Lessons Learnt from the international experience

Qualitative content current February 2021

Quantitative content updated March 2021

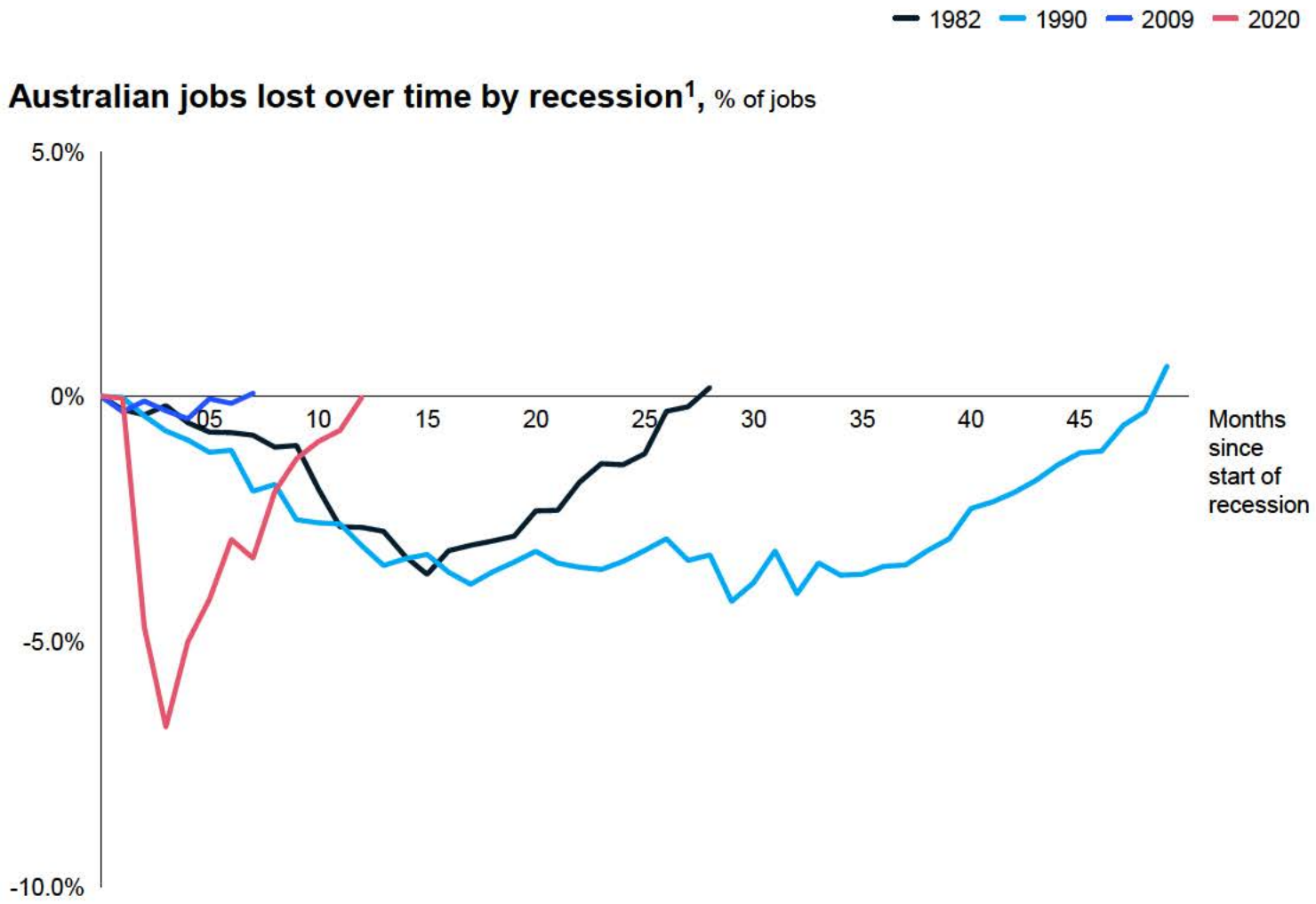
100 page document included as attachment

Agenda

Impact of COVID19

Supporting deep dives

The COVID19 shock was rapid and brief…



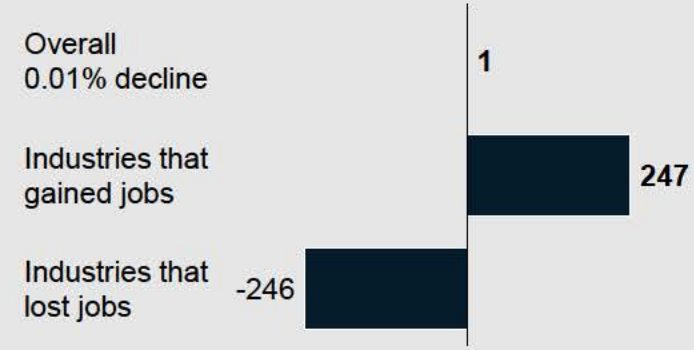
1. 2009 is included for illustrative purposes; it was not a technical recession

