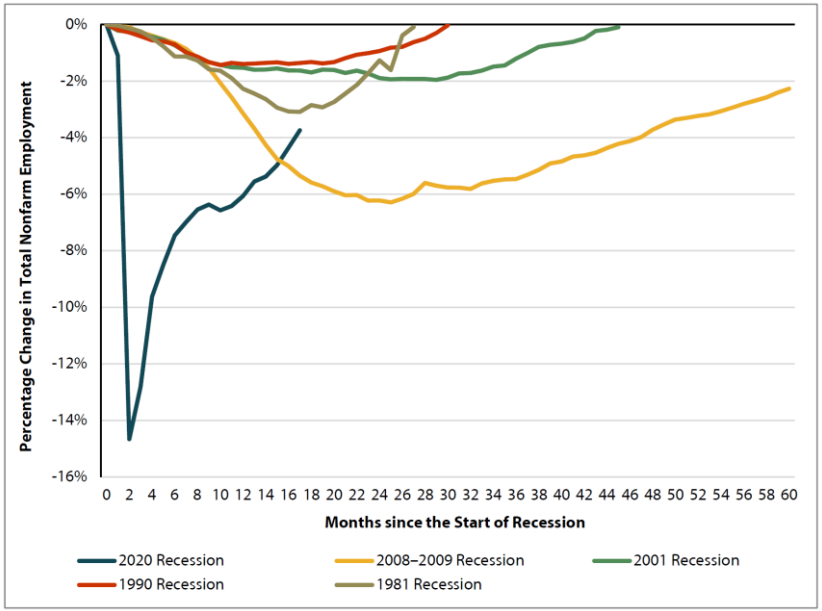
Domestic: Labor Market Challenges

Source: https://fred.stlouisfed.org/series/PAYEMS

- **COVID-19 Pandemic**
  - 22 million jobs lost between Feb/Apr 2020
  - 15% drop in total nonfarm employment
  - Most severe/abrupt change in total employment over the last 40 years

- **Record Job Openings + High Unemployment**
  - **Job Openings**
    - 10.6M
  - **Unemployment**
    - 8M people considered out of work in the U.S.
  - ***Quits***
    - *Quits* hit a new series high going back to December 2000, as 4.5M voluntarily left their jobs (3% matching September 2021)

- BLS, JOLTS, https://www.bls.gov/news.release/jolts.nr0.htm (4 Jan 2022)

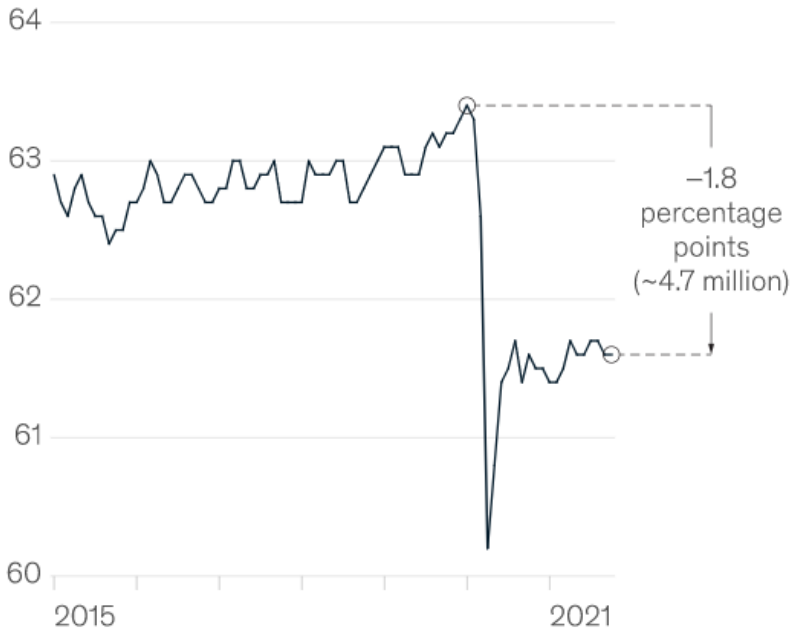


Labor mismatches have become prominent across the United States.

US job openings, index (Feb 2020 = 100)

Job openings have risen beyond pre-COVID-19 levels as the economy bounces back.

US civilian labor-force participation rate,[1] %



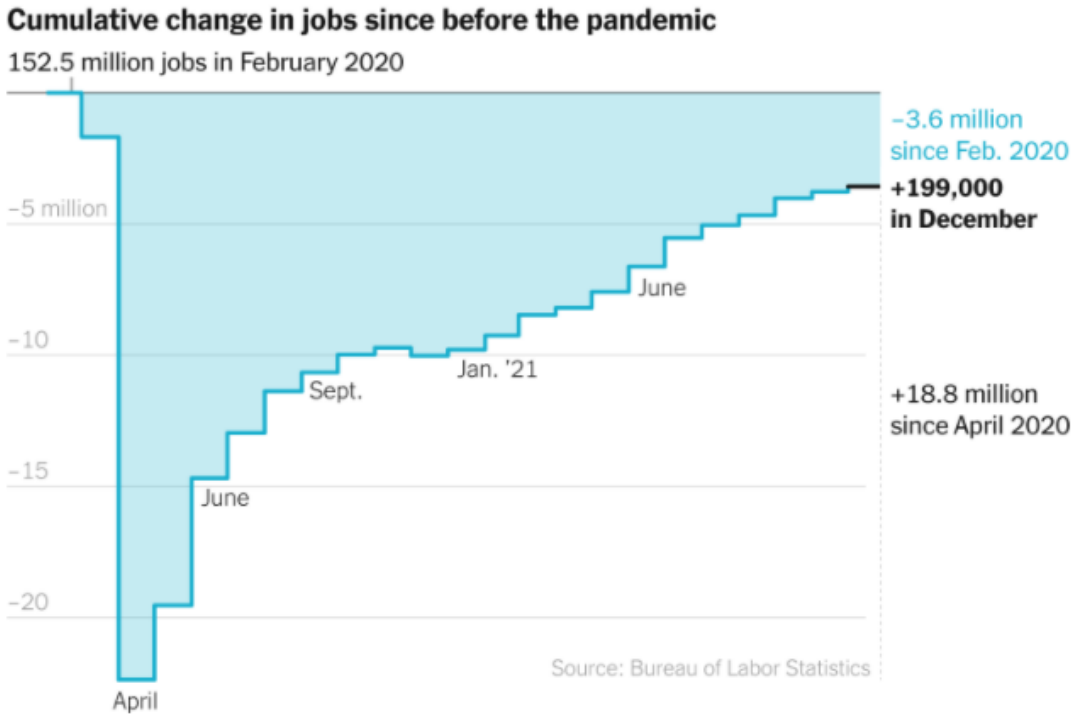
However, the labor force is about 4.7 million smaller than it was prepandemic.

Source: Federal Reserve Bank of Philadelphia March survey; US Bureau of Labor Statistics

Why Slow Return to the Workplace

https://www.cnbc.com/2021/10/20/6-reasons-why-americans-arent-returning-to-work.html

- **COVID Transmission Worries**
  - Fear of contagion in high-contact industry sectors
- **Early retirements**
  - Baby boomers are retiring faster than usual
- **Added Care responsibilities**
  - Women have disproportionately w/d from workforce
  - Reasons
    - School closures depressed female labor participation
    - Caring for COVID-19 affected family member
- **More Savings**
  - Cash balances were up 50% for typical household in July 2021 relative to 2 years ago
- **Wages**
  - Businesses not paying a wage workers will accept
  - Wages risen more than 4.5%; leisure sector up 11%
- **Values**
  - Did pandemic make people value work less?

