

COVID-19 BCG Perspectives Series

Facts, scenarios, and actions for leaders

Vaccines & Therapeutics Outlook Part II: Scenarios and Implications

29 September 2020

COVID-19 BCG Perspectives

Objectives of this document

COVID-19 is a global societal crisis

We at BCG believe that the COVID-19 outbreak is first and foremost a societal crisis, threatening lives and the well-being of our global community. Society now, more than ever, needs to collaborate to protect people's lives and health, manage mid-term implications, and search for lasting solutions.

Leaders need to drive an integrated response to navigate the crisis

It is the duty of health, political, societal, and business leaders to navigate through this crisis. A complex interplay of epidemic progression, medical response, government action, sector impact, and company action is playing out. This document intends to help leaders find answers and shape opinions to navigate the crisis in their own environments. It encourages thinking across the multiple time horizons over which we see the crisis manifesting itself.

Summary snapshot | Restart progression at a glance

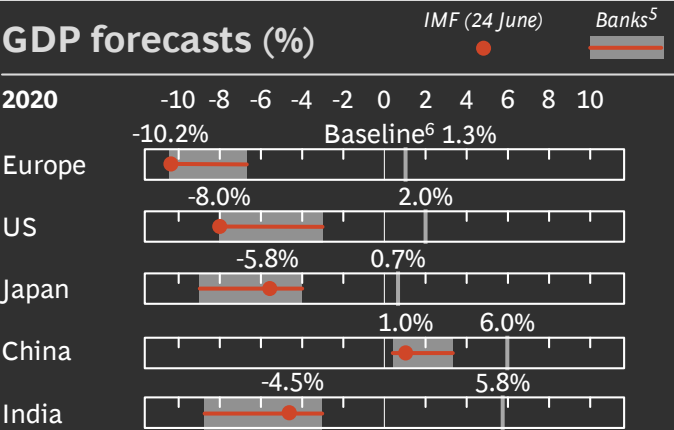
As of 27 Sep 2020

Epidemic Progression

Global epidemic snapshot

		33M	297K	9.1M	997K
		# of cases	# of daily cases ¹	# of active cases	# of fatalities
Month-on-month growth of new cases ²	Americas	1.6x	1.7x	1.0x	0.8x
	Europe	0.8x	1.0x	1.7x	1.8x
	Asia ³	2.0x	1.7x	1.4x	1.3x

Economic Impact



Consumer Activity

Mobility

		June	July	August
Mobility ⁷ (month vs. Jan '20)	US	-19%	-19%	-19%
	Europe	-25%	-17%	-17%
	Japan	-13%	-13%	-13%
Domestic air travel tickets booking ⁸ (YoY)	US	-73%	-76%	-69%
	UK	-92%	-86%	-85%
	China	-45%	-26%	-2%

Sales

Retail goods sales ⁹ (excl. auto & fuel, YoY)	US	8%	8%	8%
	UK	1%	3%	4%
	China	2%	-2%	-1%
Passenger vehicle sales ¹⁰ (YoY)	US	-38%	-19%	-27%
	Europe	-25%	-19%	-17%
	China	2%	9%	6%
Hotel occupancy ¹¹ (YoY)	US	-43%	-36%	-32%
	Europe	-73%	-66%	-45%
	China	N/A	-19%	-12%

Business Impact

Stock market performance

Month end vs. 02 Jan '20	June	July	August
S&P500	-5%	0%	7%
FTSE100	-19%	-22%	-22%
CHN SSE	-3%	7%	10%
Volatility Index (S&P500) ¹²	2.4x	2.0x	2.1x

International trade

Trade value ¹³ (YoY)	US	-20%	-11%	N/A
	UK	-17%	-19%	N/A
	China	1%	3%	4%

Industrial production

Purchasing manager's index ¹⁴ (base = 50)	US	50	51	53
	EU	48	52	52
	China	51	51	52
Steel production (YoY) ¹⁵		-7%	-3%	0%

1. Calculated as 7-day rolling average; 2. Calculated as monthly average of daily cases vs. previous month; 3. Includes Middle East and Oceania; 4. As of 27 September 2020; 5. For India, forecast is for financial year; for others, it is for calendar year; YoY forecasts; range from forecasts (where available) of World Bank, International Monetary Fund, JP Morgan Chase; Morgan Stanley; Bank of America; Fitch Solutions; Credit Suisse; Danske Bank; ING Group; HSBC; As of reports dated 12 April 2020 to 27 Sep 2020; 6. IMF Jan 2020 forecast; 7. Mobility values are calculated as the average of mean monthly mobilities in workplace, public transit, retail & recreation, and grocery & pharmacy and compared to a baseline from 03 Jan – 06 Feb 2020; Europe mobility values are calculated as the average of Germany, France, UK, Spain, and Italy; 8. Calculated as change in last 14 days rolling average value as compared to same period last year; 9. Retail goods sales includes online & offline sales and comprise food & beverages, apparel, cosmetics & personal care, home appliances, general merchandise, building material; does not include auto, fuel & food services; 10. Figures represent passenger vehicle (including sedan, hatchback, SUV, MPV, van and pickup) sales data for 2020 over same month in 2019; Europe value calculated as cumulative sales in Germany, France, UK, Spain, and Italy; 11. Calculated as average occupancy rates compared to same month of previous year; 12. Underlying data is from Chicago Board Options Exchange Volatility Index (VIX); Volatility Index is a real-time market index that represents the market's expectation of 30-day forward-looking volatility and provides a measure of market risk and investors' sentiments; 13. Calculated as sum of imports and exports, measured in USD and compared to previous year period; 14. PMI (Purchasing Manager's Index) is a diffusion index that summarizes whether market conditions, as viewed by purchasing managers, are expanding (>50), staying the same (50), or contracting (<50); 15. Data corresponds to G-20 countries (minus Indonesia). Sources: JHU CSSE; Our World in Data; WHO; World Bank; IMF; Bloomberg; Google Mobility; US Census Bureau; Eurostat; PRC National Bureau of Statistics; ACEA actuals; Marklines; ARC ticketing data; STR; Statista; CBOE; OECD; BEA; GACC (customs) China; ONS; BCG

Executive Summary | COVID-19 BCG Perspectives

Leaders need to develop an action agenda with potential future scenarios – driven by a combination of healthcare technology outcomes and societal responses

- Daily case growth slowing globally; however, Asia continues to grow, and several European countries are witnessing resurgence
- 9 vaccine candidates in Phase III; some may get emergency use authorizations starting in Q4 2020¹; multiple promising therapeutics in clinical trials
- Several factors/elements of healthcare technology and societal response as well as their interplay will determine four potential scenarios for 2021
- (1) Fast Recovery: Phased vaccine approvals followed by organized governmental response leads to rapid adoption, setting up the path for a speedy recovery
- (2) Cautious Confidence: Vaccine benefits in healthy adults provide impetus for restart; lower efficacy for other population segments
- (3) False Euphoria: Minor successes in vaccines/therapeutics are lauded by society; misplaced euphoria leads to reduced caution, paving way for case flare-ups
- (4) Prolonged Draught: Low efficacy in vaccine candidates impacts morale; grim outlook leads to adoption of altered lives with social distancing embedded
- Public and business leaders need to actively deploy a set of no-regret moves and a specific scenario-linked action agenda

Severe global economic downturn witnessed in 2020; some green shoots on recovery visible

- Economic forecasts indicate a rebound to 2019 GDP levels only by end of 2021 for most leading economies
- Unemployment numbers for top economies declining or flattening out; US: temporary jobs coming back, permanent job losses slightly increasing
- Retail and recreation mobility recovering fastest with some countries² already above pre-crisis levels; lower recovery of workplace mobility indicates WFH³ adoption
- In the US, business activity across all sectors, except energy, has rebounded to previous year levels; in Europe, automotive & mobility showing strong rebound
- 4 (out of 24)⁴ sectors are currently above pre-crisis TSR⁵ levels; 7 sectors have a significant share⁶ of companies with >15% default risk

We believe during this crisis leaders need to think along two dimensions:

Taking an integrated perspective on health/medical progression, governmental responses, societal reactions, and economic implications to understand business/sector impacts

Thinking multi-timescale in a Flatten-Fight-Future logic

1. Initial data observed in the early stages of phase 3 trials may lead to restricted approvals starting in Q4 2020; 2. E.g., Germany and Italy in Europe; 3. WFH: Work from home; 4. Semiconductors, Retailing, Household products and Pharma; 5. TSR: Total Shareholder Return; 6. Retailing, Materials, Auto, Transport, Hospitality, Real estate, and Energy are sectors with > 10% of companies with probability of default > 15%

Questions on every public and business leader's mind right now

Non-exhaustive

1 When will we have a safe and effective COVID-19 vaccine and what will it look like?

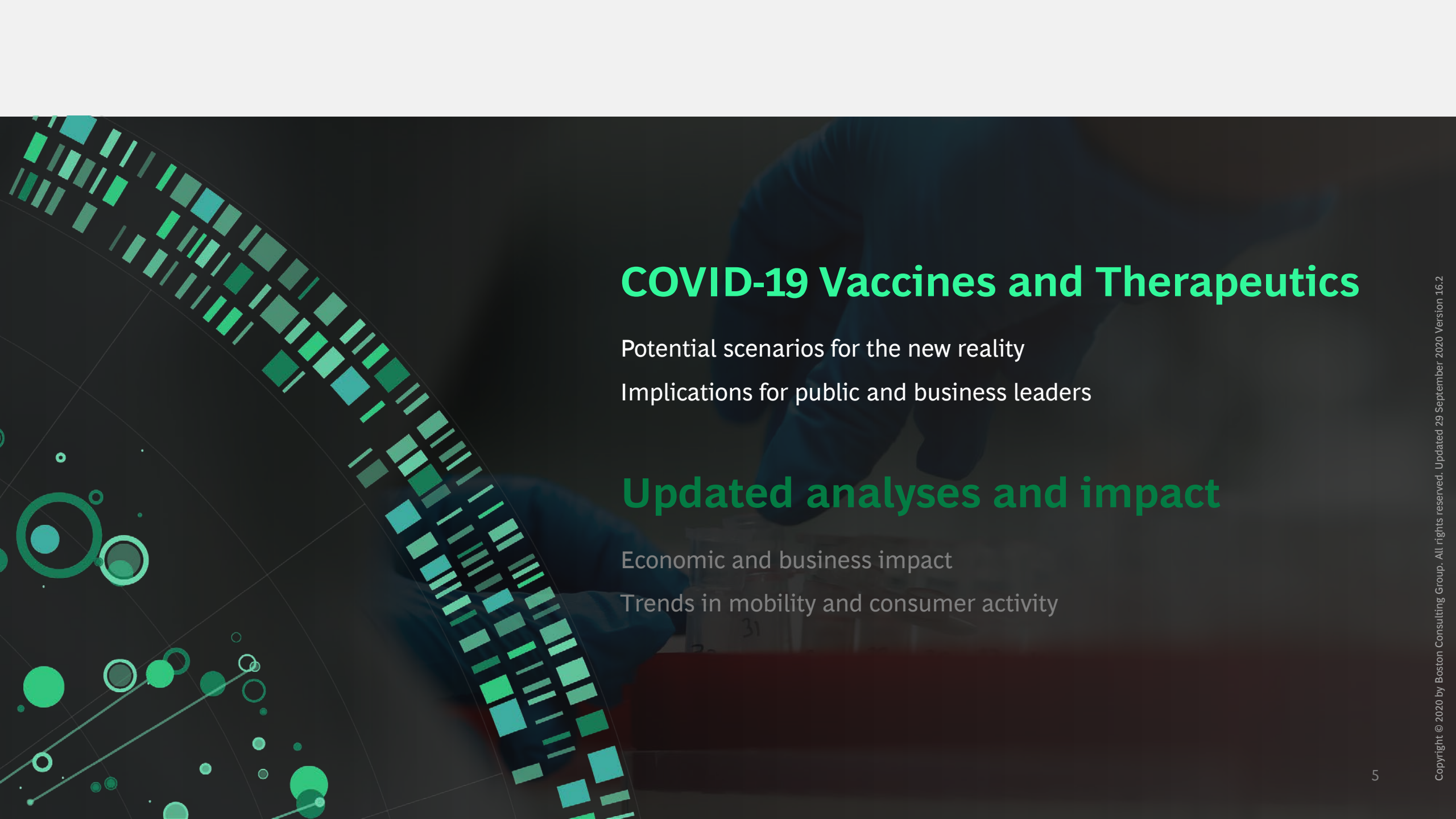
- What is the current development landscape across leading COVID-19 pharmaceutical countermeasures (vaccines & therapeutics)?
- What factors will drive early authorizations and subsequent approvals?
- When will a vaccine likely be widely available?
- Will vaccine efficacy and safety outcomes impact vaccine adoption patterns and healthcare response priorities?
- What are the pre-conditions to ensure broad availability & distribution?

Focus for the previous edition

2 What choices and implications emerge for public and business leaders?

- What potential scenarios emerge from healthcare technology and societal response outcomes?
- What is the possible virus control, and social and economic revival outlook for each scenario?
- How should public leaders think about communication strategies and ensuring equitable access across scenarios?
- How should business leaders think about safeguarding their employees and planning for a potentially tumultuous 2021?
- What 'no-regret moves' do leaders need to take now?