Source: ABS; McKinsey analysis

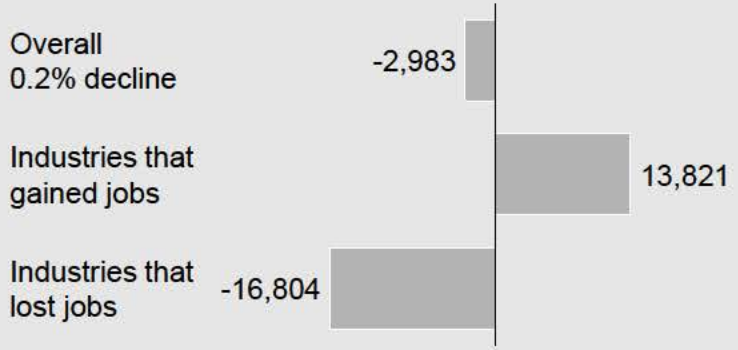
… recovery is not complete

Net change in Jobs and GVA

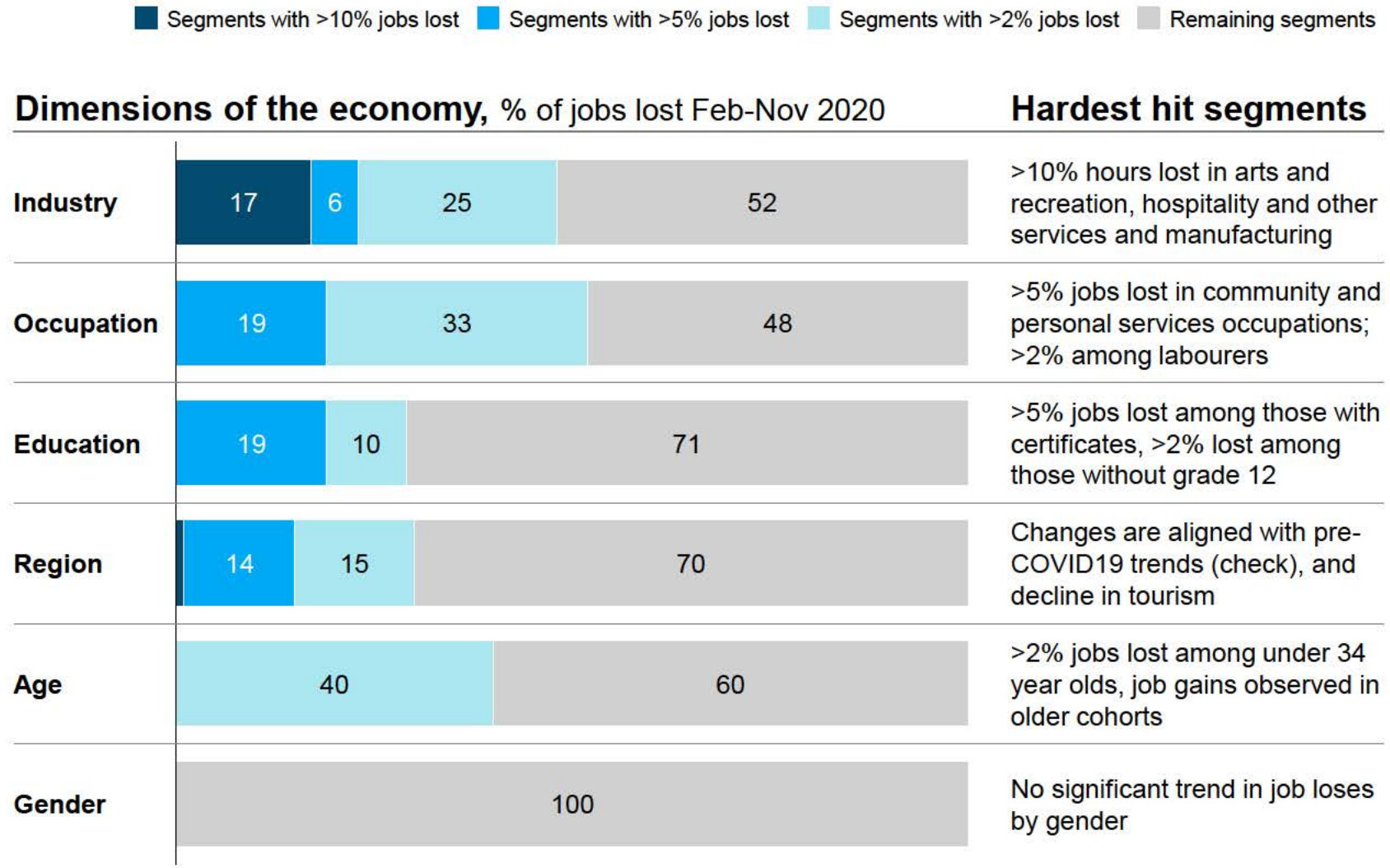
Jobs, Feb 2020 – Feb 2021, '000s



GVA, June 2019 – June 2020, $Millions



COVID19 shock hit primarily down industry lines



Source: ABS; McKinsey analysis

Policy implications

- **17% of jobs** were located in **industries that lost 10% or more of their jobs**
- The only other dimension where more than 10% of jobs were lost in a single category was regions
- This implies that **recovery policy will be most effective if it is targeted at key industries,** as opposed to other economic dimensions

Job losses were greatest in industries exposed to restrictions, but spread right across the economy

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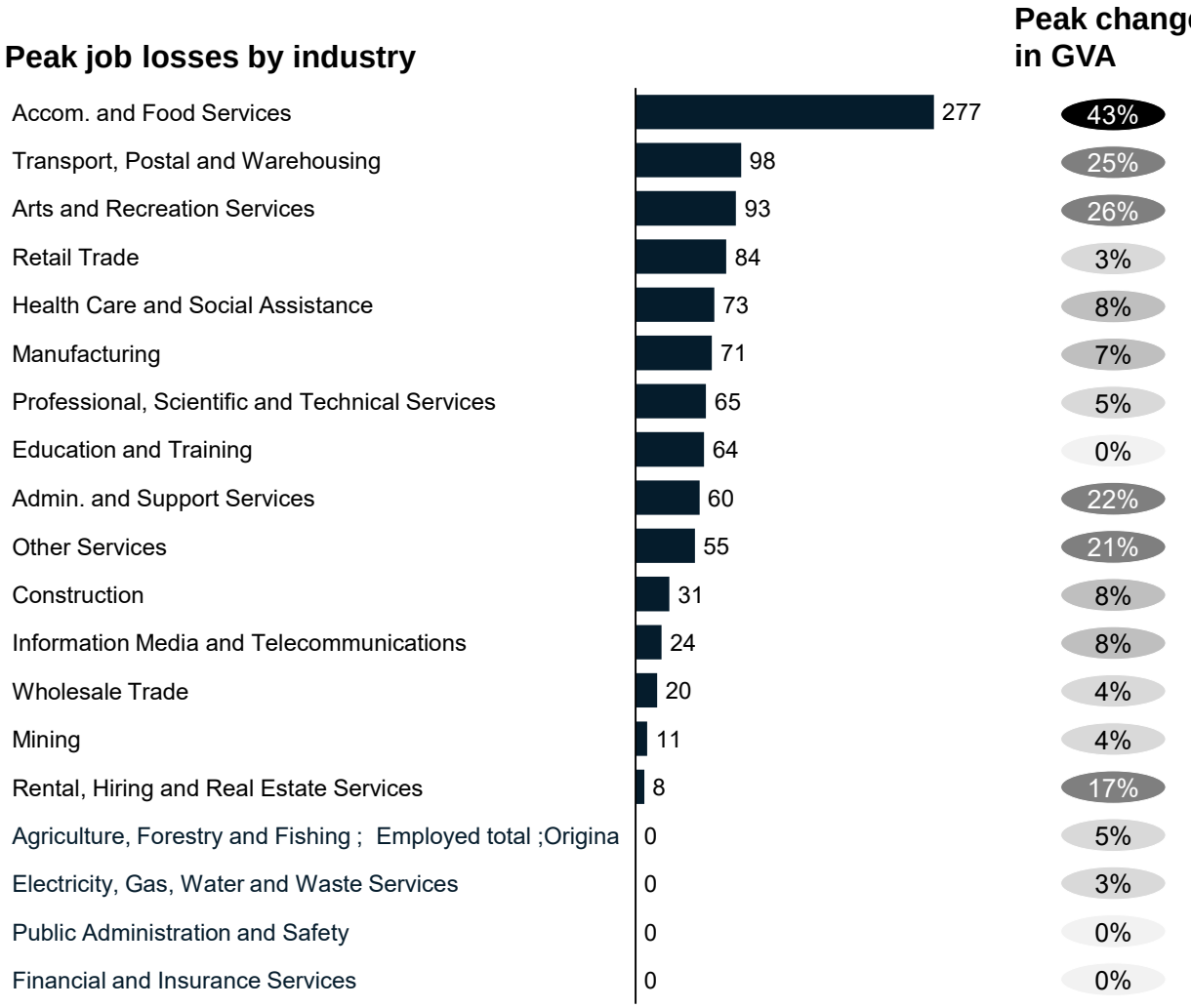
Peak job losses over Feb 2020 – Feb 2021 by industry and occupation, 000s