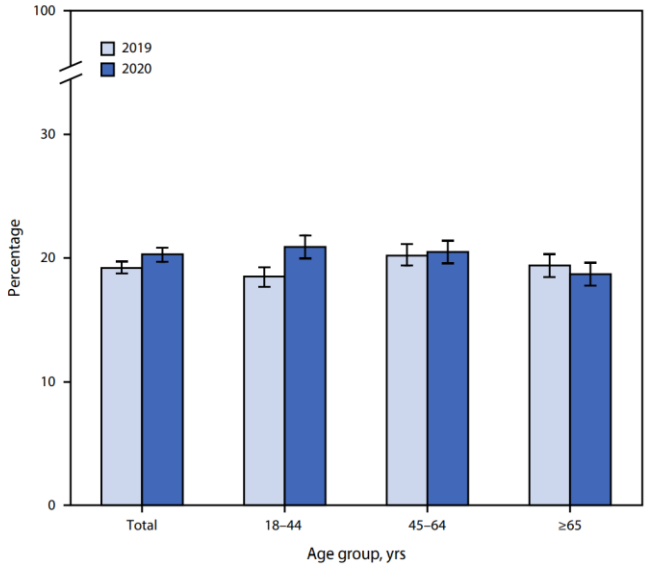


Mental Health Treatment during the Pandemic

CDC *QuickStats*

MMWR. 2021;70(43):1525.

Percentage* of Adults Who Received Any Mental Health Treatment in the Past 12 Months,† by Age Group and Year — National Health Interview Survey, United States, 2019–2020§



* 95% confidence intervals indicated with error bars.
† Adults were considered to have received any mental health treatment if they reported having taken prescription medication for their mental health or having received counseling or therapy from a mental health professional in the past 12 months.
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

The percentage of adults who had received any mental health treatment in the past 12 months increased from 2019 to 2020 overall (19.2% to 20.3%) and among adults aged 18–44 years (18.5% to 20.9%). In 2019, the percentage of adults who had received any mental health treatment in the past 12 months was lower among those aged 18–44 years (18.5%) compared with those aged 45–64 years (20.2%) and ≥65 years (19.4%). In 2020, the percentage decreased with age, from 20.9% among adults aged 18–44 years to 18.7% among those aged ≥65 years.

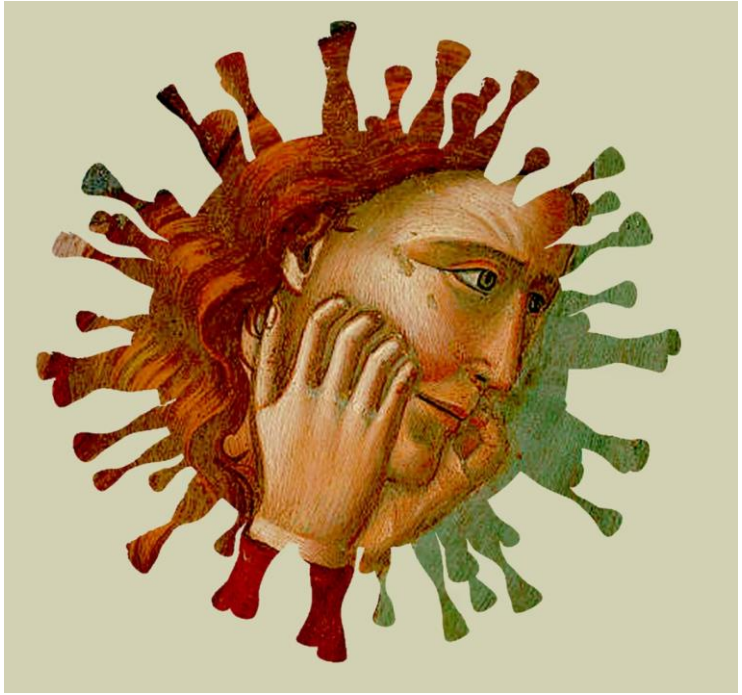
Sources: National Center for Health Statistics. NCHS data brief, no. 380. https://www.cdc.gov/nchs/data/databriefs/db380-H.pdf; NCHS data brief, no. 419. https://www.cdc.gov/nchs/data/databriefs/db419.pdf

Reported by: Emily P. Terlizzi, MPH, ljx9@cdc.gov, 301-458-4991; Tina Norris, PhD.

COVID-19 Has Helped De-Stigmatize Mental Health

https://parade.com/1274973/leighweingus/cleveland-clinic-mental-health-survey-results-2021/

- Survey conducted by *Parade* in partnership with the Cleveland Clinic.
- In polling 2,000 people, results uncovered the importance of mental health.
- In 2018, 68% of people believed mental health was just as important as physical health.
- Now, that number is up to 82%

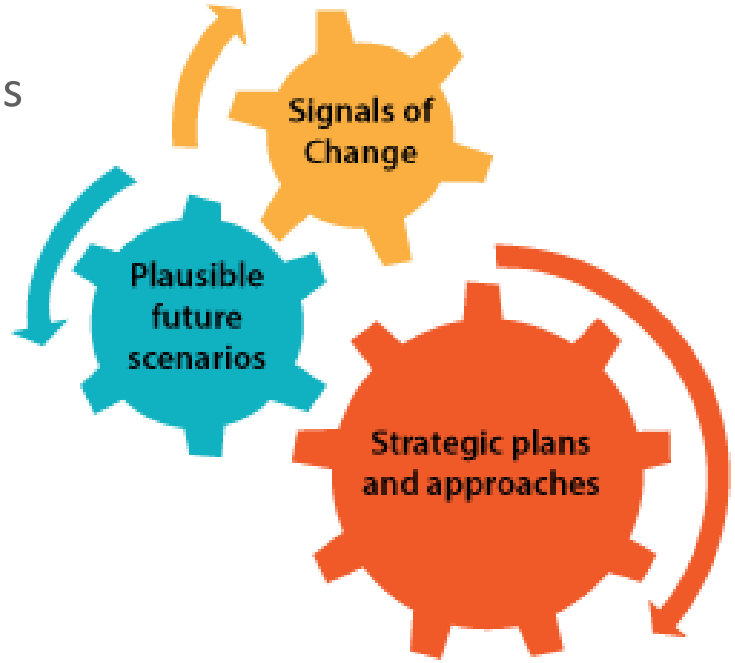


Strategic Foresight: A Futures Thinking Tool

Strategic Foresight as a Futures Tool

Proactively Managing Change Under Uncertainty

- Strategic foresight is an action-oriented planning discipline grounded in futures studies and strategic management
- Creates plausible future scenarios to identify emerging trends and issues
- Applied in the public and private sectors
- Foresight does not predict the future; it crafts well-informed stories about how the future might be different



Bishop & Hines(2012), Streit et al (2021). The Futures School (2019).

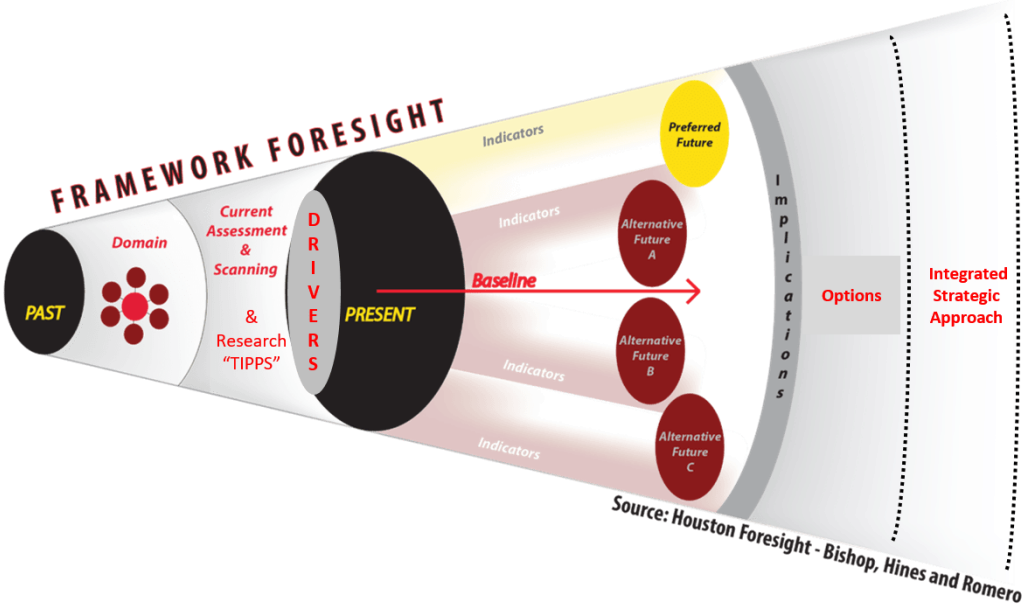
Strategic Foresight

Proactively Managing Change under Uncertainty

- Basic Elements
  - *Scan* the horizon for trends
  - *Identify* drivers for trends
  - *Create* alternative scenarios
  - *Monitor* scenarios as future unfolds