Focus for the current edition



COVID-19 Vaccines and Therapeutics

Potential scenarios for the new reality

Implications for public and business leaders

Updated analyses and impact

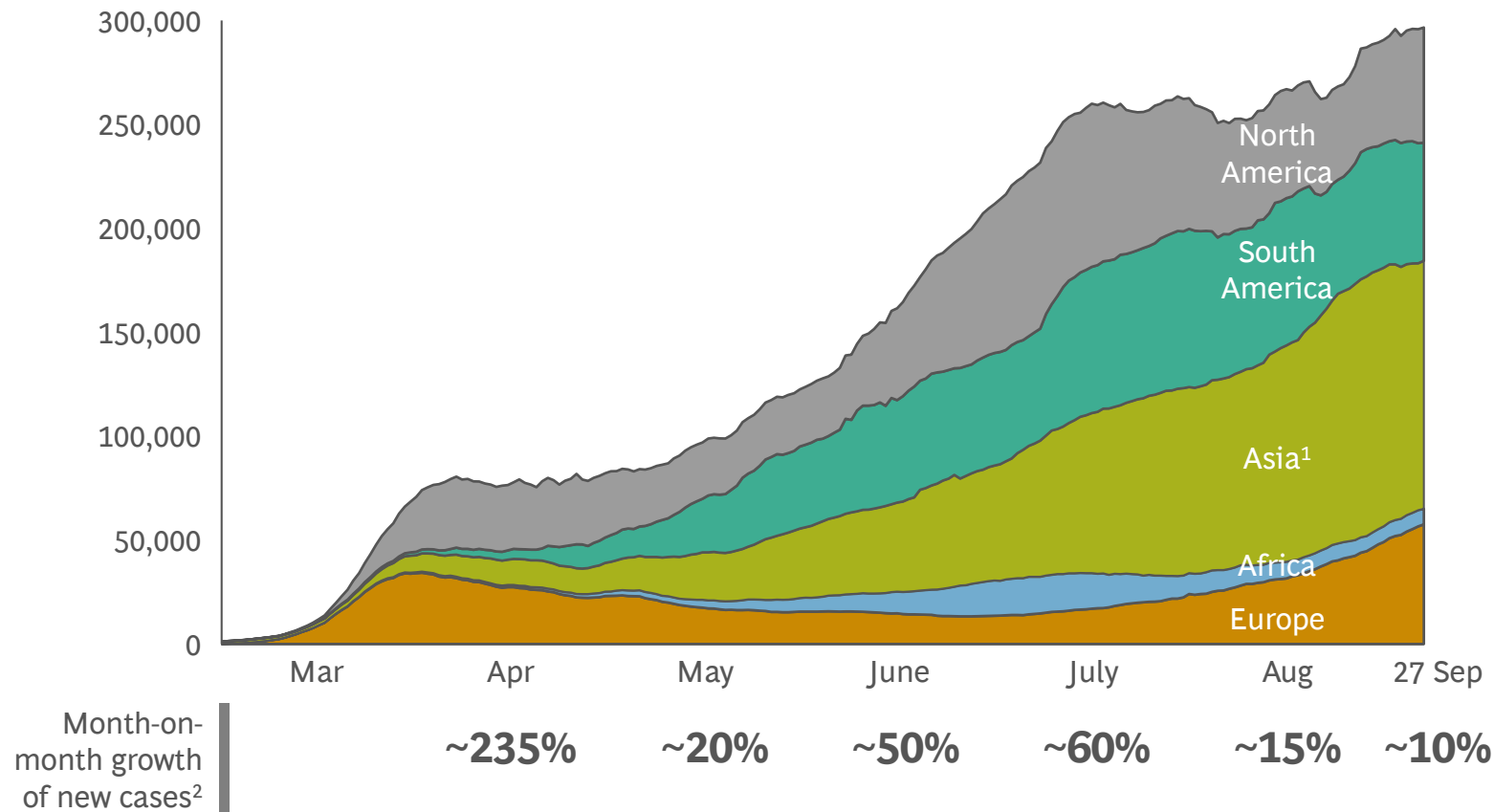
Economic and business impact

Trends in mobility and consumer activity

Epidemic progression | Daily case growth slowing globally; Asia continues to grow

As of 27 Sep 2020

Daily new cases (7-day rolling average)



Key observations

33M

of confirmed cases

9.1M (28%)

of active cases
(% of confirmed cases)

997k

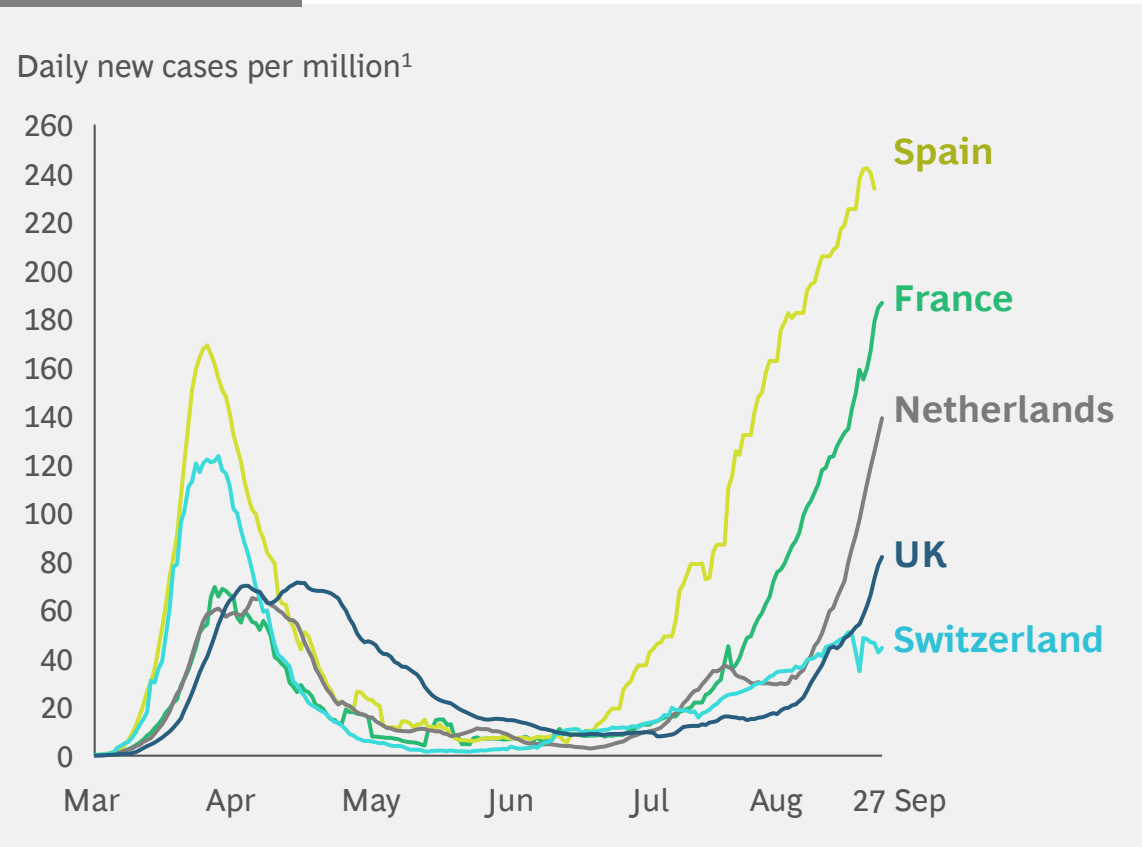
of fatalities

1. Includes Oceania (Australia, New Zealand, Papua New Guinea and surrounding island nations of the Pacificocean); 2. Calculated as growth in monthly average of daily cases as compared to previous month;
Source: Johns Hopkins CSSE; Our World in Data; BCG

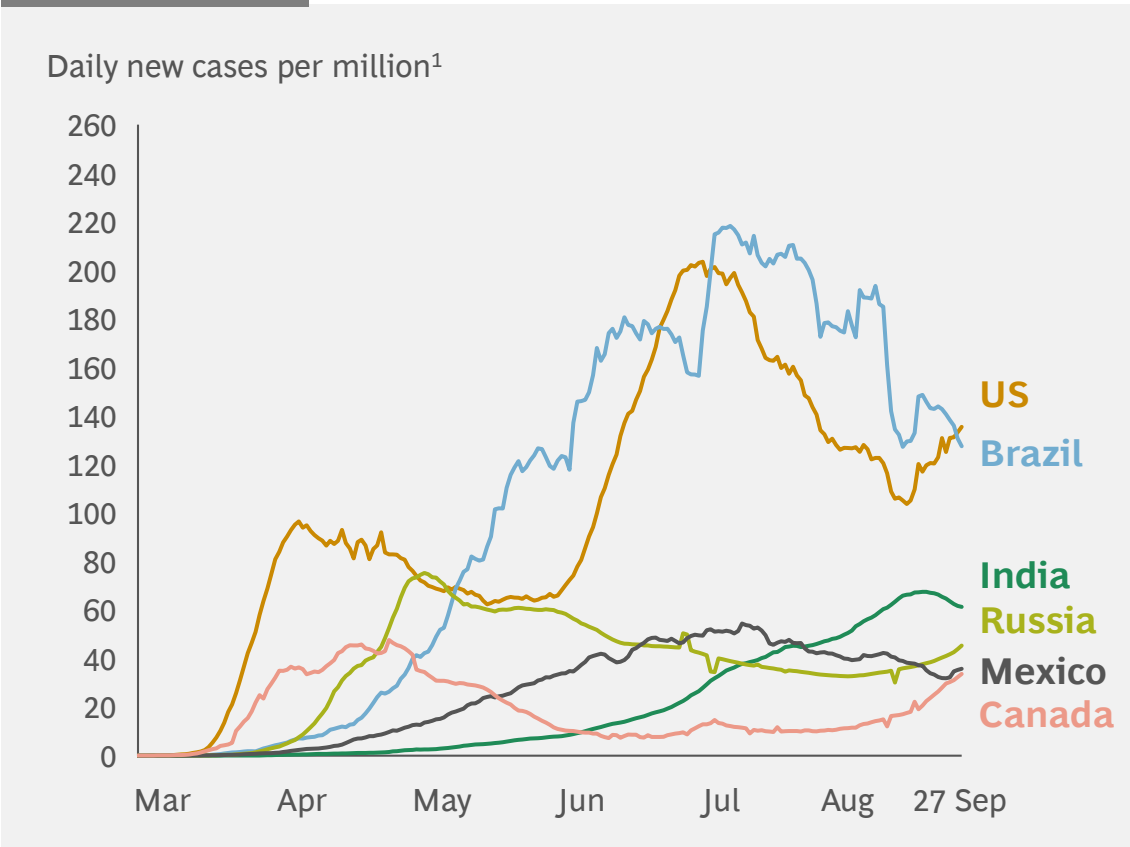
De-averaged view | Several European countries witnessing resurgence

As of 27 Sep 2020
Data shown only for top 20 countries (by GDP) with >30 daily new cases per million

Europe: Several countries witnessing resurgence, with some exceeding previous case peaks



Brazil and US showing decline compared to peak case levels



Note: Page shows de-averaged view of top 20 countries (by GDP), of which 11 have daily cases/M >30; other 9 countries have <30 daily cases/M (Italy (27), Germany (22), Turkey (20), Indonesia(16), Saudi Arabia (14), Japan (3), South Korea (2), Australia (1), China (0))

1. Calculated as a 7-day rolling average; Source: Our World in Data; BCG

Unprecedented response globally on scale and speed of R&D efforts; vaccine, therapeutic, and diagnostic outcomes key to containing the virus

As of 27 Sep 2020



The Washington Post Sep 24, 2020

First single dose vaccine, by J&J, enters Phase III in US; plan to manufacture 1 bn+ doses by next year



The New York Times Sep 19, 2020

AstraZeneca trials resume in UK, Brazil, India and South Africa, remain paused in the US



Bloomberg Sep 27, 2020

Fauci says: We are focusing heavily now on prevention & treatments; that's the bridge to the vaccine



nature Sep 16, 2020

New antigen test that can provide results in 15 min, and costs only \$5, provided EUA¹ by US FDA



The Moscow Times Sep 16, 2020

32+ countries have expressed interest in testing and obtaining Russia's Sputnik V vaccine



THE WALL STREET JOURNAL. Sep 15, 2020

In global vaccine race, Chinese vaccine by Sinopharm gets first foreign emergency use approval from UAE



Science Sep 16, 2020

US drug maker reports promising results for a monoclonal antibody; 72% reduction in hospitalization



Hindustan Times Sep 22, 2020

India's first diagnostic kit based on gene editing technology CRISPR approved for commercial use

1. Emergency Use Authorization

Best-case timelines as of 28 Sep 2020

Vaccines

40

candidates currently in clinical trials

10

candidates currently in Phase III;
in race for EUA^{1,2} starting Q4'20,
contingent on safety and efficacy profiles

Q2'21

expected start of broader distribution
(beyond targeted population segments)³
in the best-case scenario⁴

Therapeutics

254

candidates currently in clinical trials

4

key candidates currently under EUA^{1,5} in select
countries; ensuring broad clinical trials, safety,
and efficacy key for further approvals