Peak job losses by industry



Job losses by occupation

Source: ABS; McKinsey analysis

Tourism regions experienced the most acute job losses, but the greatest number of job losses were in Melbourne and Sydney

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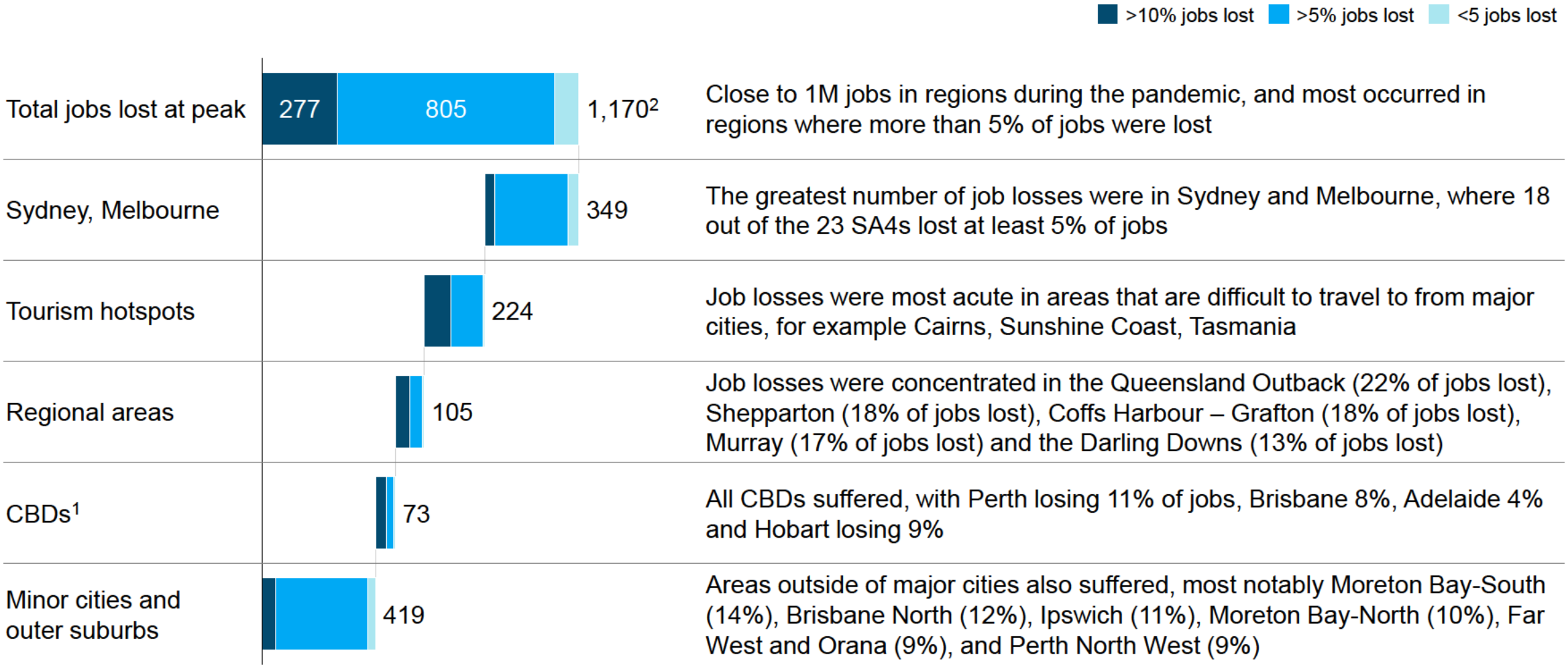
Peak job losses by region and concentration, 000s

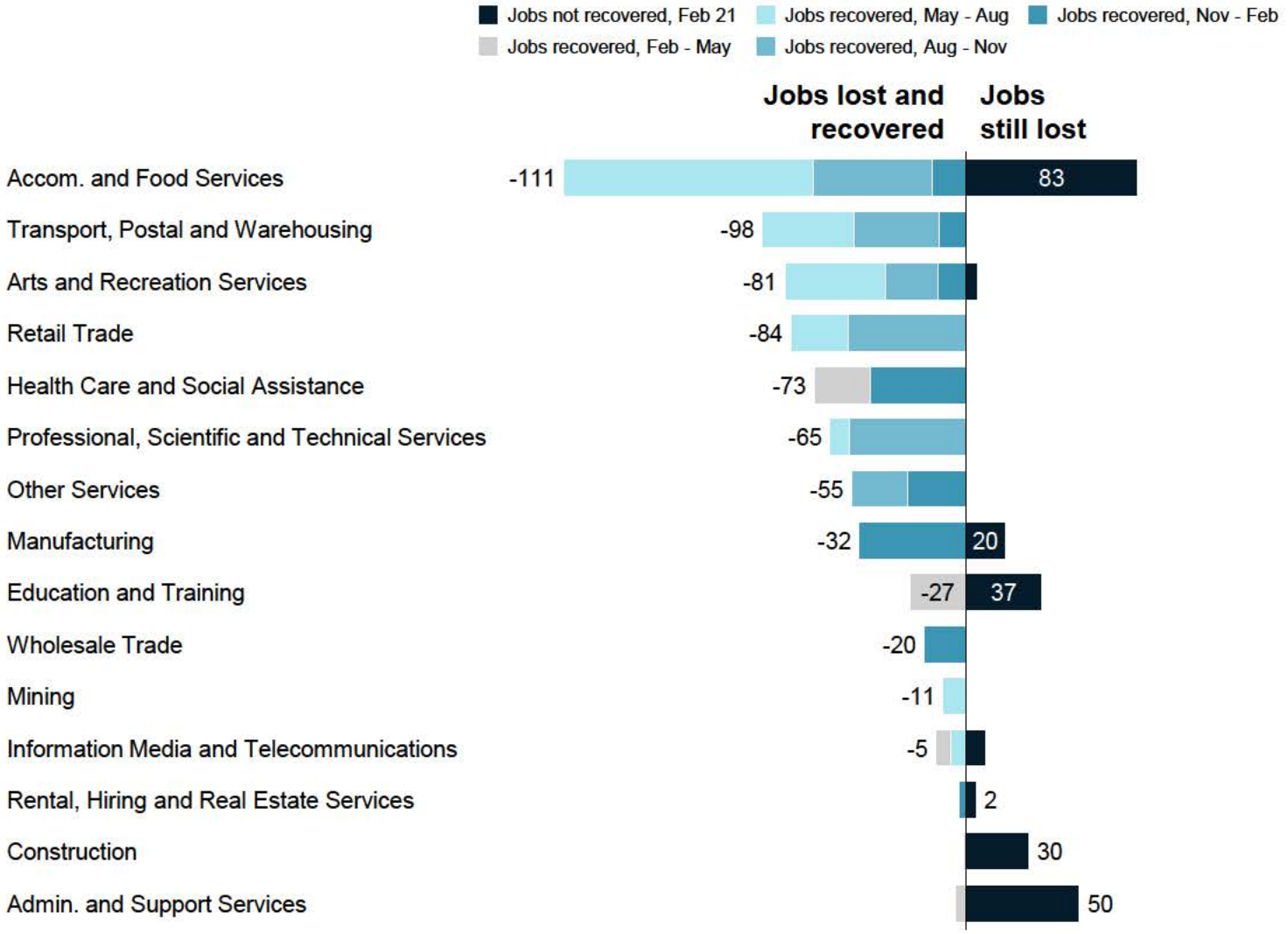


1. Excluding Sydney and Me bourne CBDs
2. Peak jobs lost across regions (1,135k) does not correspond directly to peak jobs lost across industries (1,035k) as these figures are the sum of net job losses within different segments of the economy.