- Strategic foresight is not about predicting the future, but understanding *probabilities* of multiple alternative futures

- Bias Controls
  - *Preferred* future may not be the *likely* future



Foresight Framework

Framing	Scanning	Futuring	Visioning	Designing	Monitoring
the OSH domain	for signals of change	plausible future scenarios	implications and options	strategic approach	the OSH domain
1	2	3	4	5	6
Identifying the occupational safety and health topic of interest to produce a domain description	Searching for and organizing signals of change in the domain to identify emerging issues and build a scanning library	Developing baseline and alternative future scenarios for the domain to describe plausible futures	Exploring implications of future scenarios and strategic options to provide strategic direction	Implementing strategies to prepare for plausible futures that guide action	Monitoring OSH topic of interest for new signals of change to continuously update the domain
Outputs	**Outputs**	**Outputs**	**Outputs**	**Outputs**	**Outputs**
Domain Map and Current Assessment	Scanning Library Inputs- Trends, Issues, Plans, Projections (TIPPS)	Drivers Future Scenarios	Implications Analysis	Key Strategic Issues and Approach	Updated Scanning Library and TIPPS

Adapted from Hines & Bishop (2013) . Streit et all (2021)

Pandemic Futures

Contagious Disease Futures

Adapted from Dowdle (1996)

- **Pandemic**
  - Active and widespread replication phase
  - Deceleration phase
- **Control**
  - Cases brought down to a *societally acceptable* level of circulation by vaccines and risk mitigation measures
    - Seasonal Influenza
- **Elimination**
  - Cases reduced in a *limited geographical region* to zero
    - Polio and Measles
- **Eradication**
  - Cases *worldwide* reduced to zero
    - Smallpox
- **Extinction**
  - All remaining stocks kept in secure laboratories have been destroyed
    - Smallpox

EPI-WIN is hosting a series of webinars on the Infectious Hazards foresight initiative

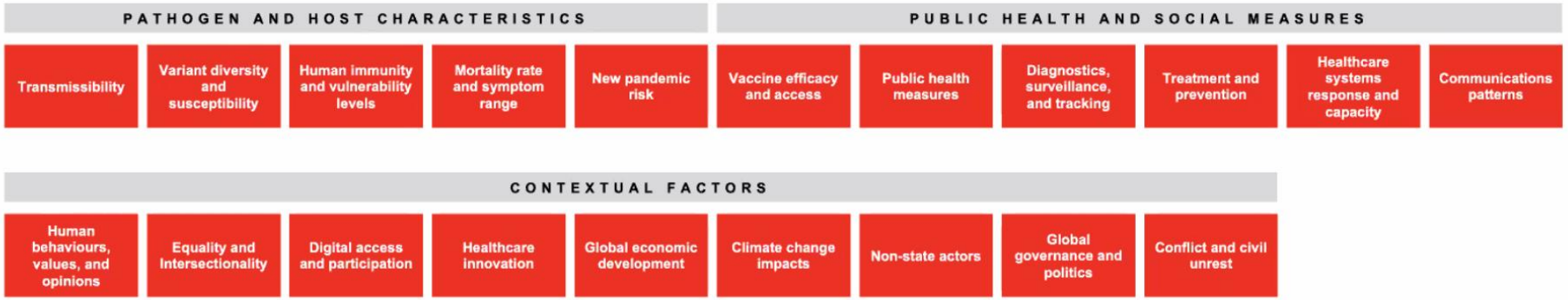
21 October – 10 December 2021

WHO and partners have embarked in the journey of imagining the future of infectious threats. WHO is hosting a series of consultations convening world leaders and influencers from a variety of disciplines to discuss the future, look at global trends and build consensus on the collective actions that the global community can take to mitigate the ongoing and anticipated risks of COVID-19 and other infectious threats in the next 3 to 5 years.

Related

EPI-WIN: WHO Information Network for Epidemics

Events



Key Pandemic Factors

- Pathogen & Host Characteristics
- Public Health & Social Risk Reduction Measures
- Social & Economic Contextual Factors

PATHOGEN AND HOST CHARACTERISTICS					PUBLIC HEALTH AND SOCIAL MEASURES					
Transmissibility	**Variant diversity and susceptibility**	**Human immunity and vulnerability levels**	**Mortality rate and symptom range**	**New pandemic risk**	**Vaccine efficacy and access**	**Public health measures**	**Diagnostics, surveillance, and tracking**	**Treatment and prevention**	**Healthcare systems response and capacity**	**Communications patterns**
Increased human transmissibility	High variant diversity, high susceptibility to vaccines	High immunity, low vulnerability	High mortality rate, intense symptoms, long duration	New global pandemic emerges, coupled with more dangerous COVID-19	High efficacy, widespread access	Increase in stricter elimination and/or mitigation strategies globally	Robust local, national, and global systems for diagnostics and surveillance	Widespread use of vaccines as the only global treatment and prevention option	High vulnerability of healthcare systems globally, low resilience, backlog of treatment	High volumes of healthcare misinformation and disinformation and high susceptibility of the general public
Increased human transmissibility + sustainable animal viral reservoirs	High variant diversity, low susceptibility to vaccines	Variable immunity, variable vulnerability by region	High mortality, intense symptoms, short duration	New pandemic emerges, coupled with an endemic COVID-19	High efficacy, region- or country specific access	Decrease in stricter elimination strategies, increase in mitigation strategies globally	Robust local and national systems for diagnostics and surveillance, limited global or regional cooperation	Widespread use of vaccines coupled with a variety of treatment and prevention options	Low vulnerability of healthcare systems globally, high resilience, effective adaptation to surges in COVID-19	Healthcare misinformation and disinformation restricted to some platforms, groups, and regions only
Variable human transmissibility across variants	Low variant diversity, high susceptibility to vaccines	Variable immunity, variable vulnerability by age group and health status	Mixed mortality rate and variable risk of long symptoms across all age groups	New pandemic emerges after COVID-19 herd immunity is reached	Mixed efficacy, widespread access	Increase in stricter elimination strategies globally, decrease in mitigation strategies	Variable quality and reach of local and national systems for diagnostics and surveillance	Reduced use of vaccines, high use of treatment and prevention options	Low vulnerability of healthcare systems in certain regions, high vulnerability and low resilience in other regions	Risk, reach and impact of healthcare misinformation and disinformation significantly reduced
Stable human transmissibility	Low variant diversity, low susceptibility to vaccines	Low immunity, high vulnerability	Low overall mortality rate, but risk of long symptoms across all age groups	Future pandemics appear but do not become a global health crisis	Mixed efficacy, region- or country specific access	Widespread decrease in public health measures	Breakdown of local and national systems for diagnostics and surveillance, highly limited provisions	Reduced use of vaccines, limited use of treatment and prevention options		
Reduced human transmissibility		Low immunity, low vulnerability (virus less deadly)	Low mortality rate, low risk of long symptoms		Limited or reduced efficacy					