Q4'20

expected broader availability⁶

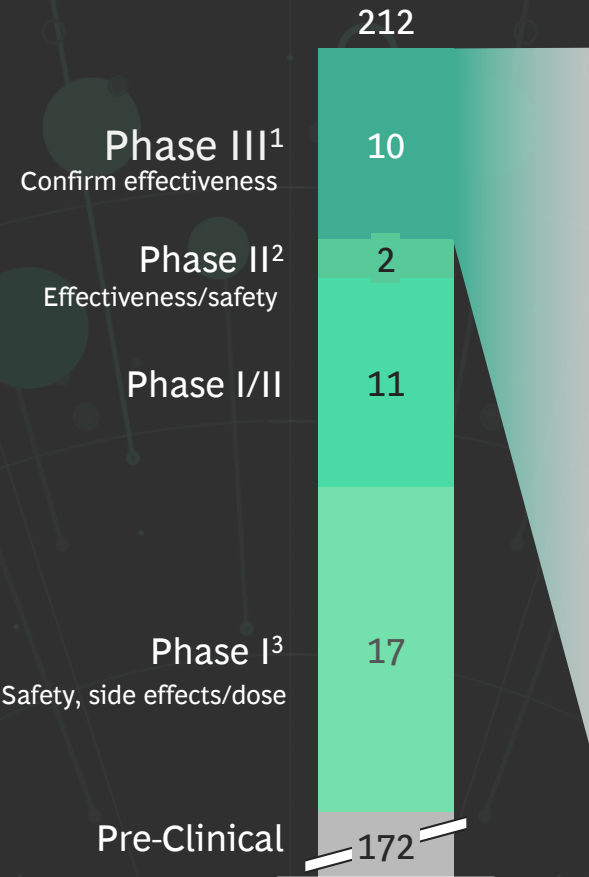
1. Emergency Use Authorization; nomenclature may differ across geographies; 2. Estimated timelines for grant of EUA: BioNTech/Pfizer, Moderna by Q4 '20, Oxford University/AstraZeneca between Q4 '20 & Q1 '21; Sinovac, Sinopharm/BIPB, Sinopharm/WIPB and CanSino by Q1 '21; Janssen (J&J), Novavax and Gamaleya Research Institute to be ascertained; 3. Anyone who wants a vaccine can get a prescription; 4. Estimated for the US; will be subject to a set of preconditions including phase 3 results, manufacturing & distribution setup and scale-up, etc.; 5. EUA for Remdesivir in the US, Japan, Australia (non-exhaustive), Convalescent plasma therapy in the US (non-exhaustive); Dexamethasone in UK, Japan (non-exhaustive); Favipiravir in India, Russia, China (non-exhaustive); 6. First few million doses; Gilead to ramp up availability of Remdesivir to 2M by Dec 2020; the US has secured 500k already and pre-booked 90% of September 2020 month's capacity; Additionally, availability basis prescription has started in select geographies like India, Japan, European Union, etc; Gilead has also signed non-exclusive voluntary licensing agreements with generic pharmaceutical manufacturers based in Egypt, India and Pakistan; Dexamethasone widely available but used generally in severe patients requiring supplemented oxygen support; Source: FDA, WHO, Milken Institute; Biocentury; Company websites, BCG

Further reading

**Vaccines & Therapeutic Outlook Part I:
Timelines and Success Factors**

Vaccine fast movers | 10 vaccine candidates already in Phase III

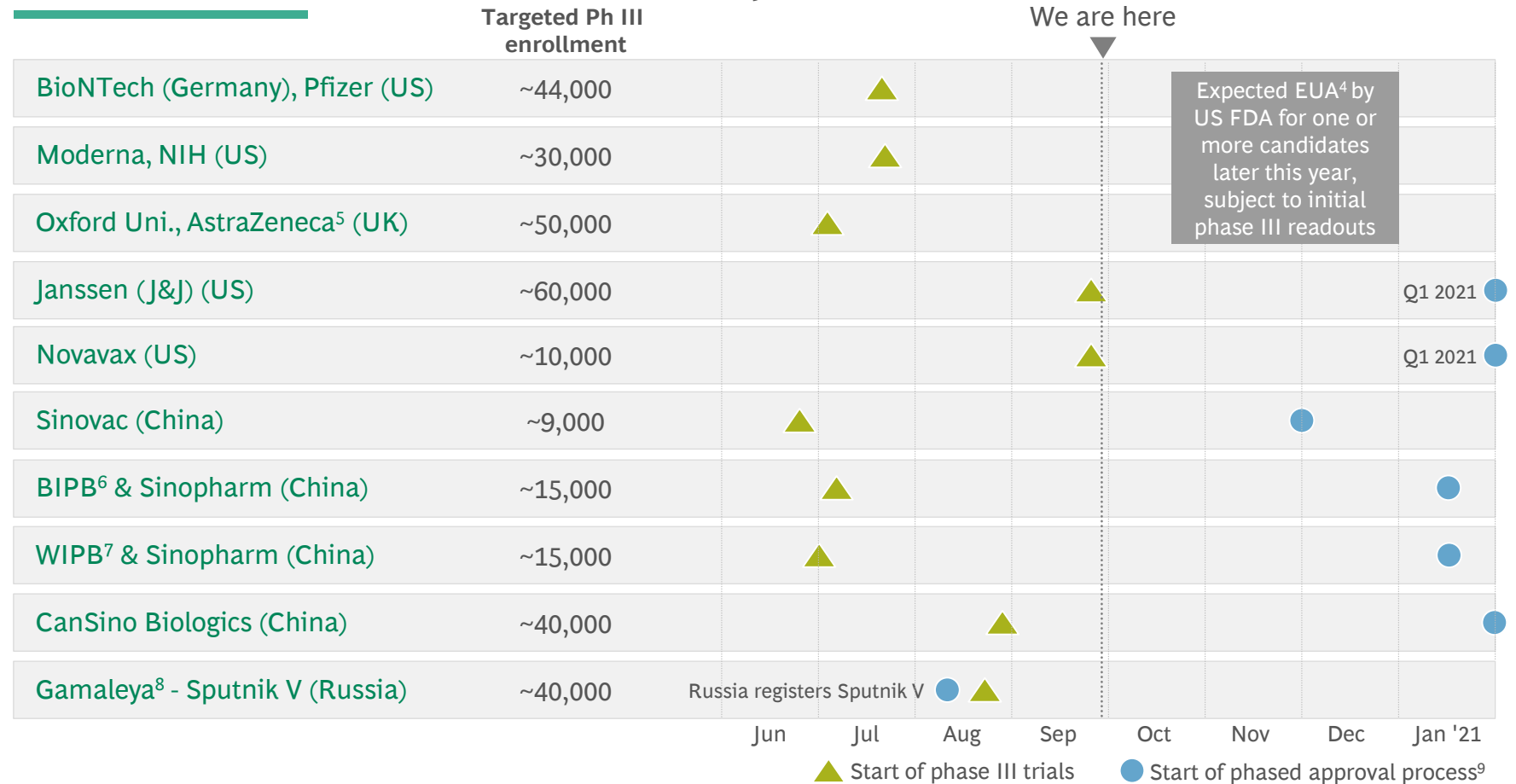
Vaccine candidates across development phases



As of 28 Sep 2020

WHO Phase III classification

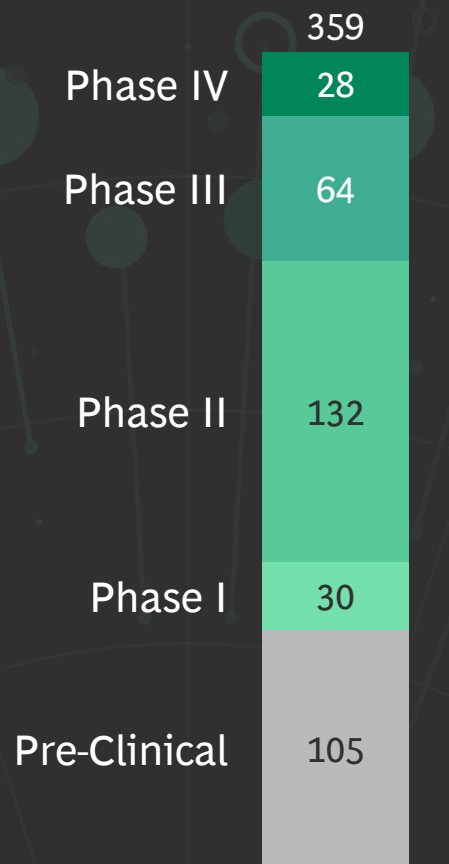
Potential timelines for candidates currently in Phase III



Note: The timeline represented is highly dependent on Phase III vaccine results including safety, efficacy data and hence, subject to change; 1. Ph III trials involve a large number of volunteers (e.g., 10s of 1000s) to test efficacy & safety of vaccine; 2. Phase II studies involve small number of volunteers (e.g., 100-1000) & are intended to provide preliminary information about a vaccine's ability to produce its desired effect; 3. Phase I clinical studies involve initial testing in very small number of volunteers (e.g., 20-100) to test the safety profile; 4. Emergency Use Authorization; 5. Oxford University/AstraZeneca voluntarily paused Ph. III trials to review the safety event on a UK patient; trials have since resumed in UK, India but remain suspended in some other countries, including US; 6. Beijing Institute of Biological Products; 7. Wuhan Institute of Biological Products; 8. Gamaleya Research Institute; 9. Trials are expected to continue till 2021 & 2022 for different candidates, as per WHO, clinicaltrials.gov. However, companies are expected to start approval applications with initial phase 3 results. Source: Guggenheim, Wells Fargo, Bloomberg, FT, Cowen, NYT, Milken Institute, Morgan Stanley, NIH, clinicaltrials.gov, WHO, Press Search, BCG

Therapeutics | Multiple therapeutic candidates at various stages of clinical trials

Globally 300+ treatments undergoing trials



As of 25 Sep 2020

US example

3 therapeutic candidates currently approved¹ in the US for potential COVID-19 treatment

	Remdesivir (antivirals)	Dexamethasone (corticosteroid)	Plasma Therapy (convalescent plasma)
Interim report view	~30% drop in recovery time >50% patients discharged in 2 weeks	Mortality risk reduction in <u>severe patients</u> ² Reduced 28-day mortality rate by 17%	8.7% mortality rate ³ for patients transfused within 3 days of diagnosis versus 11.9% in patients transfused after 3 days
Authorization status	Broader EUA ^{4,5} granted allowing treatment of suspected or confirmed COVID-19 patients	<u>Widely available</u> as anti-inflammatory drug	EUA ⁴ granted ⁶ ; rigorous randomized trials underway

Example candidates under Phase II / Phase III clinical trials

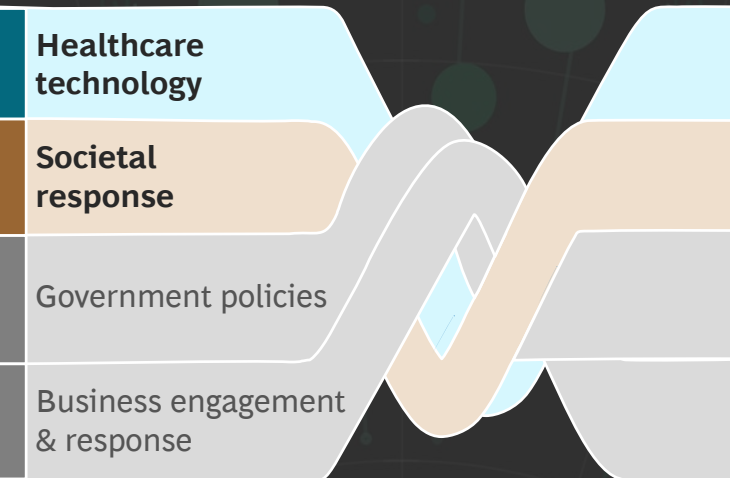
Non-exhaustive

	LY-CoV555 (Eli Lilly) (monoclonal antibodies)	Actemra (Roche) (monoclonal antibodies)	Favipiravir (antivirals)
Trial phase	Phase III	Phase III	Phase II
Interim report view	72% reduction in hospitalization for patients who received antibody vs. those who received a placebo	Patients were 44% less likely to progress to mechanical ventilation or death	Normalization of clinical signs ⁷ is 40% faster; longer median time to first use of oxygen

1. Remdesivir and plasma therapy granted Emergency Use Authorization; US Health and Human services included dexamethasone in COVID-19 treatment guideline; 2. Patients requiring supplemental oxygen support; 3. 7-day mortality rate; 4. Emergency Use Authorization; 5. Initial EUA restricted use on patients with severe conditions (e.g., patients requiring supplemental oxygen support); 6. EUA granted despite no to limited randomized clinical trial involving a placebo group to estimate actual impact of the plasma treatment; 7. Clinical signs include temperature, oxygen saturation, cough, which are compared with control arm; Source: ClinicalTrials.gov, Milken Institute, BioCentury, WHO, NEJM, RAPS, CNN, The New York Times, medRxiv, Company Websites, BCG

Several factors and their interplay will drive epidemic progression scenarios in 2021

Factors & their interplay



Healthcare technology and societal response considered to build scenarios for 2021

Non-exhaustive

Vaccines¹

Efficacy (reduction in severity and/or transmissibility)

Safety data (frequency & severity of safety events)

Storage requirements²

Target population segments (such as elderly, adults, children, etc.)