Source: ABS Detailed Labour Force

As restrictions lifted, cohorts hardest hit by restrictions also recovered the fastest

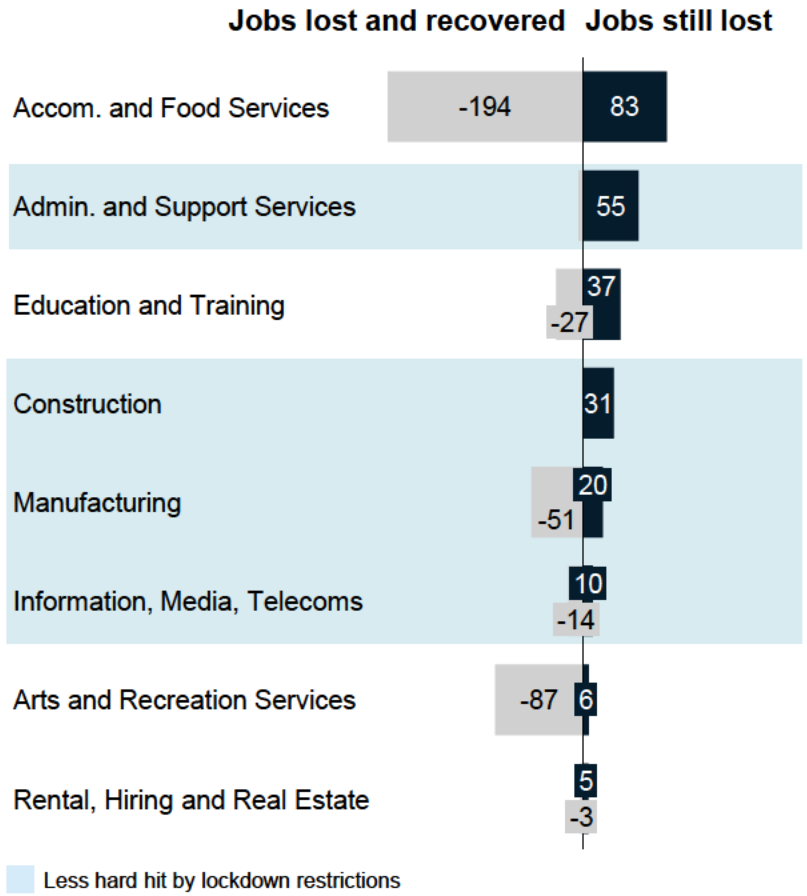
Peak and current jobs lost relative to Feb 2020, '000s



Source: ABS Detailed Labour Force

One year in, the soft spots in the economy already look different

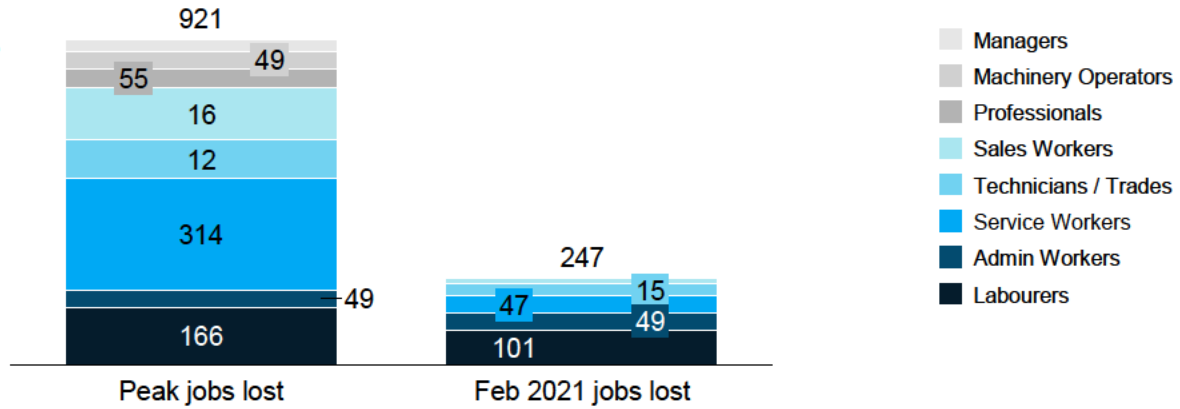
Half the remaining job losses are in industries that were less hard hit by initial restrictions



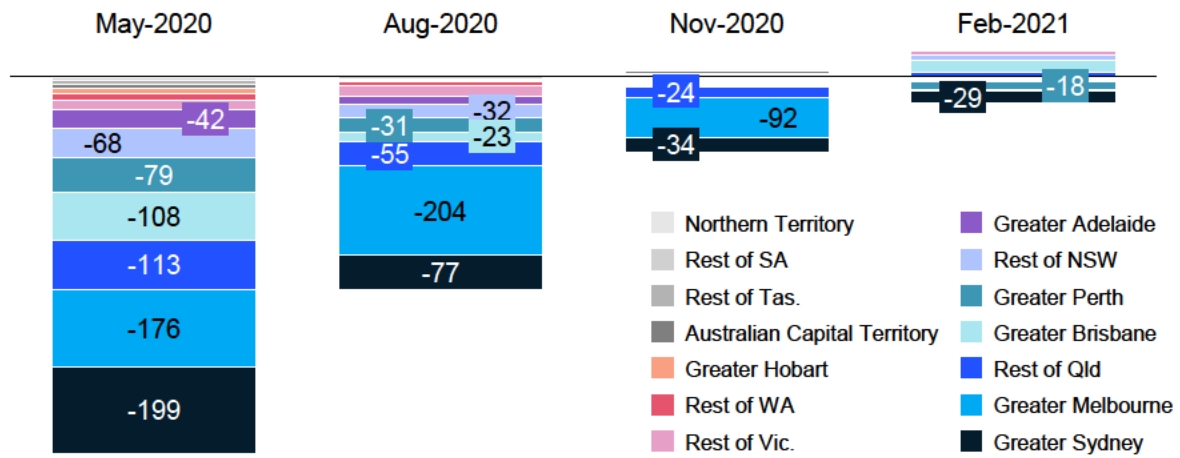
Industries that recovered all jobs lost in 2020 not listed here

Occupation and region cohorts most affected are in segments with soft long term growth, rather than cohorts hard hit by initial restrictions, Jobs lost relative to Feb 2020, '000s