PATHOGEN AND HOST CHARACTERISTICS					PUBLIC HEALTH AND SOCIAL MEASURES					
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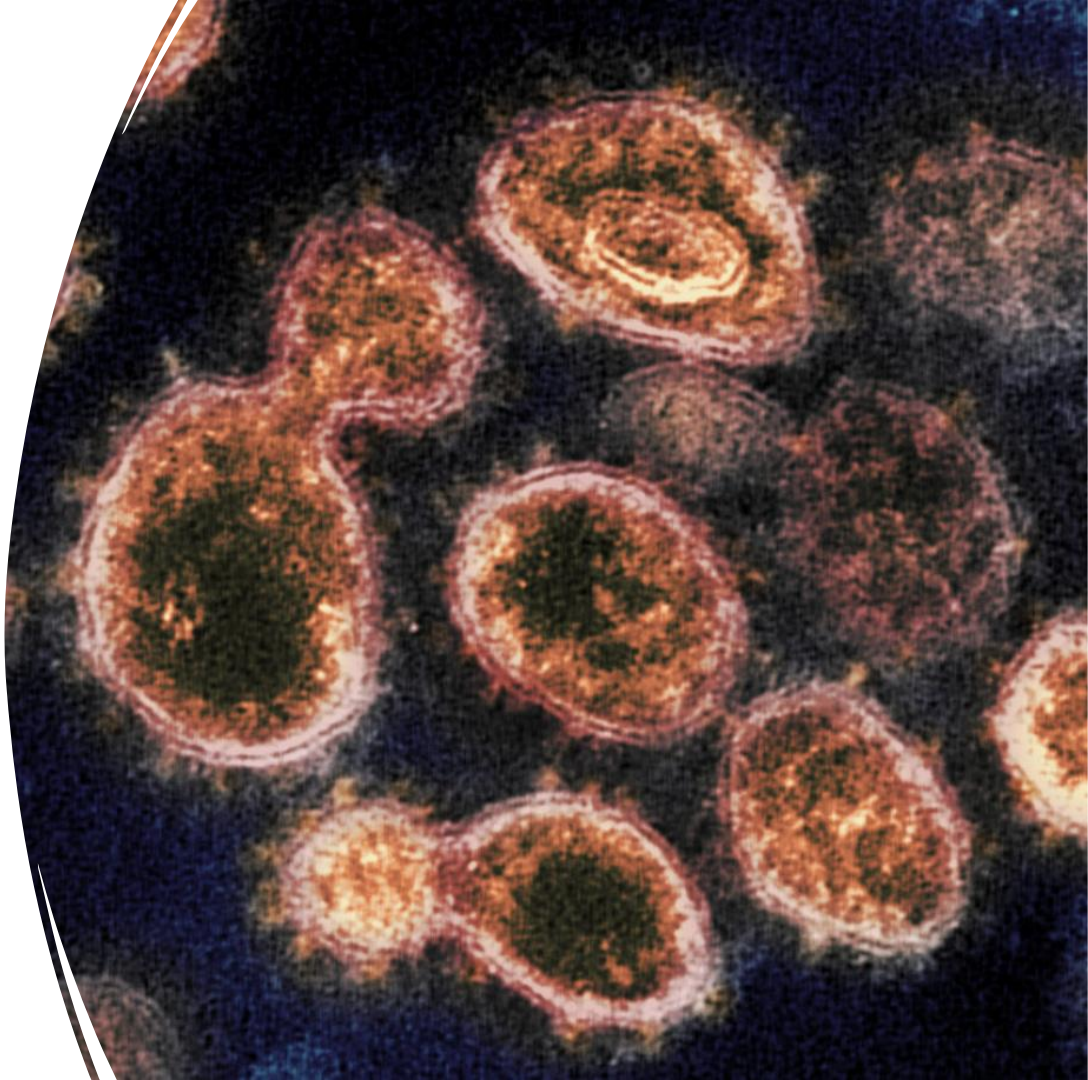
Plausible Pandemic Futures

- Like the common cold
- Like seasonal influenza
- Worse than *Delta*
- Therapeutics to the rescue



Like the Common Cold

- Two coronaviruses—SARS-CoV-1 and MERS-CoV—emerged in the recent past but were successfully controlled before they caused a pandemic.

- Four other coronaviruses caused severe disease when they first emerged but are now circulating seasonally around the world causing only very mild symptoms, similar to the common cold.

Coronaviruses	Disease
SARS-CoV-2	COVID-19
SARS-CoV	Severe Acute Respiratory Syndrome (SARS)
MERS-CoV	Middle East Respiratory Syndrome (MERS)
HCoV – 229E	Usually mild respiratory disease (10-15% of common colds caused by HCoVs) but can cause severe disease in vulnerable groups
HCoV – OC43	
HCoV – NL63	
HCoV - HKU1	

Like the Common Cold

Lavine et al. *Science* (2021)

- **Model**
  - An immunological and epidemiological model asserts that SARS-CoV-2 could become a seasonal virus causing little mortality
  - Model shows that such an age-structured system can converge in a matter of years towards a steady state where individuals are infected as children, which allows them to build an immune response with very low mortality.
  - This immunity prevents severe symptoms when infected as adults.
- **This is a *Rosy* Future**
  - SARS-CoV-2 may undergo a similar transition like the 4 other common coronaviruses that circulate widely, yet barely trouble health-care systems.
  - Modeling does not indicate ***when*** that transition will happen.

Like the Common Cold

- In the end all pandemics burn themselves out…
  - https://www.economist.com/briefing/2021/10/16/how-the-world-learns-to-live-with-covid-19
- How?
  - Infections reach an equilibrium between susceptibles and the immune
    - Vaccinations and natural infection are the drivers
- *Endemic*
  - SARS-Cov-2 has a constant presence, but a socially unacceptable number of people
  - *Endemic* is more of a perception
    - Societal tolerance level for severe disease
    - For example, we tolerate a rather high level of mortality from seasonal influenza

Omicron Severity—Toward Endemicity?

- Evidence supports *Omicron* bring less severe than *Delta* in vaccinated and boosted
  - But cannot be described as “mild” because of risk of long or chronic COVID
  - Unvaccinated remain at risk of severe acute disease

- Recent CA study examined the outcomes of nearly 70,000 COVID-19 patients and suggests *Omicron* causes less severe disease than previous variants (Lewnard JA et al.)
  - Hospitalization: Omicron 48% less than Delta
  - ICU and death: Omicron 25% less than Delta
    - Aligns with similar data from South Africa, UK and Denmark

- Lab studies show *Omicron’s* lower virulence might be due to its tendency to replicate more in upper respiratory tract instead of the lungs

- Some agree that *Omicron* may help push the world further toward COVID-19 endemicity.

Like the Common Cold

- **Healthcare System Effects**
  - idea that a more transmissible virus results in milder symptoms is “an urban legend.”
  - Even if *Omicron* causes milder disease, increased transmission can put additional pressure on health systems. In addition to more patients with mild disease seeking care, milder disease that goes untreated can progress to more severe symptoms, and increased transmission can facilitate further mutations to the virus.

- **Workplace Effects**
  - *Endemicity* may not help the unvaccinated
  - Leads to a workplace with two subsets of workers with two different risk profiles

Like Seasonal Influenza

Branswell (2021); Joseph (2021)

- **Similarity to Influenza**
  - If SARS-CoV-2 remains quite transmissible, evolves as fast as the influenza virus on a seasonal basis, immunity wanes like influenza, and even breakthrough infections do sometimes result in severe outcomes, you end up with something that looks like an annual influenza season

- **Future Scenario**
  - More cases and more deaths than seasonal influenza (50-100K deaths a year)
  - May be more socially acceptable because of COVID-19 fatigue and resentment against the unvaccinated
  - May stress healthcare system because COVID-19 will not be “instead,” but on “top of” influenza
  - “*Flurona*”
    - COVID-19 occurring at the same time as seasonal influenza in the same individual

Worse than *Delta*

Alizon & Sofonea (2021)

- A model can be developed that predicts the virus population will evolve towards *avirulence* based on experience with other human coronaviruses, but…

- Important lesson from this pandemic is that extreme care should be taken before comparing SARS-CoV-2 to other viruses, even other human coronaviruses.

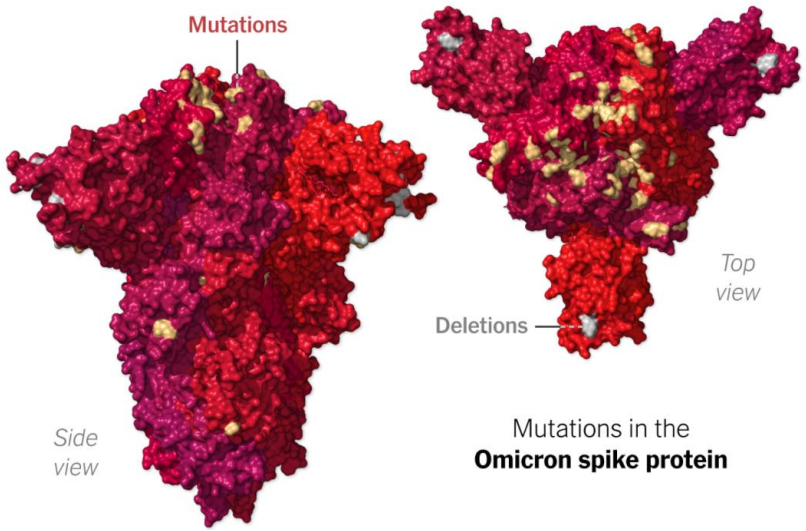
- Current trends may not follow the model of a benign coronavirus
  - Emergence of variants like *Omicron*
    - In unvaccinated populations
    - In immunocompromised individuals where virus continues to replicate