Healthcare technology

Duration of immunity³

Co-administration with other vaccines⁴

Therapeutics

Efficacy (reduction in transmission, fatality rate, or length of stay)

Combination therapy approaches⁵

Safety data (frequency & severity of safety events)

Target population segments

Diagnostics⁶

Accuracy (likelihood to deliver true positive & true negative results)

Turnaround time (time from test to results)

Societal response

Non-pharmaceutical intervention⁷ (NPI) adoption rate and stringency

Consumer uptake of vaccines, therapeutics, and diagnostics

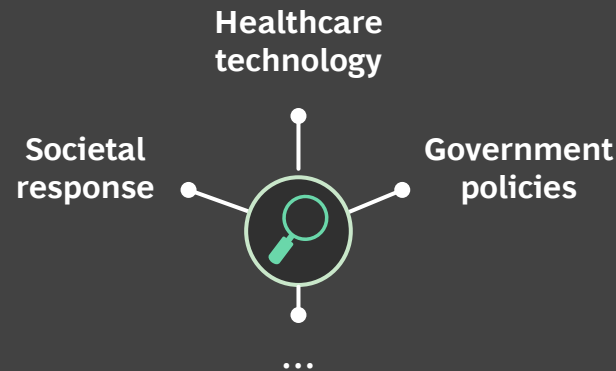
Adherence to government messages and mandates

1. Additional variables include stage of vaccine (wave 1 vs. 2, i.e., time lag between subsequent vaccines); 2. Eg., mRNA vaccine technology candidates require storage temperatures of -80C; 3. Natural immunity from prior infections also to be factored in; 4. Subsequent vaccines from wave 2; 5. Includes co-administration with other modalities of therapies and vaccines; 6. Additional variables include qualitative (yes/no) vs. quantitative (neutralizing anti-body titer) diagnostics; 7. Includes social distancing, masks, tracking, tracing, etc. Source: BCG

Leaders should use a scenario-based approach to derive implications and develop action plans

Factors

Identify a set of factors whose outcomes and interplay will determine the future scenarios

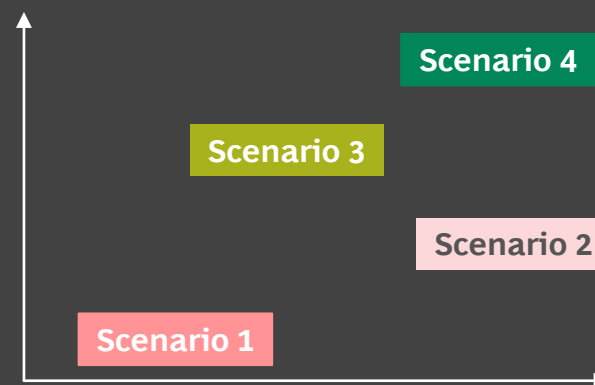


Example | Vaccine efficacy range; therapeutics response; NPI¹ adoption

Scenarios

Build scenarios that emerge based on plausible combinations of factor outcomes

Potential scenarios



Example | Vaccine with strong efficacy & safety data vs. vaccine with limited success

Implications

Carve out a set of implications and move early on actions

Scenario-specific actions
Actively track leading indicators to identify which scenario is panning out

Scenario 1

...

Scenario 2

...

Scenario 4

...

No regret moves

Act now to set up for success

Example | Tiered distribution prioritizing frontline workers; R&D for alternate vaccines

Four potential scenarios emerge for leaders to think through and plan for

Fast Recovery



Successful vaccines emerge after strong data readouts in 2020. Phased vaccine approvals are followed by a strong & organized governmental response and a well-coordinated supply chain ramp-up leading to rapid adoption, thereby setting up the path for a speedy recovery. By Q3 2021, leading economies with access to vaccine have contained the pandemic.

Cautious Confidence



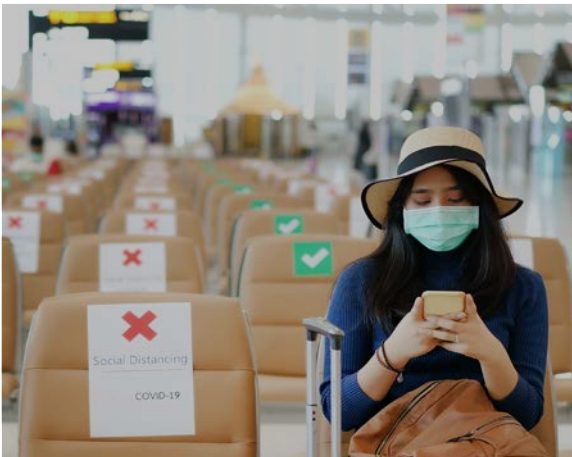
Vaccines' demonstrated benefits in healthy adults provide impetus for restart; lower efficacy (e.g., for the elderly) to no data (e.g., for children) for other population segments prevents widespread rejoice; NPIs¹ linger as society and businesses continue to safely and selectively reopen. By the end of 2021, case volumes have declined but only gradually.

False Euphoria



Minor successes in vaccines and therapeutics are lauded by society. Lack of a coordinated communication strategy leaves population confused & divided. The misplaced euphoria of a certain section that they are fully immune leads to a sudden drop in NPIs¹, leading to local case flare-ups; several geographic areas witness resurgence in 2021.

Prolonged Drought



Low efficacy (<50%) in early vaccine candidates in the ongoing phase 3 clinical trials and only few therapeutics impact the morale of the populace; grim outlook leads to adoption of altered lives with social distancing embedded and localized lockdowns becoming a norm.

1. Non-pharmaceutical interventions like social distancing, masks, tracking, tracing, etc.
Source: BCG

Fast Recovery

Scenario characteristics | *Speedy recovery towards pre-crisis normal with some behavioral shifts*

Healthcare tech. and progress

Multiple vaccines approved with efficacy >70% following strong data¹ readouts

Multiple therapeutics approved (high efficacy)

Societal response

High vaccine adoption across population segments

NPI² adoption initially high, then starts to drop

High level of trust in govt. actions & recommendations

Virus control

Infection rates decline rapidly, “green zones³” established

By Q3 2021, pandemic declared over for leading economies with cases infrequent & rapidly contained

Economic & social revival

High consumer optimism

Economic & social revival picks up, first in countries with vaccine supply & then gradually in other countries

Implications | *Manufacturing and supply chain ramp-up to be key*

Non-exhaustive

Public leaders

- Build and execute a **tiered distribution strategy** (access first for frontline groups and vulnerable population, then gradually to other sub-segments)
- Forge partnerships with private players to **scale-up manufacturing**; and with local government and health care organizations to **ramp-up supply chain capabilities** (incl. complexities arising from **cold storage requirements**⁴)
- Set up a **robust safety follow-up and monitoring program**⁵

Business leaders

- Create **awareness of vaccine benefits**; frequently update employees on government policies including vaccine distribution strategy and availability
- Partner with healthcare institutions to ensure **vaccine access to eligible employees**
- Leverage existing resources & expertise (where able) to **help solve supply chain ramp-up challenges**

1. Significant reduction in people who tested positive for COVID -19, reduction in hospitalizations, need for supplemental oxygen, and mortality across all participants and age groups;
2. Non-pharmaceutical interventions like social distancing, masks, tracking, tracing, etc.; 3. Regions where local vaccination rates are very high and daily detected case loads are very low;
4. Ultra frozen requirements for some mRNA candidates, administration challenges—once vaccine out of cold storage, must be administered within short timeframe (<48 hours);
5. Objective to rigorously follow up on all vaccinated individuals and track for possible safety events and side effects, efficacy and duration of protection; Source: BCG

Cautious Confidence

Scenario characteristics | *State of vigilant rebound, revival slowly kicks in*

Healthcare tech. and progress

Mid-range efficacy vaccine (50-70%), demonstrated benefits¹ limited² to healthy adults

New therapeutics approved (high efficacy)

Societal response

Vaccine adoption picks up in targeted segments

NPIs³ linger, become a norm for vulnerable population segments

Virus control

By the end of 2021, case volumes would have **declined but only gradually** as more and more people get vaccinated

Economic & social revival

Economic revival picks up gradually with availability of adult workforce

Schools & eldercare facilities continue to remain affected

Implications | *Balanced approach on vaccine and NPI³ adoption to be key*

Non-exhaustive

Public leaders

- **Prioritize frontline workers** & eligible sub-segments for vaccination
- Continue to **push testing and NPI³ adoption with targeted focus** on vulnerable segments (e.g., in eldercare facilities, schools, etc.)
- Continue to push **alternate vaccine & therapy developments** for improved efficacy and safety profiles

Business leaders

- Continue to focus on NPI³ measures to **safeguard vulnerable employees**
- Adopt **hybrid workplace strategies to drive operational effectiveness** (e.g., shifting health vulnerable employees away from high contact roles, work from home options)
- **Communicate widely across platforms** to educate on vaccine eligibility & limitations

1. Reduction in hospitalizations or mortality; 2. Reduction in benefit with age and no data for children, health vulnerable; 3. Non-pharmaceutical interventions like social distancing, masks, tracking, tracing, etc.; Source: BCG

False Euphoria

Scenario characteristics | *False societal elation leads to disease spikes*

Healthcare tech. and progress

Mid-range efficacy (50-70%) vaccine/s approved; **limited data** across population segments

Currently approved therapeutics widely available

Societal response

Vaccine adoption is high; limited eligibility know-how

NPI¹ adoption drops rapidly as people falsely understand the vaccine to be a knockout punch

Virus control

Local case flare-ups, resurgence in multiple geographies

Multiple ups and downs in case volumes throughout 2021

Economic & social revival

Economy & businesses open up with reduced caution

Economic revival & consumer confidence slowly kick in but could be short-lived²

Implications | *Consistent communication and swift actions to control case flare-ups to be key*

Non-exhaustive

Public leaders

- **Frequently communicate** on vaccine safety, efficacy, eligibility, etc. to control false elation & bust myths
- Maintain & reinforce **stringency on NPI¹** implementation to avoid local case flare-ups
- **Manage complexities arising from multiple waves of vaccines** (e.g. tracking already vaccinated populations for multiple dose requirements for some candidates; varying storage, transportation, and delivery norms across tech, etc.)

Business leaders

- **Communicate widely across platforms** to bust myths, educate on vaccine eligibility & limitations
- Actively **inform employees about case flare-ups** & local shutdowns
- Continue stringency on NPI¹ measures; **frequently use rapid diagnostics** (where able) for timely isolation of infected employees

1. Non-pharmaceutical interventions like social distancing, masks, tracking, tracing, etc.; 2. Economic activity could stall due to local case flare-ups and resurgence; Source: BCG

Prolonged Drought

Scenario characteristics | *Altered reality engulfed by economic uncertainties*

Healthcare tech. and progress

Early few vaccine candidates display **low efficacy** (<50%)

Only few therapeutics available with limited impact

Societal response

NPIs¹ become a **part of life**, as people try to get back to regular activities

Virus control

Disease spread continues across multiple regions

Localized lockdowns become a norm

Economic & social revival

Lower economic activity; consumer confidence declines further

Way of life altered with social distancing embedded

Implications | *Continued R&D for alternate vaccine(s) & therapeutics to be key*

Non-exhaustive

Public leaders

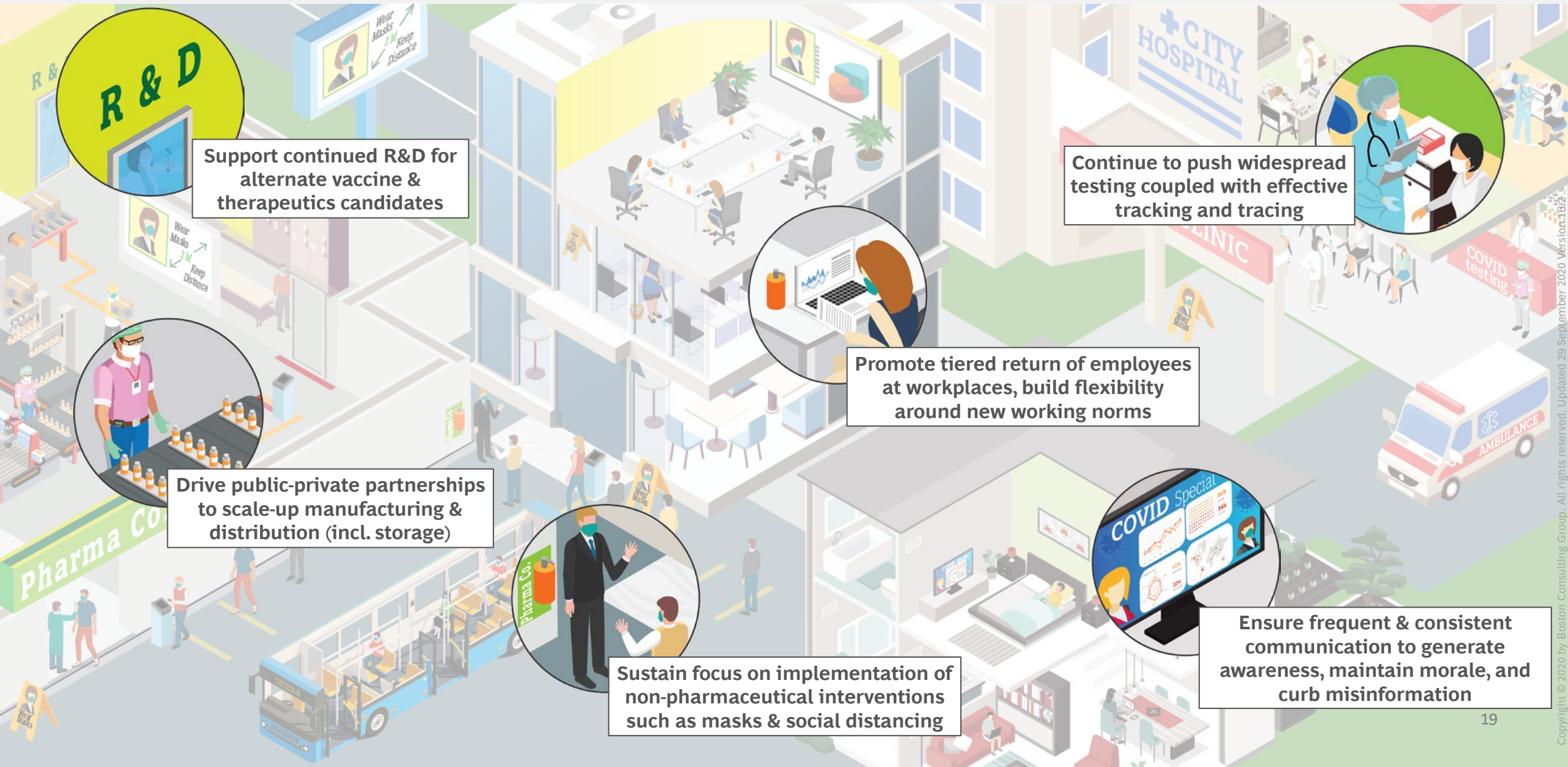
- Move to **zero tolerance** for non-adherence of NPI¹ norms
- Push for investments in **alternate vaccine & therapy candidates**² targeting improved efficacy & safety profiles
- **Institutionalize rapid testing** of broader populations; devise strategies to isolate local case flare-ups
- Ensure frequent communication on virus response efforts & continued R&D to **uphold morale**