Manual workers are the most affected by the remaining job losses



Remaining job losses are concentrated in Greater Sydney and Perth



Source: ABS; McKinsey analysis

The long term impact of COVID19 has been to accelerate structural shifts

Disruptive trend | Acceleration of trend

Key trends		Impact of COVID19
Consumption	**Rise of services**	Services consumption was rising rapidly. Demand was disrupted by lockdown, but is recovering strongly, driven by ageing populations and government expenditure
	Increasing inequality	COVID19 contraction in unemployment and a disproportionate impact on youth unemployment
	Aging population	Australia has an aging population, which underpins growth in health care demand. This trend has been accelerated by the extended pause in migration
	Potential to WFH	Work-from-home shifted real estate and consumption preferences, as spending more time at home increased the attractiveness of home improvement
Labour	**Digitisation**	Surge in e-commerce, digital entertainment, online grocery shopping and click n collect
	Automation	Automation and other cutting-edge technologies appears to have accelerated during the pandemic, and could raise productivity
	Rising education levels	Enrolments in post-graduate education and training increase as graduates struggle to find jobs
Other macro-economic factors	**Low interest rates**	Secular stagnation and low interest rates prior to COVID19 has been compounded by global recession and declining consumption rate preferences
	Supply vulnerabilities	Although Australia remains one of the most open economies, globalisation peaked in 2010 and COVID19 supply chain disruptions increased onshoring
	Attractiveness of Australia	Low levels of COVID19 transmission and disruption to everyday life has increased the attractiveness of Australia as a place to live

Source: McKinsey analysis

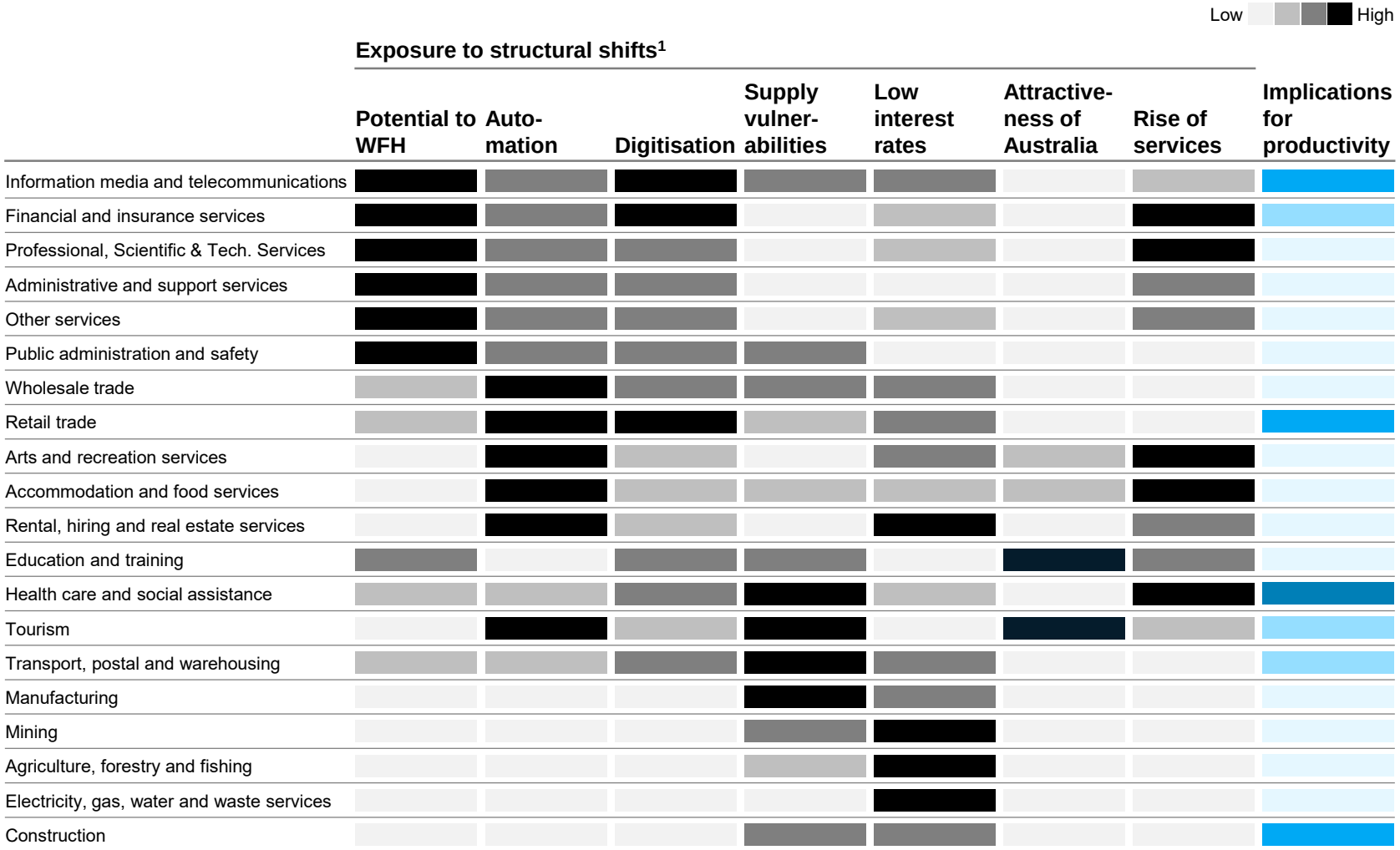
COVID19 has accelerated changes that were already underway, rather than changing the direction of growth

Shifts in consumption patterns, together with low interest rates and disrupted global trade patterns, create opportunity for disruption and renewal

Digitisation, automation and rising education levels can fuel productivity growth, but put demand for some segments of the labour market at risk

The significance of this shift can be seen in the growth of ‘Mega 25’ tech stocks (see appendix)

These shifts will have a bigger impact on some industries than others



1. Note that 3 trends (increasing inequality; ageing population; rising education levels) have not been called out separately as their impact either does not vary significantly by industry, or is proxied by other shifts

Source: ABS; RBA, McKinsey analysis

There is significant variation in the exposure of industries to structural shifts

For example, some industries are highly exposed to digitisation (e.g., Financial and insurance services), while others are exposed low interest rates (e.g., Mining)

The acceleration of these structural trends has the potential to drive significant productivity improvement, and in turn, economic growth

The key challenge is ensuring this growth is inclusive of vulnerable cohorts and regions

These trends are expected significantly boost productivity in some industries – see appendix for details

The longer term impact of COVID-19 has been to accelerate structural shifts underway

Disruptive trend | Acceleration of trend

Key trends		Description
Consumption	**Rise of services**	Services consumption was rising rapidly. Demand was disrupted by lockdown, but is recovering strongly, driven by ageing populations and government expenditure
	Increasing inequality	COVID19 contraction in unemployment and a disproportionate impact on youth unemployment
	Aging population	Australia has an aging population, which underpins growth in health care demand. This trend has been accelerated by the extended pause in migration
	WFH and home-based preferences	Work-from-home shifted real estate and consumption preferences, as spending more time at home increased the attractiveness of home improvement
Labour	**Flight to digital**	Surge in e-commerce, digital entertainment, online grocery shopping and click n collect
	Automation	Automation and other cutting-edge technologies appears to have accelerated during the pandemic, and could raise productivity
	Rising education levels	Enrolments in post-graduate education and training increase as graduates struggle to find jobs
Other macro-economic factors	**Low growth & interest rates**	Secular stagnation and low interest rates prior to COVID19 has been compounded by global recession and declining consumption rate preferences
	Reduced globalisation	Although Australia remains one of the most open economies, globalisation peaked in 2010 and COVID19 supply chain disruptions increased onshoring
	Attractiveness of Australia	Low levels of COVID19 transmission and disruption to everyday life has increased the attractiveness of Australia as a place to live