- **Immune Escape variant?**
  - Mutations leading to escaping vaccine-generated immune protection leads to a protracted pandemic
  - Causing strict mitigation measures (lockdowns; travel interruption; border closures)
  - Reconfiguration of vaccines and reinstitution of population vaccination
    - Pfizer preparing Omicron mRNA vaccine

Worse than *Delta*

- **Viral Variant Characteristics**
  - Transmissibility
  - Virulence
  - Immune Evasion

- **Newest SARS-CoV-2 Variant**
  - B.1.1.529 (Greek letter *Omicron* [O]) declared a *Variant of Concern* (26 November 2021)
  - Emerging Omicron Characteristics
    - Transmissibility
      - Significantly more transmissible than Delta
    - Virulence
      - As virulent in the unvaccinated as *Delta*
    - Immune Evasion
      - Mildly evades vaccine- and natural infection-based immunity



Viral Characteristics Create *Our Futures*:

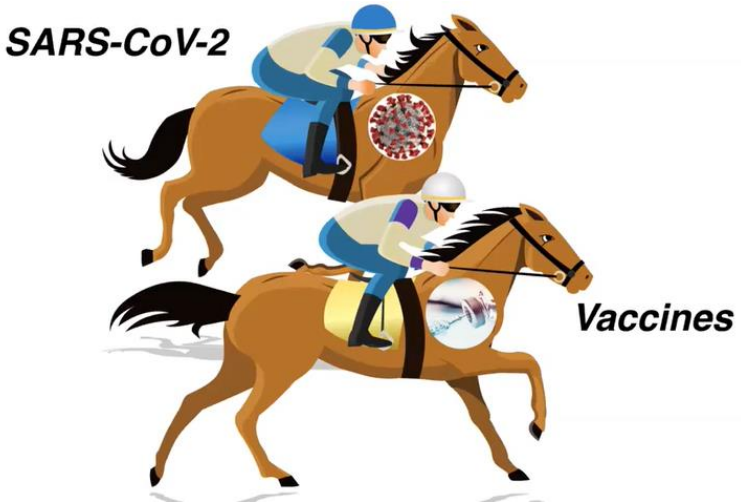
- **Transmissibility**
  - Evidence indicates that *Omicron* is more transmissible than the Delta variant. How much more?
  - Incorporating uncertainties into scenarios, generates a distribution of outcomes, much like the cone of uncertainty used for a hurricane landfall forecast.

- **Immune Evasion**
  - The future burden of Covid depends in large part on whether highly transmissible variants able to evade pre-existing immunity, such as Omicron, continue to emerge.

Worse than *Omicron:*

Future is Replication-Dependent

- Interrupting persistent global replication is the key to preventing variant emergence affecting the U.S.
- By the time one variant is detected, another is already emerging under the radar somewhere in the world because of a combination of surveillance lags, low vaccine uptake & inequitable vaccine access to low-income countries.
- If new variants arise roughly twice per year, then we should expect multiple outbreaks each year, even in the summer.
- If such variants emerge less frequently, then outbreaks might occur annually or even less frequently.

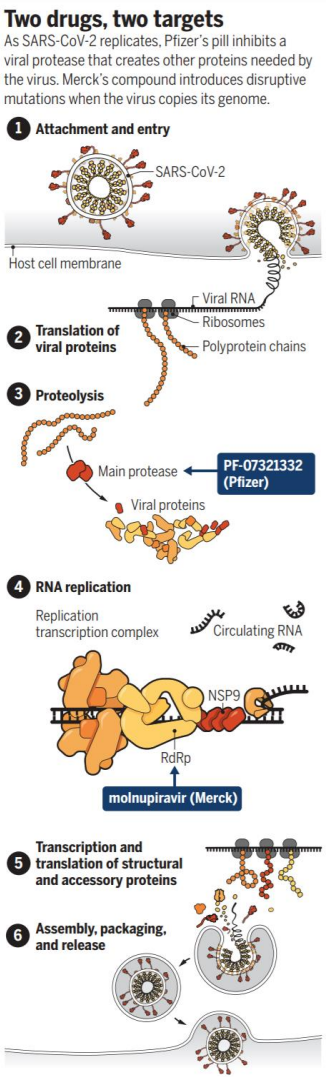


Therapeutics to the Rescue

- **Monoclonal Antibodies**
  - Block SARS-CoV-2 surface proteins and slow it from infecting host cells.
  - Limited supply &expensive ($2000/dose)
  - Only *Sotrovimab* appears effective for *Omicron*

- **New *Oral* Antivirals**
  - **Molnupiravir** (Merck and Ridgeback Biotherapeutics)
    - Reduces the risk of hospitalization by 30%
    - Mode of action is by lethal mutagenesis

  - **Paxlovid** (Pfizer)
    - Reduces the risk of hospitalization by 89%
      - Drug contains two protease enzyme inhibitors central to SARS-CoV-2 replication—*Nirmatrelvir* and *Ritonavir*
    - Studies show rapid and significant reduction in viral load which could help lower the risk of transmission
    - Must be taken within ≤ 5 days of exposure/onset of symptoms