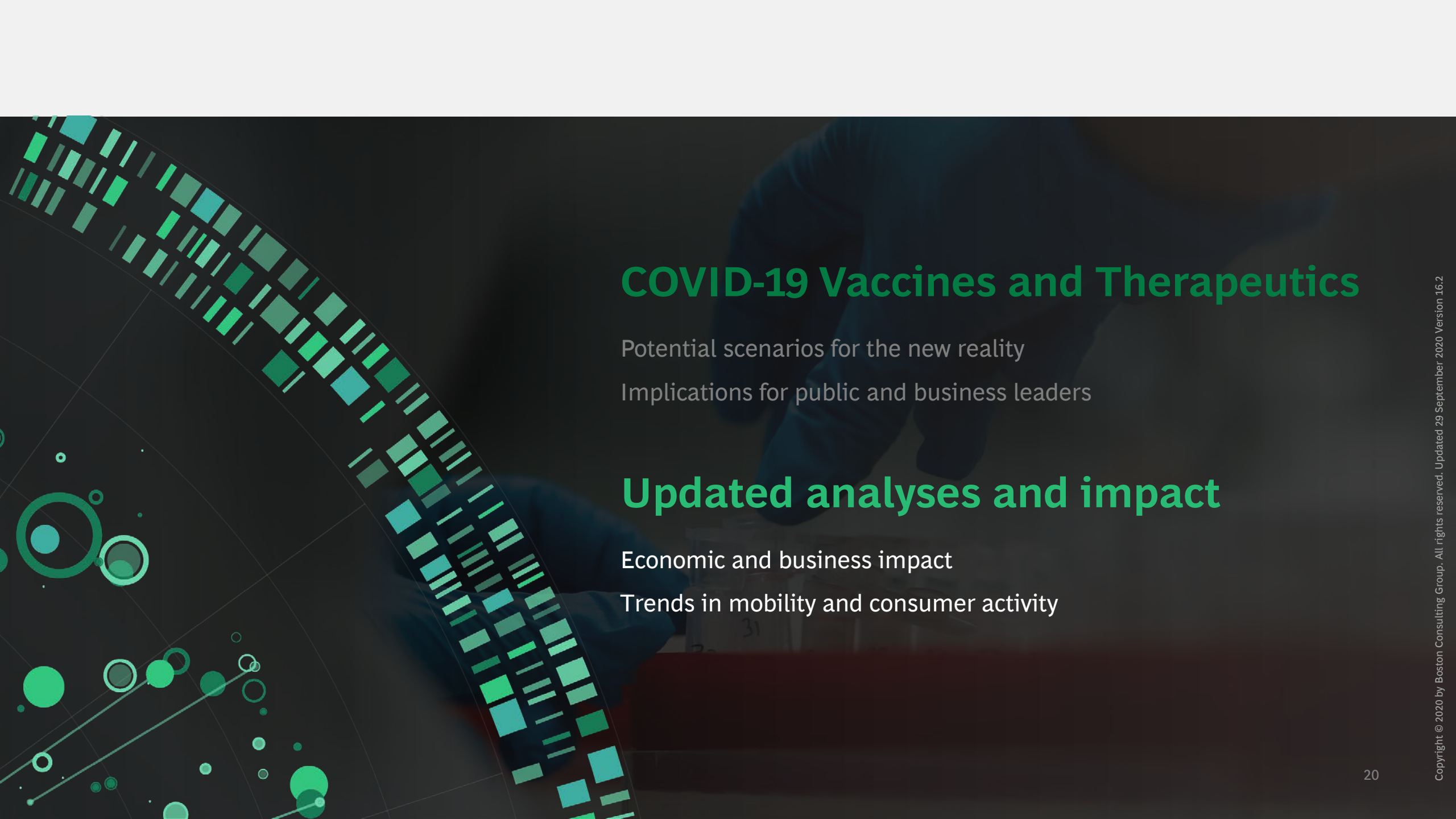
Business leaders

- Create **focused employee trainings on NPI¹ adoption**; ensure strict implementation across employee groups
- **Build diagnostic capabilities** to frequently test & isolate employees
- **Redeploy resources & funds** (e.g., CSR³) to support virus response efforts

1. Non-pharmaceutical interventions like social distancing, masks, tracking, tracing, etc.; 2. Vaccines & therapeutics with higher efficacy and safety, testing with higher accuracy & better turnaround time; 3. Corporate Social Responsibility; Source: BCG

Leaders need to actively deploy a set of no-regret moves irrespective of the scenario outcomes





COVID-19 Vaccines and Therapeutics

Potential scenarios for the new reality

Implications for public and business leaders

Updated analyses and impact

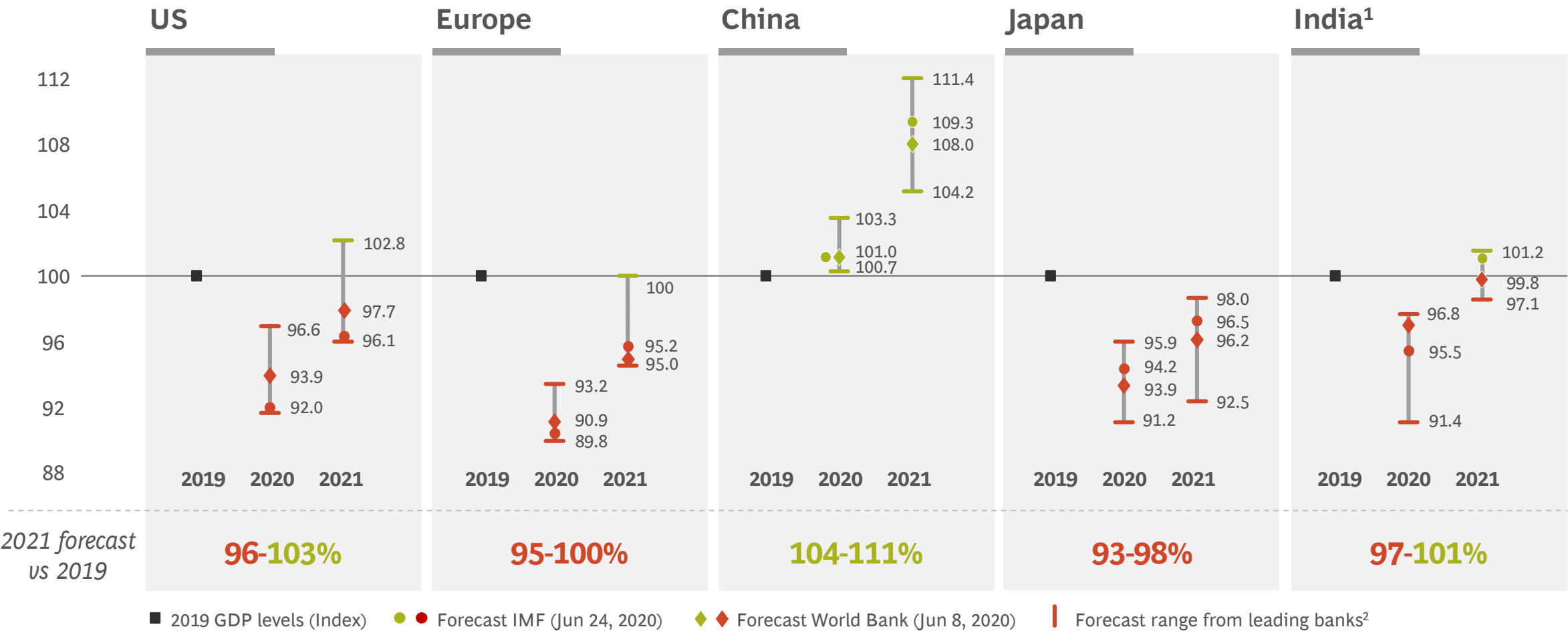
Economic and business impact

Trends in mobility and consumer activity

Economic forecasts point toward a severe downturn in 2020; most countries expected to rebound to 2019 GDP only by end of 2021

As of 25 Sep 2020

GDP forecast levels indexed to 2019 value (Base: 100)

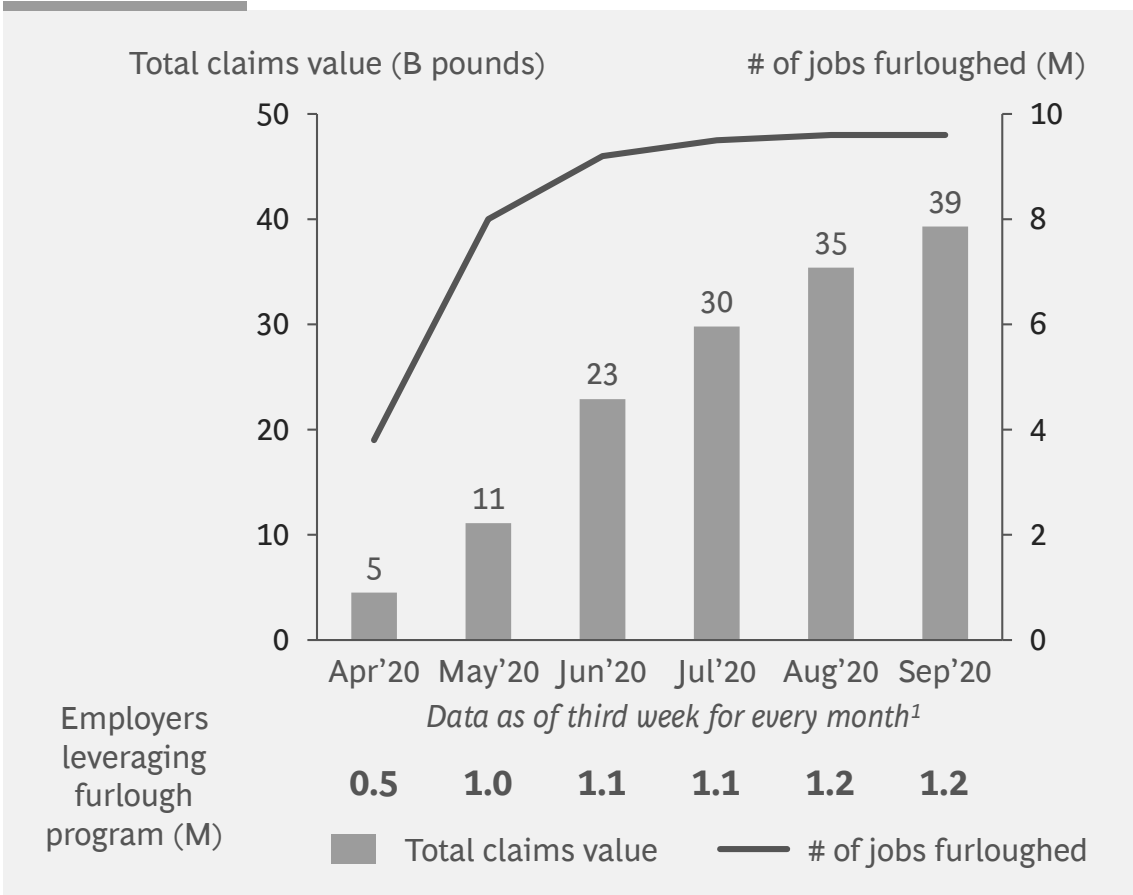


Note: As of reports dated 31 March 2020 to 25 Sep 2020, YoY forecasts; 1. For India, forecast is for financial year; for other countries, the forecast is for calendar year; 2. Range from forecasts (where available) of JPMorgan Chase; Morgan Stanley; Bank of America; Fitch Solutions; Credit Suisse; Danske Bank; ING Group; HSBC; Source: Bloomberg; World Bank; IMF; BCG

Unemployment numbers declining or flattening out; in the US, temporary jobs starting to come back