Source: McKinsey analysis

These shifts mean the economy could look different:

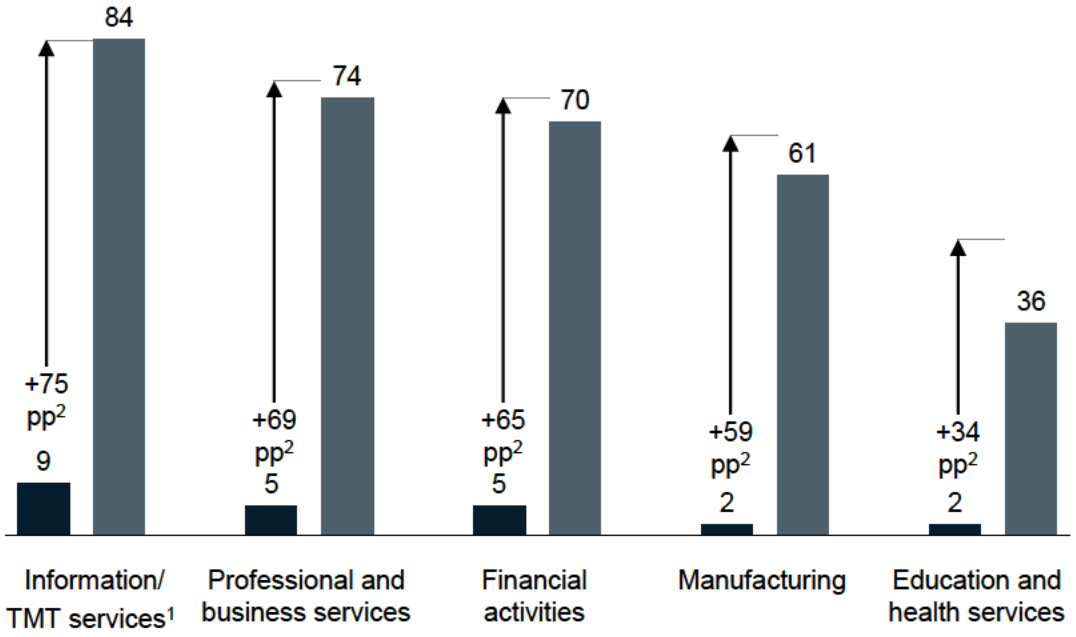
Shifts in consumption patterns, together with low interest rates and disrupted global trade patterns, create opportunity for disruption and renewal

Digitisation, automation and rising education levels can fuel productivity growth, but put demand for some segments of the labour market at risk

WFH: COVID-19 has shifted the way the workforce operates

The levels of remote working have skyrocketed during lockdowns and are likely to remain higher than pre-crisis level

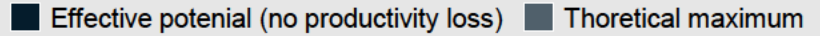
Share of employees working remotely full time, percent



1. TMT = technology, media, and telecom. Pre-COVID-19 figures for remote-work frequency in sector sourced from internal survey (unavailable in American Time Use Survey)
2. Percentage points

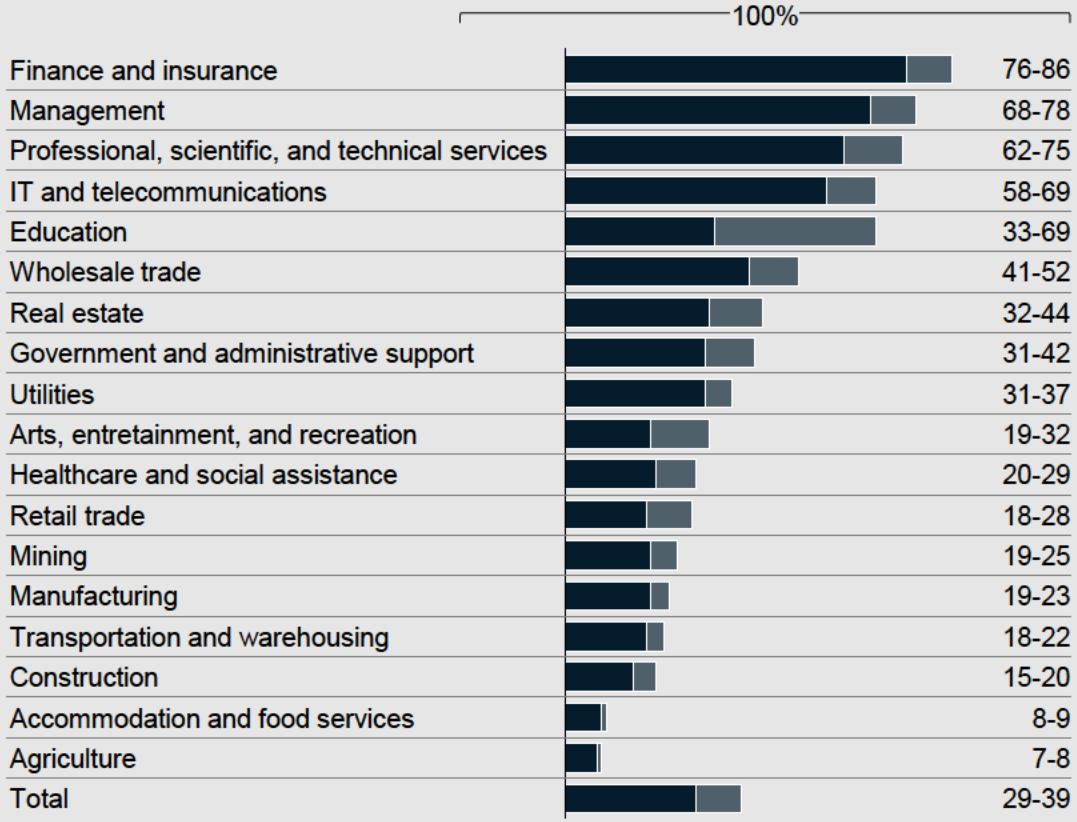
Note: Note: The theoretical maximum includes all activities not requiring physical presence on-site; the effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations

Source: American Time Use Survey, US Bureau of Labour Statistics, n=134; expert interviews; press search; McKinsey analysis