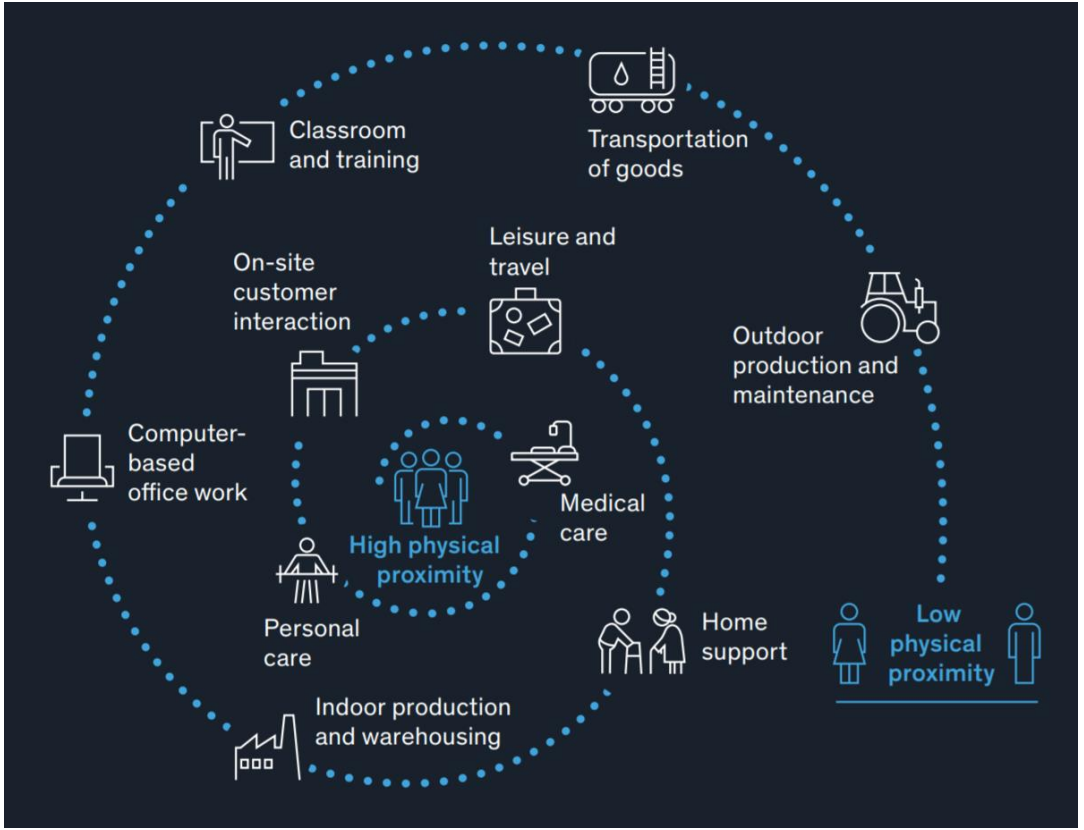


Future of Work in the Coronanormal World

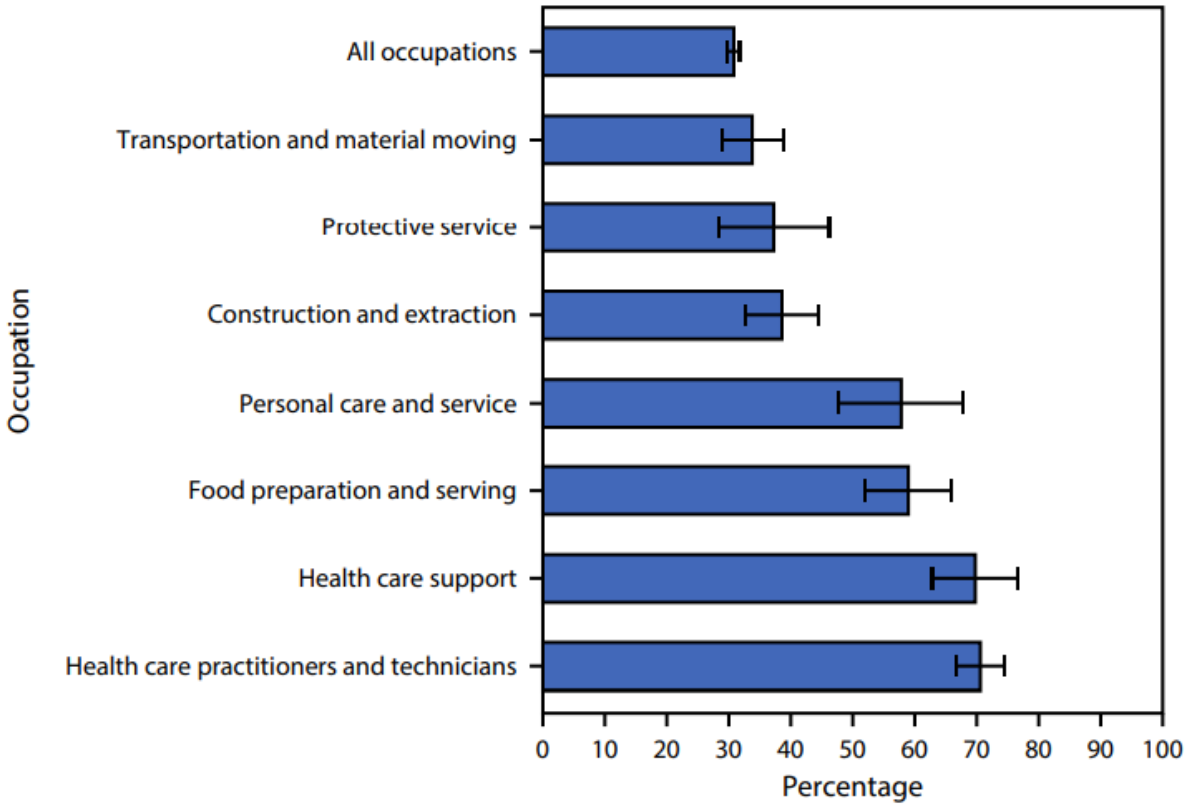
Future of Work Pandemic Trends

McKinsey Global Institute (Lund et al. February 2021)

- **Trends**
  - A direction or vector along which drivers of change travel
  - Many trends may shape future of work
- **SARS-CoV-2 Mega-Trend**
  - Avoidance of physical proximity
- **Different Job Types = Different Risk Levels**
  - Physical presence *not* required
  - Physical presence required
  - Physical presence AND physical proximity required



Percentage* of Employed Adults Who Needed to Work Closer Than 6 Feet from Other Persons All or Most of the Time at Their Main Job,† by Occupation§ — National Health Interview Survey, United States, July–December 2020¶



3 Trends Accelerated by the Pandemic

Lund et al. February 2021

- **Shift to Remote Working**
  - Remote work and virtual meetings are likely to continue, albeit less intensely than at the pandemic's peak, effects for real estate, business travel, and urban centers
- **Increased Digital Platform Work**
  - E-commerce and other virtual transactions have greatly accelerated, creating increased demand for non-standard or gig work arrangements for last-mile deliveries
- **Increased Deployment of Automation and AI**
  - COVID-19 may propel faster adoption of automation and AI, especially in work areas with high physical proximity, and lead to labor effects

Future of Working Scenarios:
1. Shift to Remote

- **As You Were**
- **Virtual**
- **Hybrid**

What is Remote Working?

- **Pre-Pandemic—2019 Style**
  - Prior to the pandemic, work was predominantly "*location-centric*," designed around the 19th century industrial era constraints of a manual manufacturing era as opposed to the 21st century digital knowledge era.

- **Remote working during the pandemic**
  - An approach that allows an individual to work in a non-traditional workplace, usually one's home.
  - "Location-*independent*"
  - Artifact of the pandemic
    - Although "telework" existed prior to the pandemic

Does Working from Home Actually Work?

Evidence from a Chinese Experiment (Bloom et al. 2015)

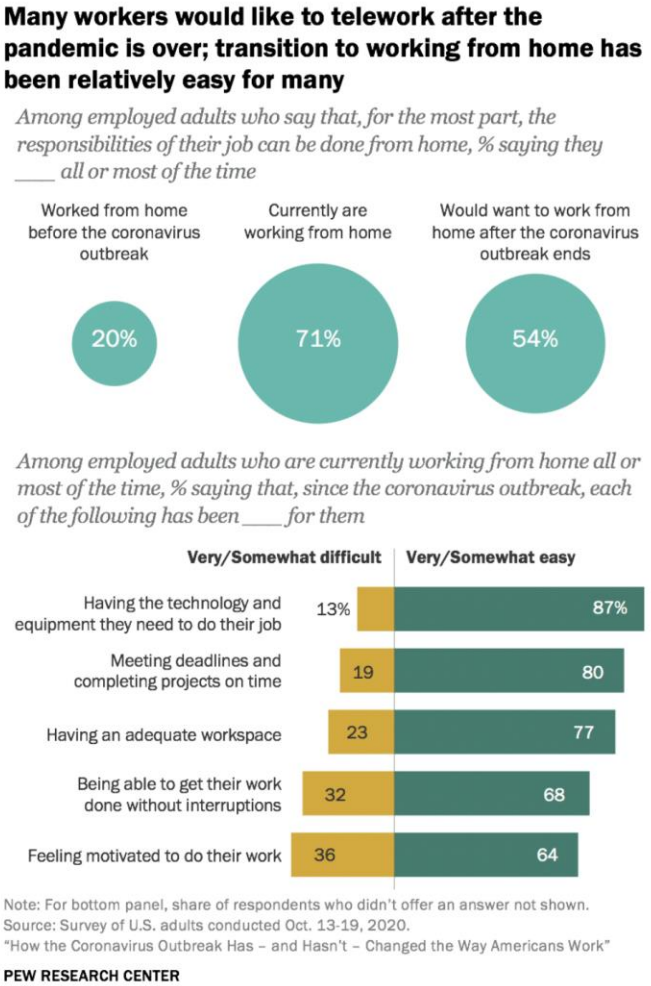
- **Design**
  - Randomized control trial
    - Two divisions in an [online travel company] headquarters in Shanghai, asked them who wants to work from home four days a week.
    - Evens got work from home and the odds stayed in the office
- **Participants**
  - 125 in the working from home group and 125 people that were in the control group (coming to the office)
- **Observation**
  - Performance tracked, minute by minute, for the next 21 months and collected other date on who quit, who got promoted, who did well, who made bonuses
- **Findings**
  - Employee Productivity
    - Contrary to expectation, the working-from-home employees were 13% more productive than the folks in the office. 4% out of the 13 percent were more productive per minute.
    - Rest of the increase in productivity (9 percent) was due to the fact that folks at home just worked more. Their quit rates were almost half because they were a lot happier. But their promotion rates were almost half of the ones at the office.
  - Firm Advantages
    - For the firm, on average, it was net good because they were more productive, and they saved on office space.

Remote Working

Cambon & Waller (2021)

- **Prevalence**
  - By October of 2020, the proportion of remote workers increased to 71% (Gallup) from 25% pre-pandemic (BLS).