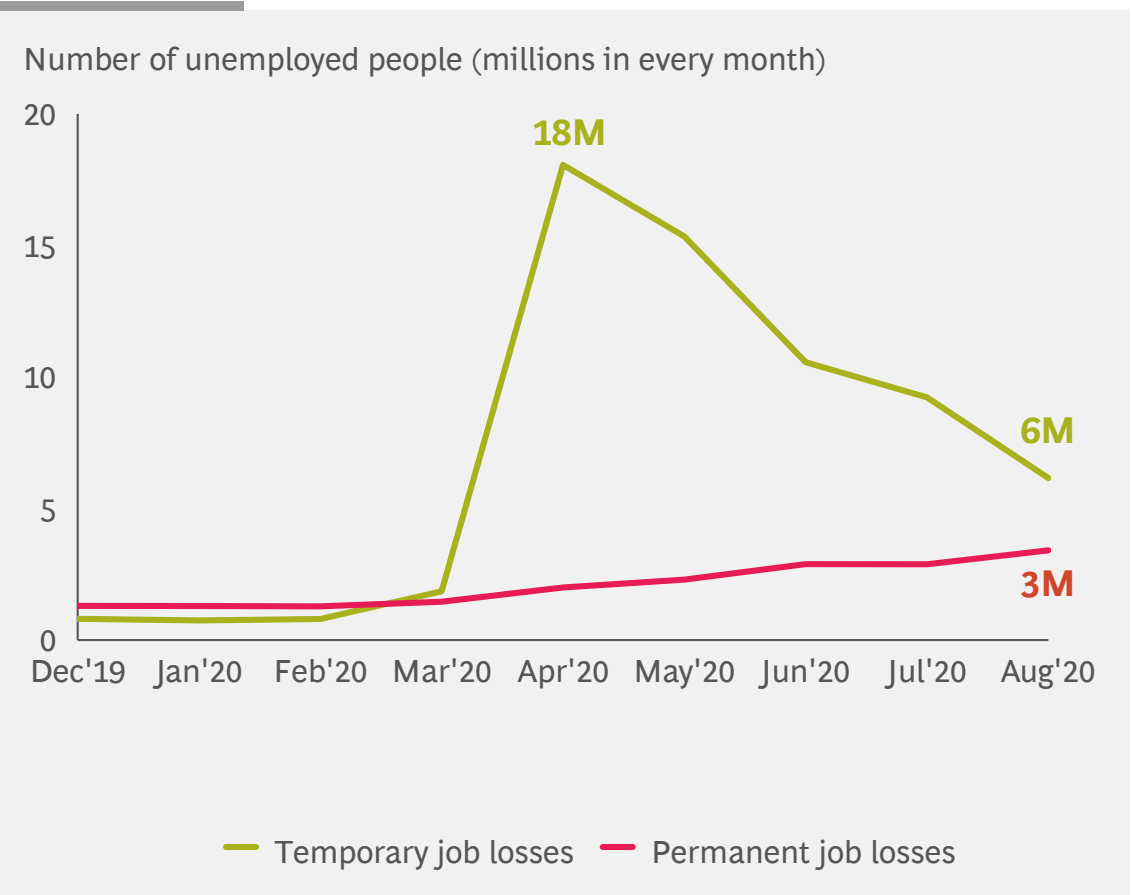
As of 21 Sep 2020 | UK Example

In the UK, number of jobs furloughed is flattening out



As of 04 Sep 2020 | US Example

In the US, temporary job losses continue to decline; however, permanent job losses increasing



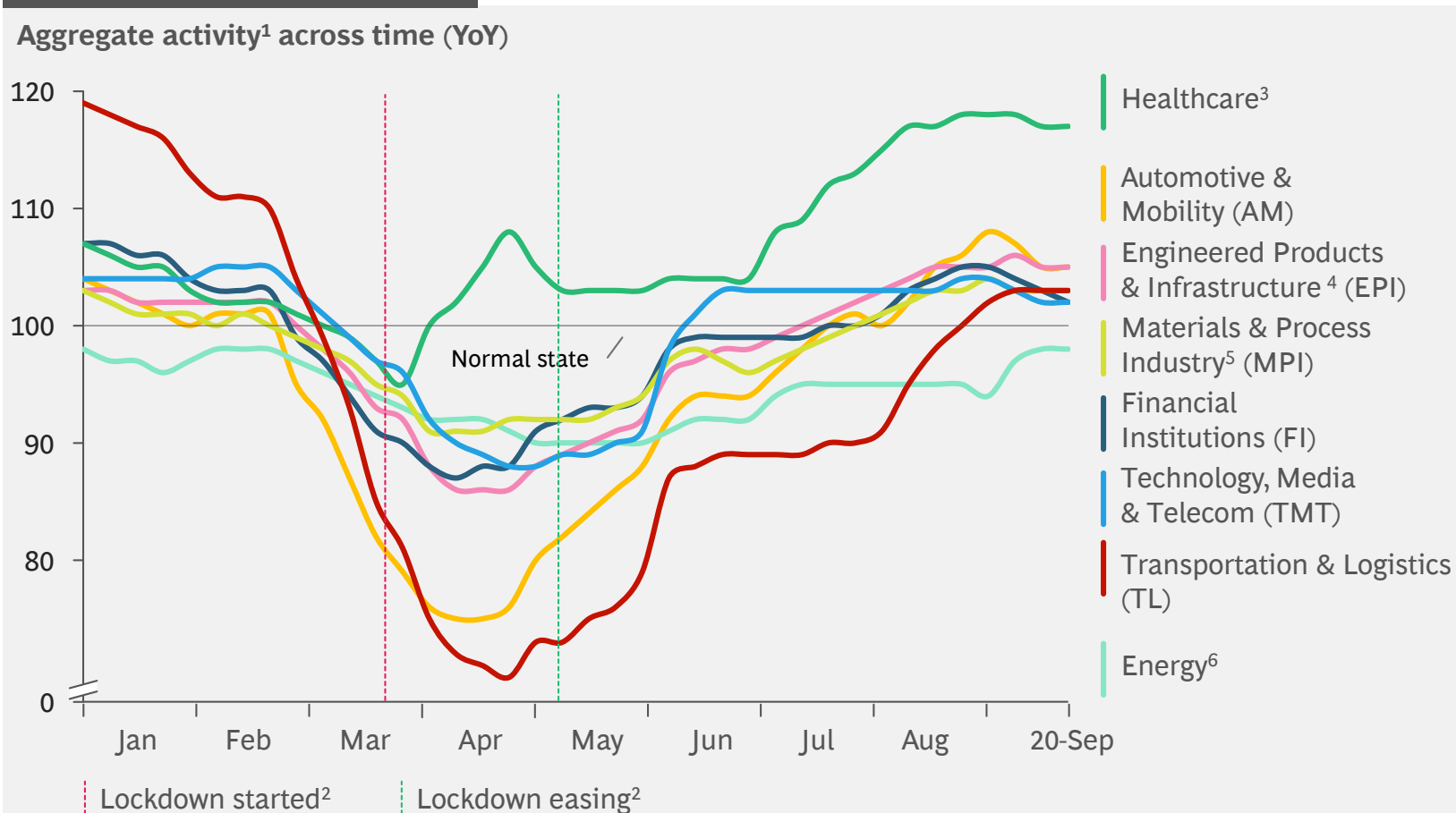
1. Data represented as of third Sunday of the month: 23 Apr, 17 May, 21 June, 19 July, 16 Aug, 20 Sep.
Source: US Department of Labor – Employment Situation Report (04 Sep 2020); HMRC Coronavirus Statistics – UK Government

In the US, business activity¹ across all sectors, except energy, has currently rebounded to previous year levels

As of 20 Sep 2020
Data for US

Non-exhaustive

BCG Economic Recovery Pulse Check (ERPC): US example



Healthcare witnessed stronger rebound due to increased demand during current crisis

AM, EPI, FI, MPI, TMT & TL saw steady, moderate recovery; currently above previous year levels

Energy continues to remain below pre-crisis levels

Note: Index value of 100 indicates normal activity compared to previous year's period; 1. Sector level activity based on 100+ data sources, e.g. financial index, macro economic data, employment, sector confidence, specific data source by sector etc.; 2. Refers to US lockdown start and easing dates 3. Medical Tech, Biopharma, Consumer Health (excluding Hospitals); 4. Aerospace & Defense, Infrastructure, Machinery & Industrial Automation; 5. Chemicals, Metals and Mining, Building Materials, Forest Products, Paper and Packaging; 6. Oil & Gas, Energy & Utilities. Source: BCG

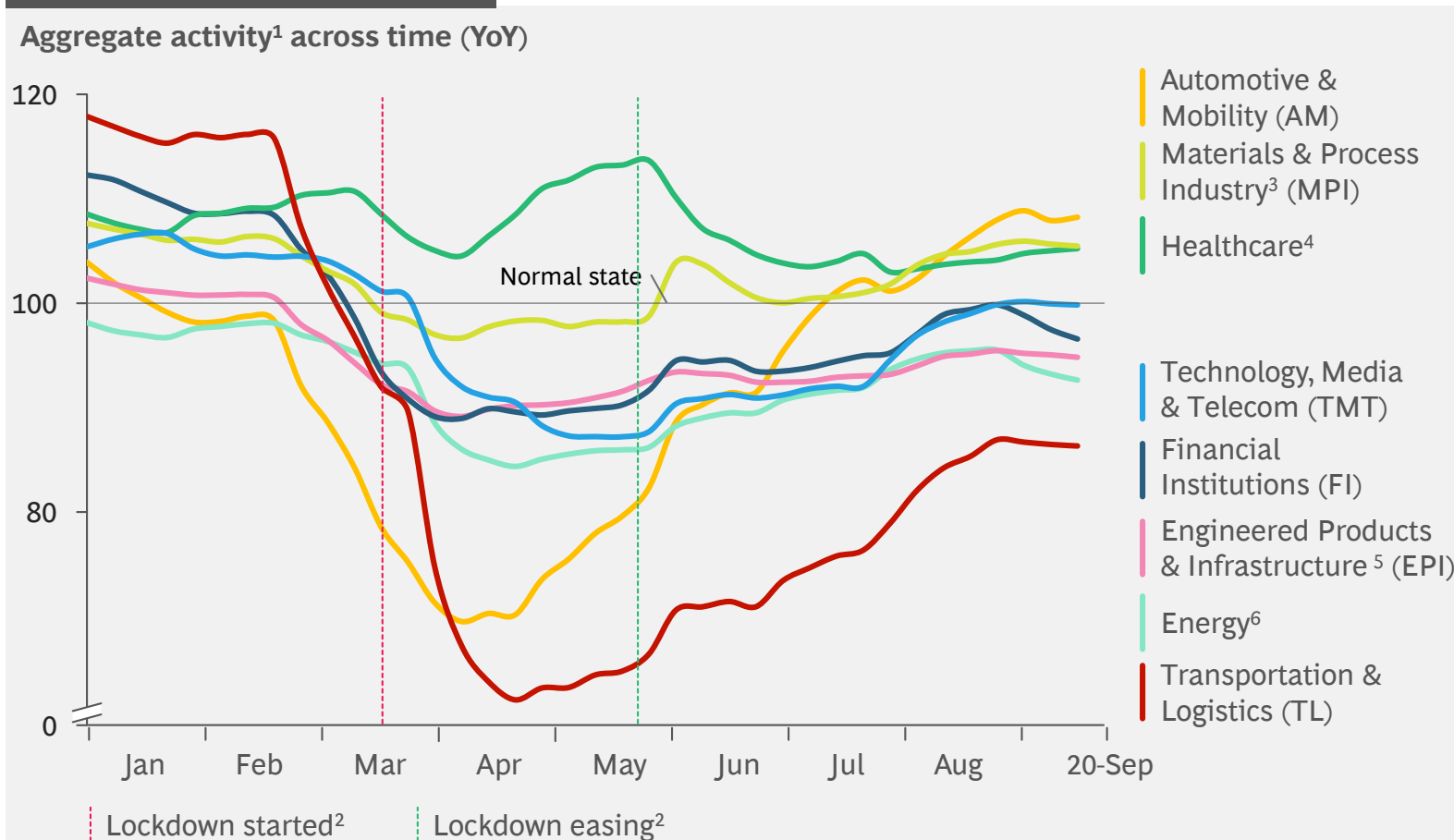
In Europe, business activity¹ across many sectors has exceeded or is close to previous year levels

ECONOMIC &
BUSINESS IMPACT

As of 20 Sep 2020
Aggregated for Europe (GER, FR, UK, ITA, SPA)

Non-exhaustive

BCG Economic Recovery Pulse Check (ERPC): Europe example



AM, MPI, and Healthcare currently above previous year levels; AM has seen strong recovery since the low activity during broader lockdown phase

TMT, FI, EPI, TL, & Energy remain below pre-crisis levels; TMT sees continued rebound, close to previous year levels