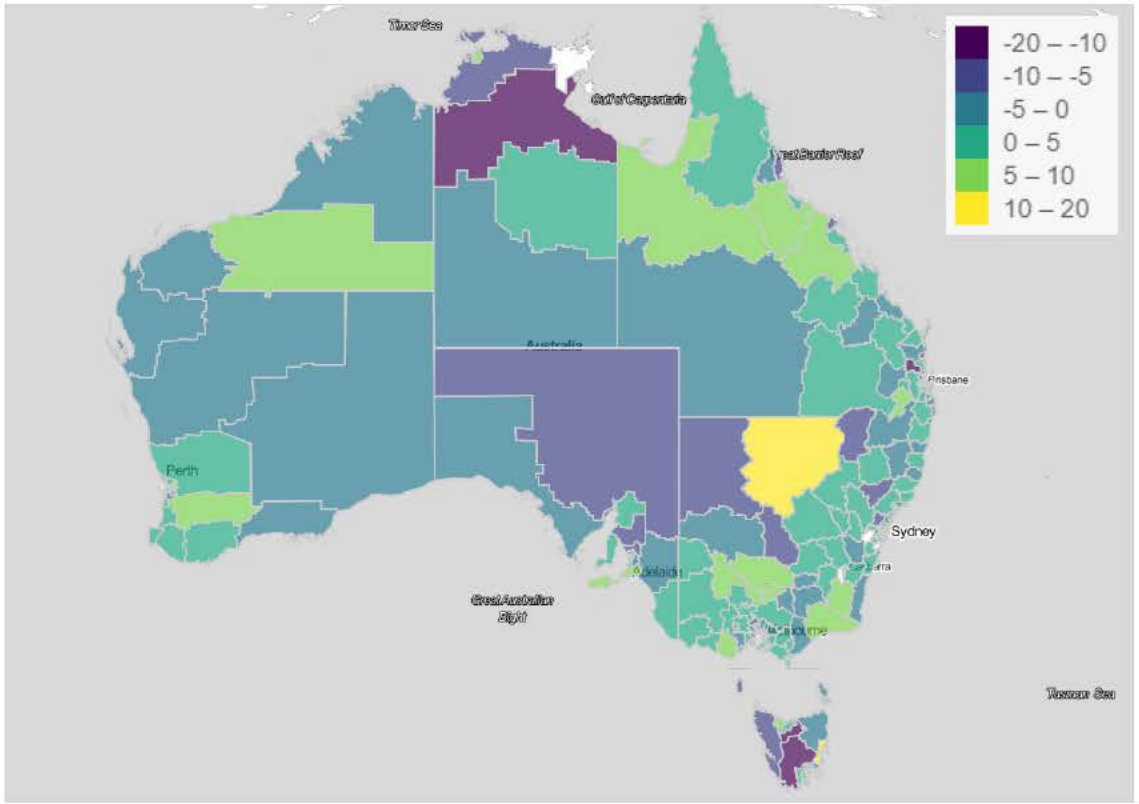
The finance, management, professional services, and information sector have the highest potential for remote work

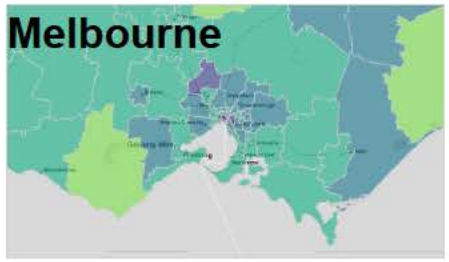
Potential share of time spent working remotely by sector in the United states, %

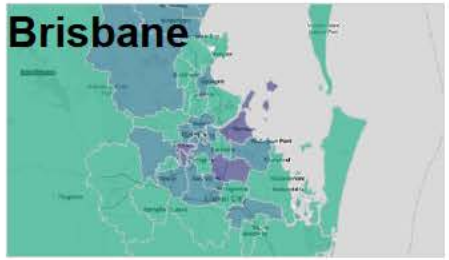


WFH: Improved remote work options has encouraged increased migration to regions

Growth in median dwelling rent by location, March to June 2020, %







This reversal in rent trends may create a new growth opportunity for regional and remote areas, and pose a dampener on recovery in metropolitan areas

Trends in rents reversed between March and June 2020, with CBD rents falling, and regional and remote areas booming

The reversal in rents, and corresponding flight of individuals to regional and remote areas, may have exacerbated the short-term impact of COVID19

It is unclear the extent to which this reversal will persist, but may present a new opportunity for growth in regional and remote areas

Source: RBA

Rise of services: Services will be a key component of equitable growth, but unlike in past recessions, COVID hit services

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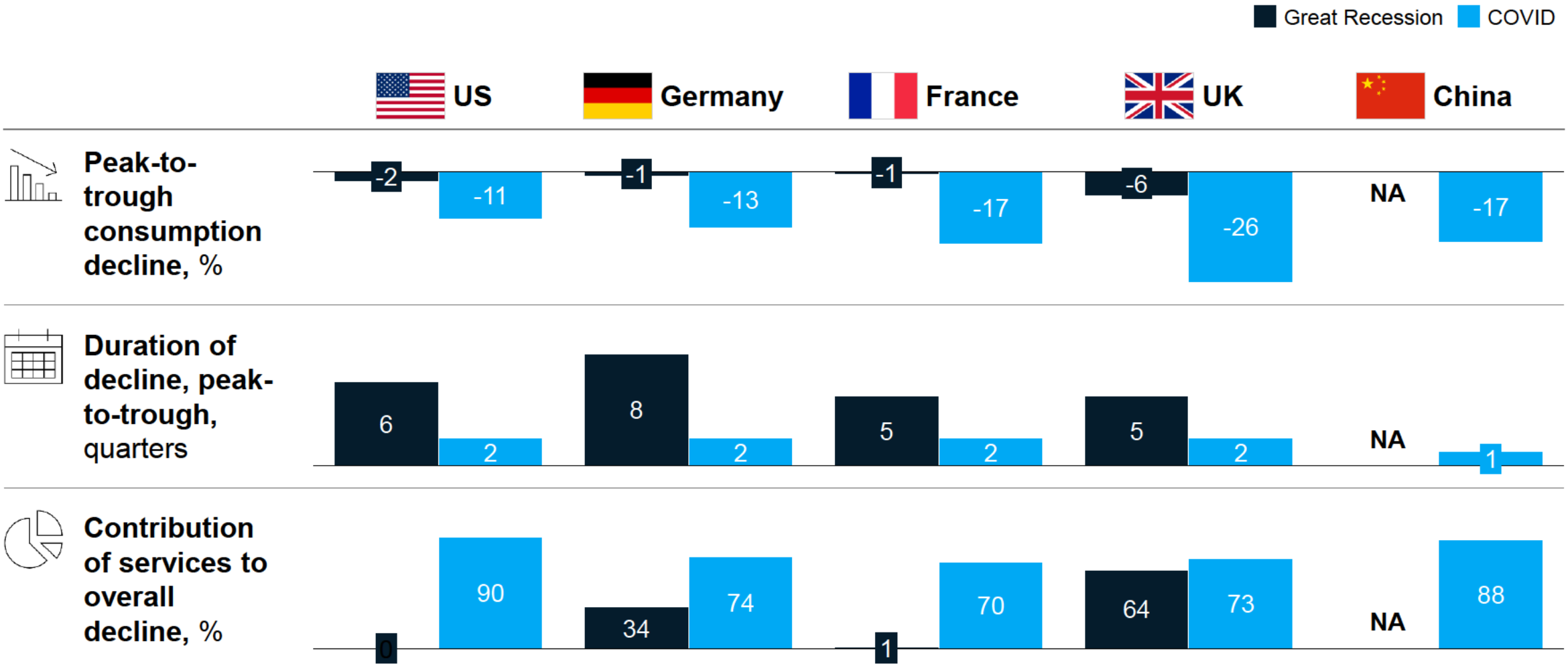