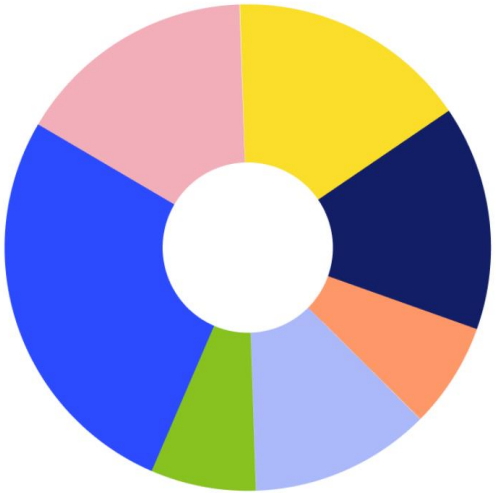
- **Employee Attitudes**
  - 54% liked remote working in a 2021 PEW survey
  - 73% in 2021 Microsoft survey hoped that remote work options would be retained post-COVID-19.
  - Reasons
    - Fewer commutes to a physical workplace
    - Enhanced childcare opportunities
    - Quieter



Remote Working: Downsides for Employee

https://buffer.com/2021-state-of-remote-work

What's your biggest struggle with working remotely?



27%	Not being able to unplug
16%	Difficulties with collaboration and communication
16%	Loneliness
15%	Distractions at home
12%	Staying motivated
7%	Being in a different timezone than teammates
7%	Other

2021 State of Remote Work

buffer.com/2021-state-of-remote-work

Do I *Work* at Home, or do I *Live* at Work?

Li (2021); Boyd (2002)

- **"Context collapse"**
  - Originated in the study of the effects of social media.
  - Term coined by Michael Wesch, a cultural anthropologist at Kansas State.
  - Refers to the infinite audience possible online as opposed to the limited groups a person normally interacts with face to face. In a limited group, a person is constantly adjusting their tone and presentation of self to fit into the social context.

- **Working Virtually from Home**
  - Context collapse occurs when individuals face a collision or collapse between boundaries of two or more previously segmented social spaces, for which they previously presented or performed their own *identities* in different manners, often due to the differing norms and natures of the social spaces.

  - Shift to remote work, aided by employer monitoring, has eroded the line between office and home

Remote Working: Employer Views

Kobie (2021)

- **Business Advantages**
  - Increased productivity
  - Customer satisfaction
  - Employee satisfaction
  - Real property savings
  - Recruitment/retention advantage

- **Employer Attitudes**
  - *Pre-Omicron*
    - Pretty soon, workplace will return to “normal”
  - Corporate America is now coming around to remote work
    - Management-labor power dynamics are changing
  - Concerns:
    - Preserving company culture
    - Maintaining performance and collaboration
  - https://www.washingtonpost.com/business/2022/01/15/remote-work-omicron/

Working Futures:

Knowledge Workers—Remote is Feasible

Hybrid Approach to Working

Cambon & Waller (2021)

- **Hybrid Working**
  - Flexible reporting to the physical workplace as agreed to by employer and employee
  - Co-located working versus distributed working—Quadrants 1 to 4

While we may work together when co-located, we often work alone even when seated together.

We don't need to be in the same place to work together.

And working alone — where our mindspace is protected from physical and mental distraction — is critical to our productivity and creativity.

In hybrid working environments, teams can engineer opportunities to collaborate more intentionally.

Those that do **collaborate intentionally** have a stronger awareness of how, where and when to use each of the four hybrid collaboration modes.

Source: Gartner

Reasons Why Hybrid Working Will Stick

Barrero JM et al (21 April 2021)

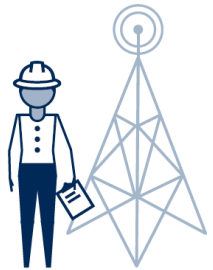
- **Survey**
  - More than 30,000 Americans over multiple waves to investigate whether WFH will stick, and why.
- **Data**
  - 20% of full workdays will be remote after the pandemic ends, compared with just 5% before.
- **Reasons**
  - Better-than-expected WFH experiences
  - New investments in physical and human capital that enable WFH
  - Greatly diminished stigma associated with WFH
  - Lingering concerns about crowds and contagion risks
  - Pandemic-driven surge in technological innovations that support WFH
- **Consequences**
  - Higher-earnings employees will enjoy large benefits from greater remote work
  - Shift to WFH will directly reduce spending in major city centers by at least 5-10%.
  - Data on employer plans and the relative productivity of WFH imply a 5% productivity boost in the post-pandemic economy due to re-optimized working arrangements.

Working Futures:

Essential Workers—
Remote Work Is Not an Option

Physical Presence and/or Proximity Required

Cambon & Waller (2021)



Role	Retail Employee	On-Site Essential Personnel	IT Field Technician
Flexibility Options	• Provide employees the choice to schedule and trade their own hours • Provide tenured employees options for what areas they work in and who they work with • Allow employees to work at different locations	• Provide employees transparency into the types of projects available to them • Allow employees to share their workstyle preference • Provide employees choice of when they can start and end each workday	• Adjust scheduling as needed (i.e., four 10-hour days, not five 8-hour days) • Provide employees options of which peers they work with on-site • Authorize remote work when not on-site

Source: Gartner

Occupational COVID-19 Transmission: Complex Issue

- Relatively few systematic comparisons of death rates in different occupations using population-level data. Mechanisms driving these differences are not well understood.

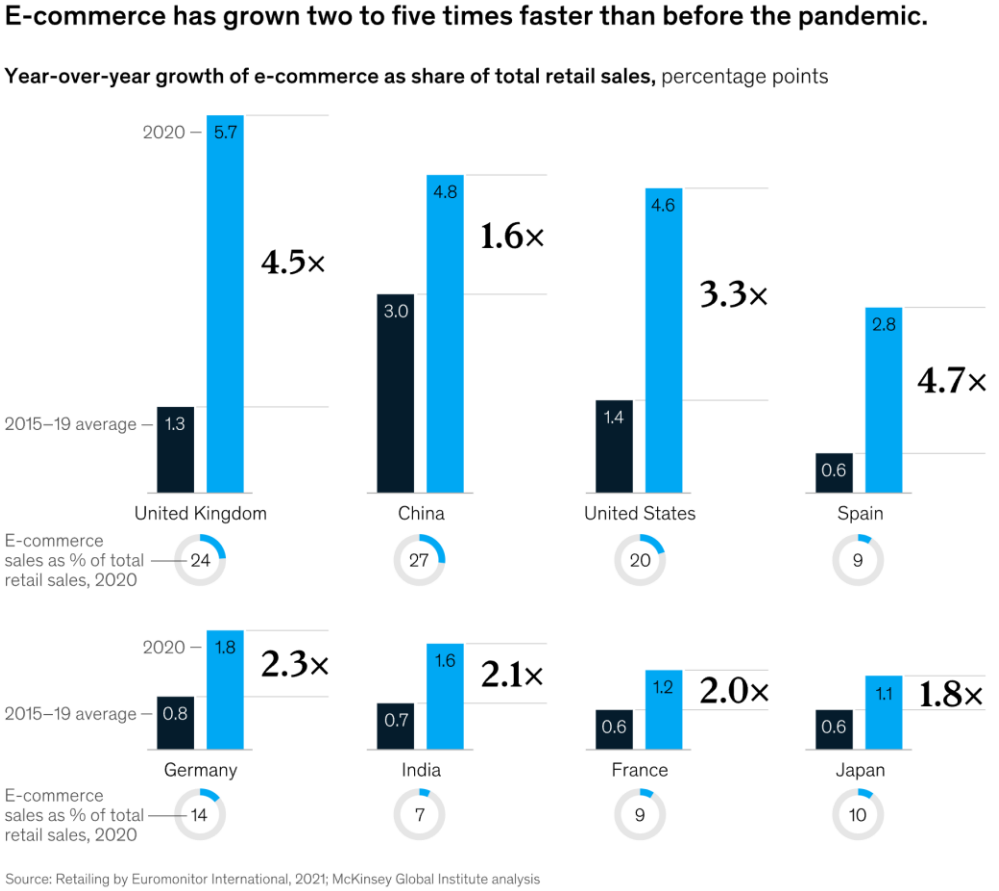
- Using a cohort study of over 14 million people aged 40–64 years living in England, researchers analyzed occupational differences in death involving COVID-19, assessed between 24 January 2020 and 28 December 2020.