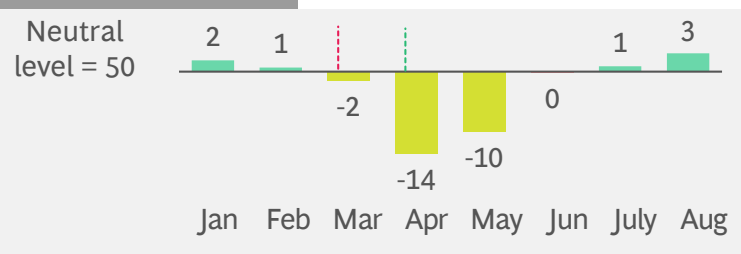
Note: Index value of 100 indicates normal activity compared to previous year's period; 1. Sector level activity based on 100+ data sources, e.g. financial index, macro economic data, employment, sector confidence, specific data source by sector etc.; 2. Refers to average lockdown start and easing dates across countries; 3. Chemicals, Metals and Mining, Building Materials, Forest Products, Paper and Packaging; 4. Medical Tech, Biopharma, Consumer Health (excluding Hospitals); 5. Aerospace & Defense, Infrastructure, Machinery & Industrial Automation; 6. Oil & Gas, Energy & Utilities; Source: BCG

Manufacturing PMI recovery globally indicates positive momentum

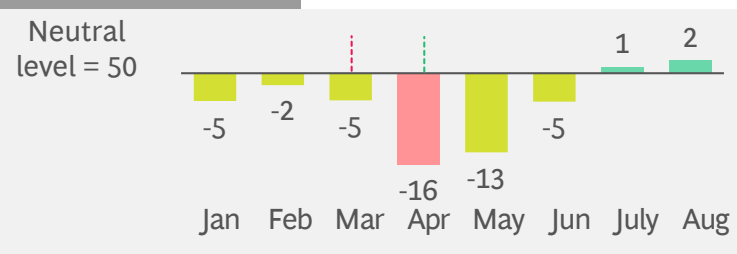
As of 25 Sep 2020

Manufacturing PMI before, during, and after the crisis

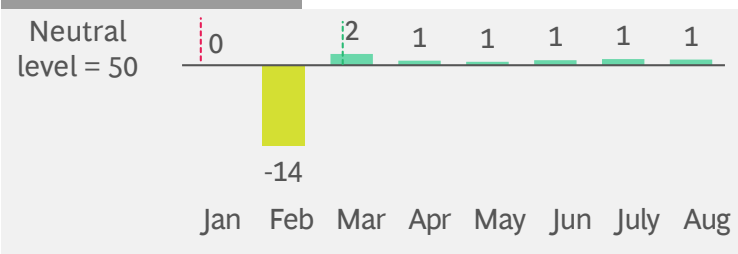
US



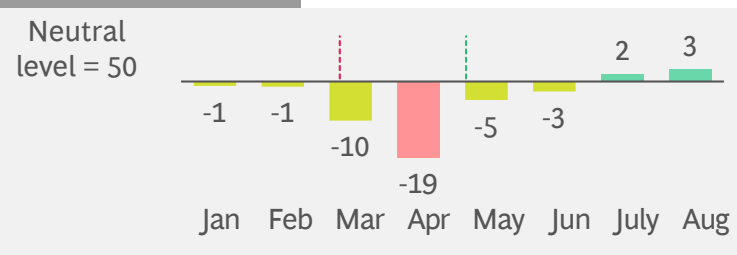
Germany



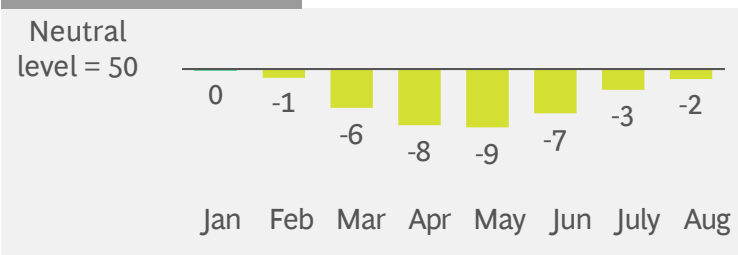
China¹



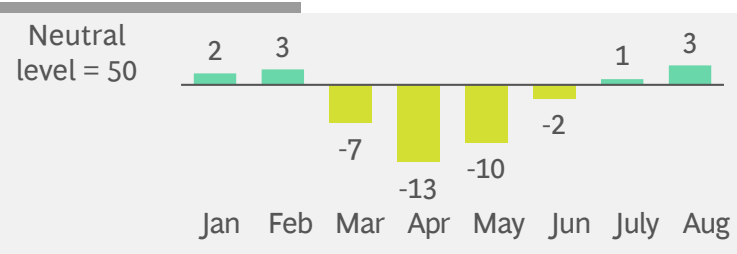
Italy



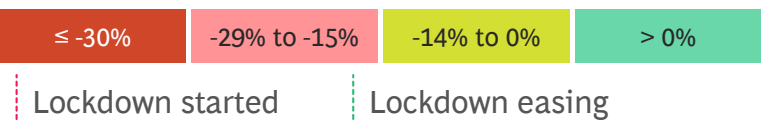
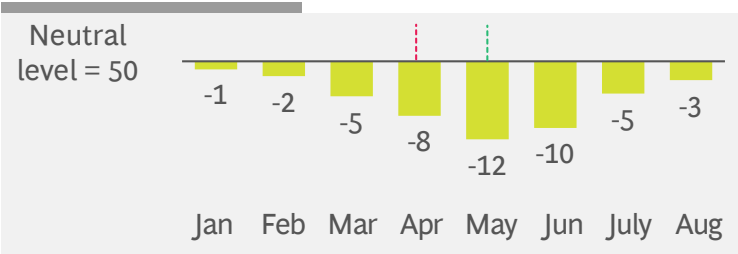
South Korea



Sweden



Japan



Note: PMI (Purchasing Manager's Index) is a diffusion index that summarizes whether market conditions, as viewed by purchasing managers, are expanding, staying the same, or contracting. 50 is neutral, >50 is considered to be positive sentiment and <50 is considered to be negative sentiment. 1. Lockdown dates are only pertaining to Hubei province; Source: Markit South Korea Manufacturing PMI SA; Jibun Bank Japan Manufacturing PMI SA; China Manufacturing PMI SA; Swedbank Sweden PMI SA; Markit/BME Germany Manufacturing PMI SA; Markit Italy Manufacturing PMI SA; Markit US Manufacturing PMI SA; Bloomberg

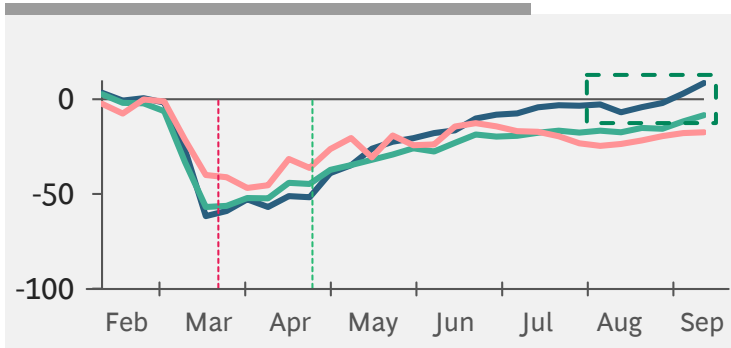
Retail and recreation mobility recovered fastest; lower recovery of workplace mobility indicates continued adoption of work from home

As of 11 Sep 2020

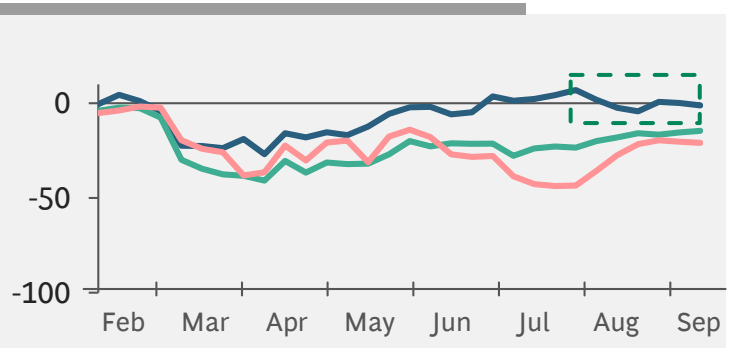
Non-exhaustive

Workplace¹, public transit² and retail & recreation³ mobility compared to baseline of January to mid-February 2020

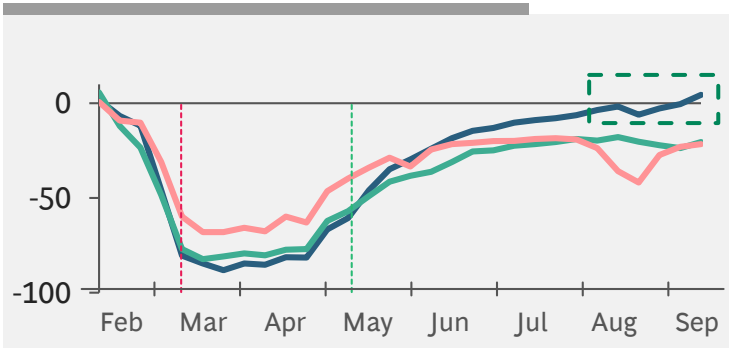
Germany



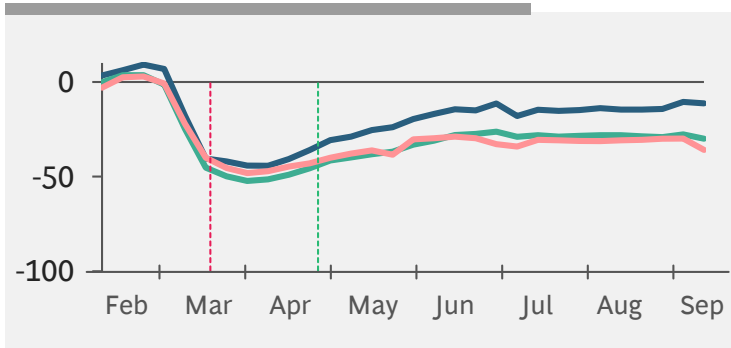
Sweden



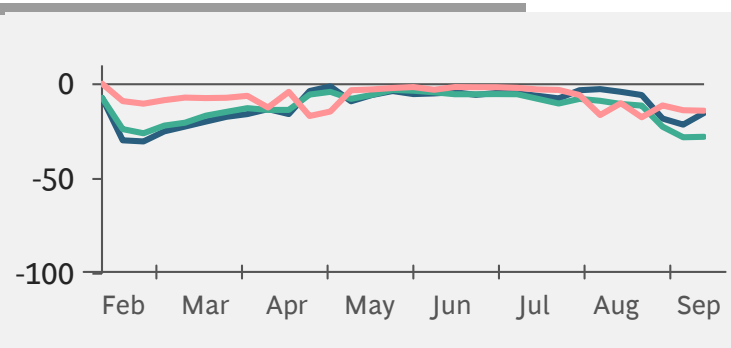
Italy



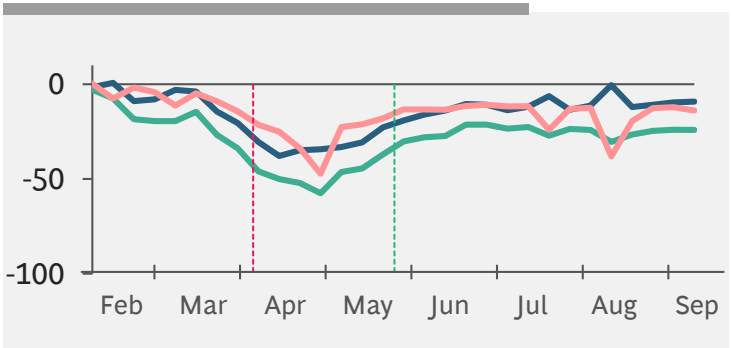
US



South Korea



Japan



Lockdown started⁴ | Lockdown easing⁴ | Workplace mobility | Public transit mobility | Retail & recreation | Mobility rebounded to baseline levels

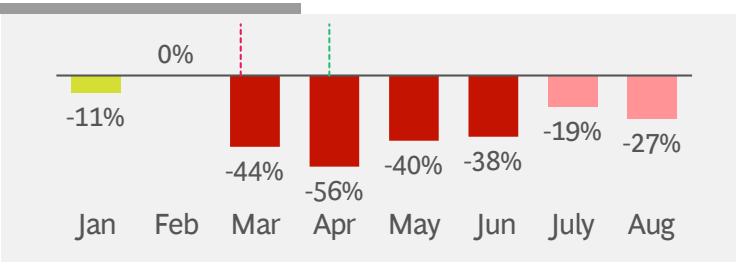
1. Tracked as changes in visits to workplaces; 2. Tracked as changes in visits to public transport hubs, such as underground, bus and train stations; 3. Tracked as changes for restaurants, cafés, shopping centers, theme parks, museums, libraries and cinemas; 4. Refers to average lockdown start and easing dates; Note: Data taken as weekly average compared with baseline (average of all daily values of respective weeks during Feb 15–Sep 11, 2020); Source: Google LLC "Google COVID-19 Community Mobility Reports". <https://www.google.com/covid19/mobility/> Accessed: 21 Sep 2020; Press search; BCG

Passenger vehicle sales see limited rebound, except in China; several countries witness a drop in August