- **Conclusion:**
  - Working conditions play a role in COVID-19 mortality, *particularly in occupations involving contact with patients or the public*.
  - However, there is also a substantial contribution from non-workplace factors.
    - Nafilyan V et al. Occup Environ Med Epub ahead of print: [31 December 2021]. https://doi.org/10.1136/oemed-2021-107818

Increased Digital Platform Work

Digital Interactions

- **Growth in virtual transactions**
  - e-Commerce, telemedicine; online banking; streaming entertainment
  - Physical proximity driver
- **Current use → future use**
  - 75% of pandemic first-time users say they will continue use
- **Trends:**
  - Increased growth in delivery, transportation and warehouse jobs
  - Most last-mile delivery jobs are usually nonstandard (gig) work arrangements



3. Automation & AI

- COVID-19 may accelerate future deployment of robotics in jobs with high scores in human interaction or physical proximity.
- **Trends:**
- **Protein processing plants**
  - Accelerated development in machine vision and robotics to replace more manual operations in protein processing plants
- **Self-checkout in retail**
  - Grocery stores and pharmacies to meet customer demand for contactless service
- **Robotic process automation**
  - Loan application processing
  - Handle paperwork surge from government stimulus programs

Employer Monitoring:

Automating Remote Supervision

Ng (2021)

- **History**
  - Direct Supervision
  - Electronic Performance Monitoring
    - https://journals.sagepub.com/doi/10.1177/0149206319869435

- **Remote Work Monitoring**
  - An increase in remote working during the pandemic has accelerated employer surveillance of employee productivity
    - Bossware or Tattleware
    - https://www.eff.org/deeplinks/2020/06/inside-invasive-secretive-bossware-tracking-workers
  - Computer-work can be easily surveilled through electronic tracking software supplied by many companies

Employer Monitoring:

Automating Remote Supervision

Ng (2021)

- **Common Monitoring Features**
  - Usage time
  - Keystroke logging
  - Screen shots and screen recordings
  - Web cam/microphone activation
  - Pretty much everything the user does on employer equipment.

- **Visible or Invisible?**
  - Most companies that offer invisible monitoring recommend that it only be used for devices that the employer owns. However, many also offer features like remote and “silent” installation that can load monitoring software on worker computers, without their knowledge while their devices are outside the office.
  - This works because many employers have administrative privileges on computers they distribute. But for some workers, the company laptop they use is their only computer, so company monitoring is ever-present.

Bossware: Health & Safety Implications

- Such an increased in employee surveillance may lead to adverse safety and health outcomes for workers, as well as affect employee morale.
- For example, employees can be penalized for engaging in health-enhancing behaviors such as taking rest or bathroom breaks.
- Bossware can be used to enforce a faster work pace and reduce downtime, which increases the risk of physical injuries, particularly those stemming from repetitive motion and can lead to an
  - “increased risk of psychological harm and mental health problems for workers — particularly due to the effects of job strain, which occurs when workers face high job demands but have little control over their work.”
- https://cdt.org/wp-content/uploads/2021/07/2021-07-29-Bossware-paper-plain-language-updated-final.pdf

Risk Mitigation Strategies

COVID-19 Hierarchy of Controls

Workplace COVID-19 Plan to Minimize Transmission Risks in a Coronanormal Era

Hazard Elimination

- Prevent viral entry by symptom/temp check
- **Vaccination**
- **SARS-CoV-2 Testing**
- Encourage symptom reporting within workplace
- Telework, if feasible
- Medical removal protection & contact tracing

Engineering Controls

- Restructure workplace spaces to ensure worker distancing
- Use partitions or barriers if workers cannot distance
- Improve ventilation through dilution, filtration, and air-cleaning
- Consider upper room germicidal irradiation

Administrative Controls

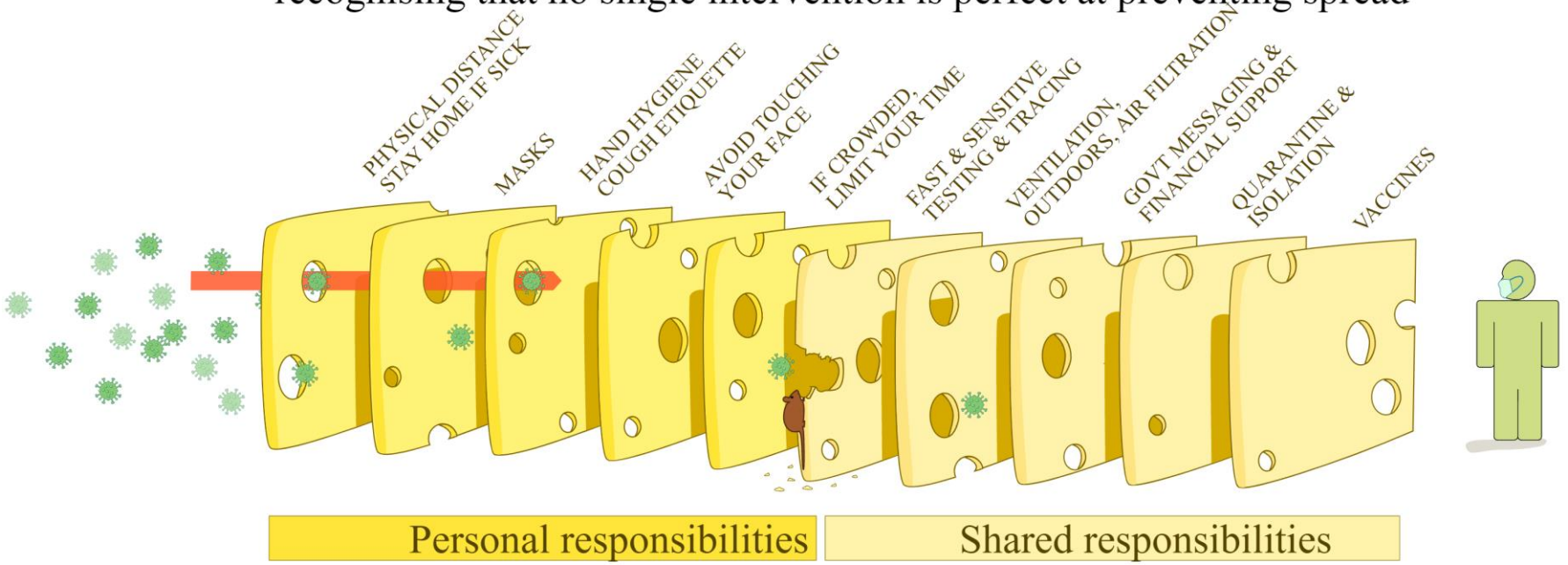
- De-densify by reorganizing workflow
- Use staggered shifts
- Infection control practices including barrier face coverings (ASTM F3502-21)
- Perform cleaning and disinfection
- Flexible sick leave
- Train employees in hazards and controls
- Psychosocial support

PPE

- **Barrier Face Coverings**
- N95s
- Gloves
- Face shields
- Gowns
- Fit-testing and respirator maintenance procedures

The Swiss Cheese Respiratory Virus Pandemic Defence

recognising that no single intervention is perfect at preventing spread



Each intervention (layer) has imperfections (holes).
Multiple layers improve success.

Ian M Mackay
virologydownunder.com
with thanks to jody lanard, katherine arden & the Uni of Qld
Based on the Swiss cheese model of accident causation, by James T Reason, 1990
version 3.0
update: 24oct2020

Mandatory and Consensus Risk Mitigation Approaches

- **State and Local Requirements**

- **National Standards**
  - OSHA
    - Healthcare Emergency Temporary Standard (withdrawn)
    - General Workplace Emergency Standard (stayed by Supreme Court)
    - Permanent Infectious Disease Standard (in development)
  - CMS/HHS Healthcare Worker Vaccination Interim Final Rule
    - https://www.federalregister.gov/documents/2021/11/05/2021-23831/medicare-and-medicaid-programs-omnibus-covid-19-health-care-staff-vaccination

- **ISO 45006**—Occupational health and safety management – preventing and managing infectious diseases – General Guidelines for organizations"
  - Guidelines for the prevention of exposure to infectious agents and management of risks to workers and other relevant interested parties from infectious diseases.
  - Excludes organizations that are already implementing mandated infection controls due to the nature of their operations, e.g., hospitals.

In advance of a pandemic, anything you say sounds alarmist.

After a pandemic starts, everything you've done seems inadequate.

Thank You!

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