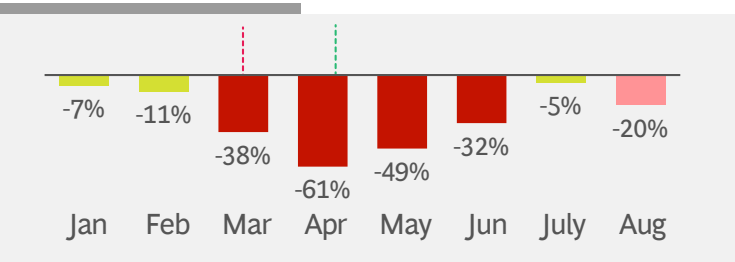
As of 25 Sep 2020

Monthly passenger vehicle¹ sales, YOY % change vs 2019

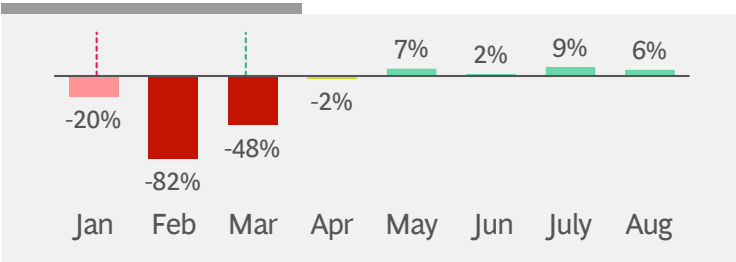
US¹



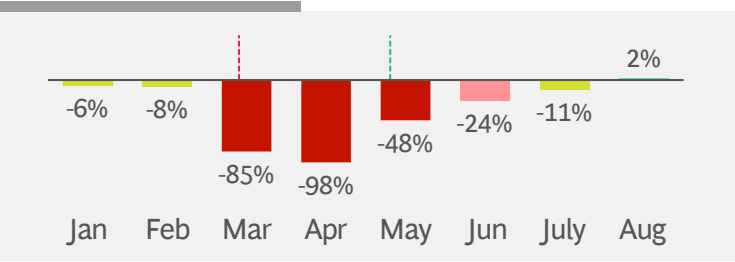
Germany



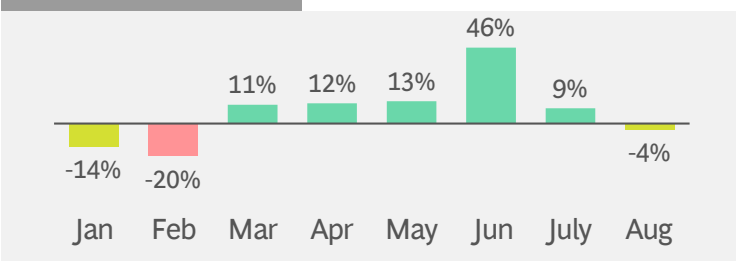
China²



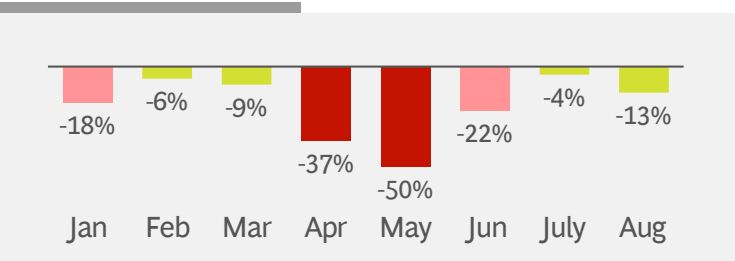
Italy



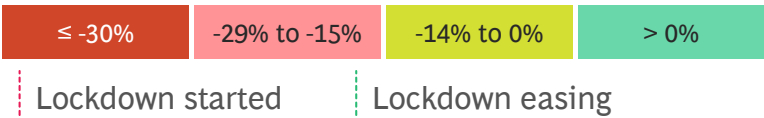
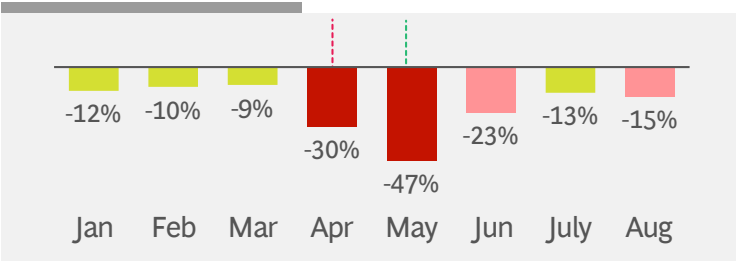
South Korea³



Sweden



Japan



1. Passenger vehicle sales includes data on, where available, hatchback, MPV, pickup, sedan, SUV, and vans; 2. Stimulus policies: Launched subsidies for car purchases in 10 cities, lessened purchase restriction in high tier cities and extended NEV subsidies; 3. South Korea's growth in auto sales from Mar through June 2020 is supported by recent tax cuts for individual consumption goods (e.g., cars), several carmakers (e.g. Audi, VW) launching new models and the increased appreciation by the Koreans of cars as a safe mode of transport and as a travel alternative for camping during COVID-19, supported by recently passed legislation to allow a variety of different cars to be modified into 'camping cars'. Source: Marklines, BCG

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Retail goods sales (excl. auto and fuel) have rebounded to pre-COVID-19 levels across most of the countries

As of 25 Sep 2020

Growth of total retail goods sales (excl. auto & fuel)¹, YOY % change vs 2019

Retail goods sales include online & offline sales and comprise food & beverages, apparel, cosmetics & personal care, home appliances, general merchandise, building material; do not include auto, fuel & food services

	Jan	Feb	Mar	Apr	May	June	July	Aug
China ²	-16%		-12%	-6%	-1%	2%	-2%	-1%
Japan	0%	2%	1%	-6%	-1%	10%	7%	
US	3%	4%	7%	-6%	3%	8%	8%	8%
UK	1%	0%	-4%	-19%	-11%	1%	3%	4%
Italy	1%	2%	-18%	-27%	-11%	-2%	-11%	
Sweden	3%	5%	2%	-3%	2%	3%	3%	

Retail goods sales have currently **rebounded** to pre-COVID-19 levels in **US, China, Japan, & UK**

In **Italy**, retail goods sales **declined in July** after showing signs of rebound in June

Sweden hasn't shown a significant impact of COVID-19 on retail goods sales

Further reading

Reigniting Retail Demand

1. Retail goods sales categorization may be different across countries; seasonally adjusted values taken; 2. For China, combined value of Jan & Feb is available; Source: US Census Bureau; PRC National Bureau of Statistics; Eurostat; Ministry of Economy Japan

De-averaged view | Retail store sales in China have rebounded across categories; apparel sales continue to be impacted in other countries

As of 25 Sep 2020

Retail store sales' breakdown by category, YoY % change vs 2019

Food & beverage stores

	Mar	Apr	May	June	Jul	Aug
China ¹	19%	18%	11%	11%	7%	4%
Japan	-1%	0%	2%	3%	1%	
US	29%	12%	15%	12%	11%	11%
UK	10%	5%	6%	6%	3%	3%
Italy	4%	0%	1%	-1%	-2%	
Sweden	7%	-2%	0%	1%	1%	

Personal care & cosmetics stores

	Mar	Apr	May	June	Jul	Aug
China ¹	-12%	4%	13%	21%	9%	19%
Japan	2%	3%	-3%	3%	1%	
US	6%	-10%	-8%	-1%	4%	4%
UK	-1%	-37%	-30%	-6%	-3%	0%
Italy	-14%	-13%	-14%	-9%	-6%	
Sweden	20%	-3%	-5%	3%	1%	

Apparel stores²

	Mar	Apr	May	June	Jul	Aug
China ¹	-35%	-19%	-1%	0%	-3%	4%
Japan	-23%	-54%	-34%	-6%	-19%	
US	-49%	-86%	-62%	-24%	-23%	-19%
UK	-36%	-68%	-60%	-33%	-25%	-16%
Italy	-64%	-88%	-43%	-18%	-40%	
Sweden	-33%	-38%	-30%	-23%	-22%	

Home appliance stores³

	Mar	Apr	May	June	Jul	Aug
China ¹	-30%	-9%	4%	10%	-2%	4%
Japan	-10%	-9%	9%	26%	12%	
US	-18%	-53%	-42%	-20%	-5%	-4%
UK	-11%	-50%	-31%	0%	9%	10%
Italy	-43%	-55%	-15%	1%	-2%	
Sweden	2%	8%	15%	15%	17%	

China's sales have almost rebounded to year-ago run rates

Retail store sales **recovery driven by F&B** across all countries

Personal care & cosmetics category sales have rebounded to last year levels except in Italy

Apparel category saw the largest decline; **far from recovery** across countries except China

Home appliances sales showing signs of rebound; continue to be higher than last year in Sweden

≤ -30%

-29% to -15%

-14% to 0%

> 0%

4 sectors currently above pre-crisis TSR levels; 7 sectors with significant share¹ of companies with >15% default risk

As of 25 Sep 2020

Categories based on TSR and net debt/enterprise value²

Based on top S&P
Global 1200 companies

		TSR performance ³			Companies with probability of default >15% ⁴		
		21 Feb 2020 - 20 Mar 2020	21 Feb 2020 - 25 Sep 2020	11 Sep 2020 - 25 Sep 2020	21 Feb 2020	25 Sep 2020	11 Sep 2020 - 25 Sep 2020
Healthier sectors	Semiconductors	-30%	9%	→	0%	0%	→
	Retailing	-40%	5%	→	0%	35%	→
	Household Products	-16%	2%	→	0%	0%	→
	Pharma	-20%	1%	→	0%	5%	→
	Materials	-32%	-1%	↘	5%	11%	↘
Pressured sectors	Software	-30%	-2%	→	9%	0%	→
	Media	-36%	-3%	↘	0%	0%	→
	Prof. Services	-30%	-3%	→	0%	0%	→
	Food/staples Retail	-10%	-4%	↗	0%	0%	→
	Capital Goods	-35%	-6%	↘	2%	7%	↘
	Tech Hardware	-26%	-6%	→	0%	0%	→
	Health Equipment	-31%	-7%	→	0%	0%	→
	Durable Goods	-39%	-10%	↘	0%	0%	→
	Food & Beverage	-23%	-12%	↘	0%	0%	→
	Utilities	-30%	-15%	→	0%	0%	→
Vulnerable sectors	Auto	-41%	-15%	↘	0%	14%	→
	Transport	-34%	-15%	↘	0%	28%	→
	Financials	-35%	-16%	↘	0%	0%	→
	Telecom	-17%	-17%	↘	0%	8%	↘
	Hospitality	-44%	-23%	↘	8%	31%	↘
	Insurance	-39%	-25%	↘	0%	0%	→
	Real Estate	-39%	-29%	↘	0%	17%	↘
	Banks	-39%	-31%	↘	0%	4%	→
	Energy	-52%	-43%	↘	0%	18%	↘

Note: Based on top S&P Global 1200 companies; Sectors are based on GICS definitions; 1. Retailing, Materials, Auto, Transport, Hospitality, Real estate and Energy are sectors with > 10% of companies with probability of default > 15%; 2. Net debt & enterprise value from latest available balance sheet; Categories defined based on comparison with S&P Global 1200 median: healthy = TSR & debt/EV > median, pressured = TSR or debt/EV < median, vulnerable = TSR & debt/EV < median; 3. Performance is tracked for two periods, first from 21 February 2020 (before international acceleration of outbreak) to 20 March 2020 (trough of the market) and from 21 February 2020 through 25 Sep 2020 based on median; 4. Implied by 5-year credit default swap based on median
Source: S&P Capital IQ; BCG ValueScience Center; BCG

↗ Pos. trend ≥ 2%
→ No sig. change
↘ Neg. trend ≥ 2%

Additional perspectives on COVID-19



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[Vaccine & Therapeutics Outlook - Part I: Timelines and Success Factors](#)



Edition #14

[US: Current Dynamics and How to Win the Fight](#)



Edition #13

[Global Restart: Key Dynamics](#)



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Edition #1

[Facts, Scenarios, and Actions for Business Leaders](#)

Glossary of terms

Clinical Trial	A systematic study of new tests and treatments to evaluate their effects on human health outcomes	Non-Pharmaceutical Interventions	Actions, apart from getting vaccinated and taking medicine, that people can take to help slow the spread of disease (e.g., social distancing, masks, etc.)
Convalescent Plasma	Convalescent plasma therapy uses blood from people who've recovered from an illness to help other patients recover	Phase I	First human trials of a medical intervention ¹ in a small group of people to evaluate a safe dosage range and identify side effects
Corticosteroid	Corticosteroids are a class of drug that lowers inflammation in the body. They also reduce immune system activity.	Phase II	Assessment of short-term safety of medical intervention ¹ in patients; given to hundreds of people
Efficacy	The potential of a drug or vaccine to protect from a disease in controlled clinical trials; expressed as %	Phase III	Trials in large (thousands) and possibly varied patient groups to determine short & long-term safety and efficacy
Emergency Use Authorization	Authority granted to facilitate availability of an unapproved product, or an unapproved use of an approved product, during a state of emergency	Phase IV	Studies performed after medical intervention ¹ has been approved & marketed for sale; aim is to identify adverse effects not apparent in prior trials
Monoclonal Antibodies	Laboratory-produced molecules engineered to serve as substitute antibodies that can restore, enhance, or mimic the immune system's attack	Placebo Controlled Trial	Clinical trials involving two groups – one group gets the active treatment, the other gets the placebo (an inactive drug with no effect)
		Pre-Clinical Study	Testing of drug or vaccine in test tubes and animals to see if it triggers an immune response

1. Experimental drug, vaccine, etc.; Source: CDC, WHO, NCBI, Mayo Clinic, Healthline

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