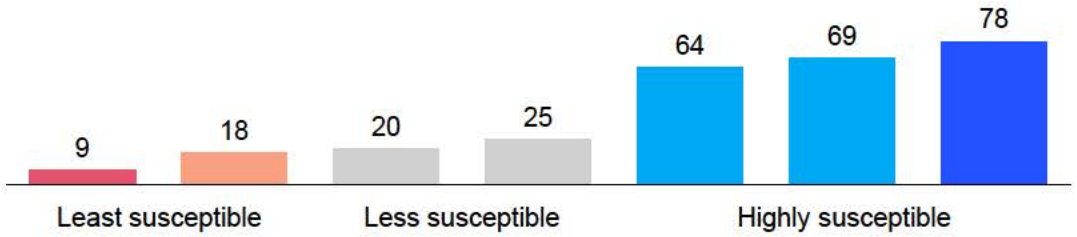
Note: Peak-to-trough based on quarterly data, dates may vary across countries. For COVID, assumed peak in Q42019 and trough in Q2 2020 (Q1 2020 in China)

Source: OE, BEA, Eurostat, NBS

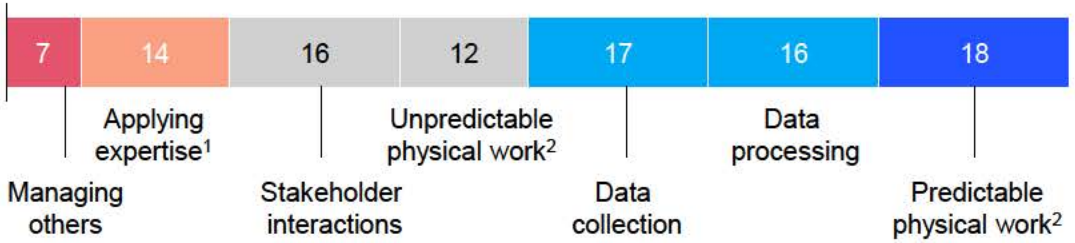
Automation: ~50% of work time spent is susceptible to automation

Analysing work activities shows ~50% of time spent is on activities which are highly susceptible to automation

Technical feasibility, % of time spent on activities that can be automated by adapting currently demonstrated technology



Time spent in all US occupations, %



1. Applying expertise to decision making, planning and creative tasks
2. Unpredictable physical work (physical activities and the operation of machinery) is performed in unpredictable environments, while in predictable physical work, the environments are predictable

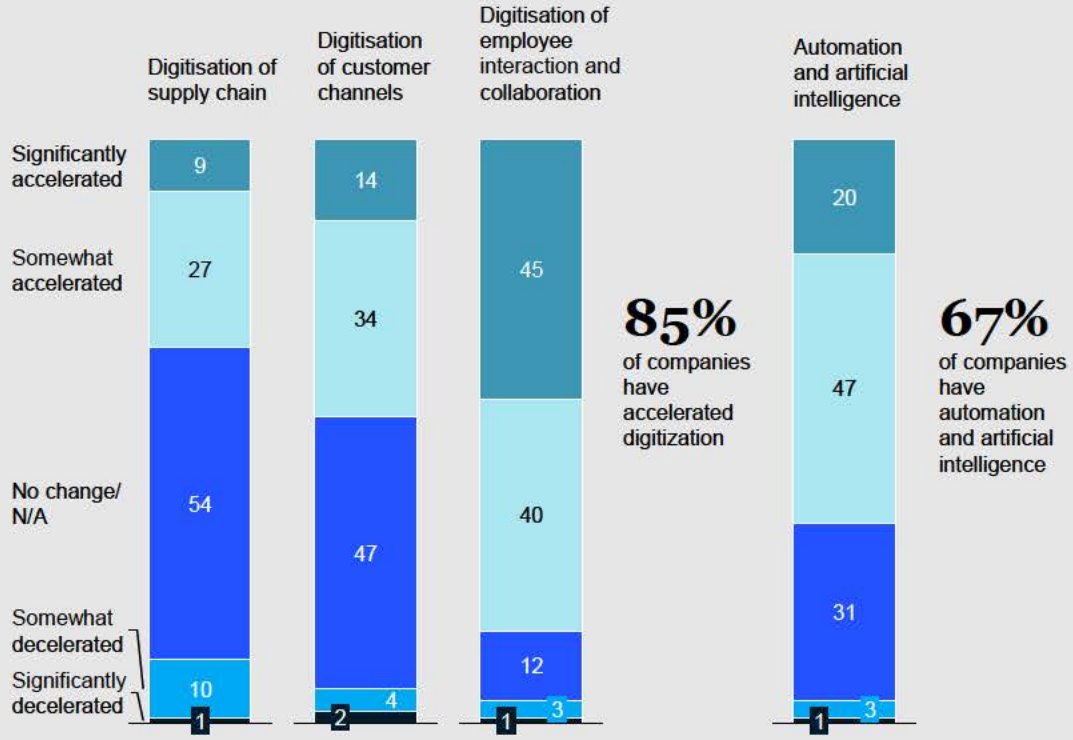
Note: Note: in practice, automation will depend on more than technical feasibility. Five factors involved: technical feasibility; cost to automate; the relative scarcity, skills, and cost of workers who might otherwise do the activity; benefits (e.g., superior performance) of automation beyond labor-cost substitution; and regulatory and social acceptance considerations

Source: McKinsey analysis

... and private businesses are responding to the opportunity

Executives say they have accelerated the deployment of digitisation and automation during COVID-19 pandemic

Since the start of COVID-19 outbreak, how has your company's or business area's adoption of the following technology trends changed? % of respondents (n=800)



Note: figures may not sum to 100% because of rounding

Source: McKinsey Global Business Executives Survey, July 2020

Automation: The mix of occupations may shift by 2030 in the post-COVID-19 scenario

Estimated change in share of total employment, post-Covid-19 scenario, 2018 to 2030[1], percentage points

Occupational category	United states	Spain	United Kingdom	France	Germany	Japan	China	India
Health aides, techs, care workers								
STEM professionals								
Health professionals								
Managers								
Business/legal professionals								
Creatives and arts management								
Transportation services								
Educator and workforce training								
Property maintenance								
Community services								
Builders								
Mechanical installation and repair								
Customer service and sales								
Food services								
Agriculture								
Production and warehousing								
Office support								

Australia's experience is most similar to developed countries with below average rates of COVID19

1. Average of 7.7% workforce would need to transition in pre-COVID scenario, increasing to 8.9% in post-COVID scenario. Average taken of United States, United Kingdom, France, Germany, Spain.
2. The pre-COVID-19 scenario includes the effects of eight trends: automation, rising incomes, aging populations, increased technology use, climate change, infrastructure investment, rising education levels, and marketization of unpaid work. The post-COVID-19 scenario includes all pre-COVID-19 trends as well as accelerated automation, accelerated e-commerce, increased remote work, and reduced business travel

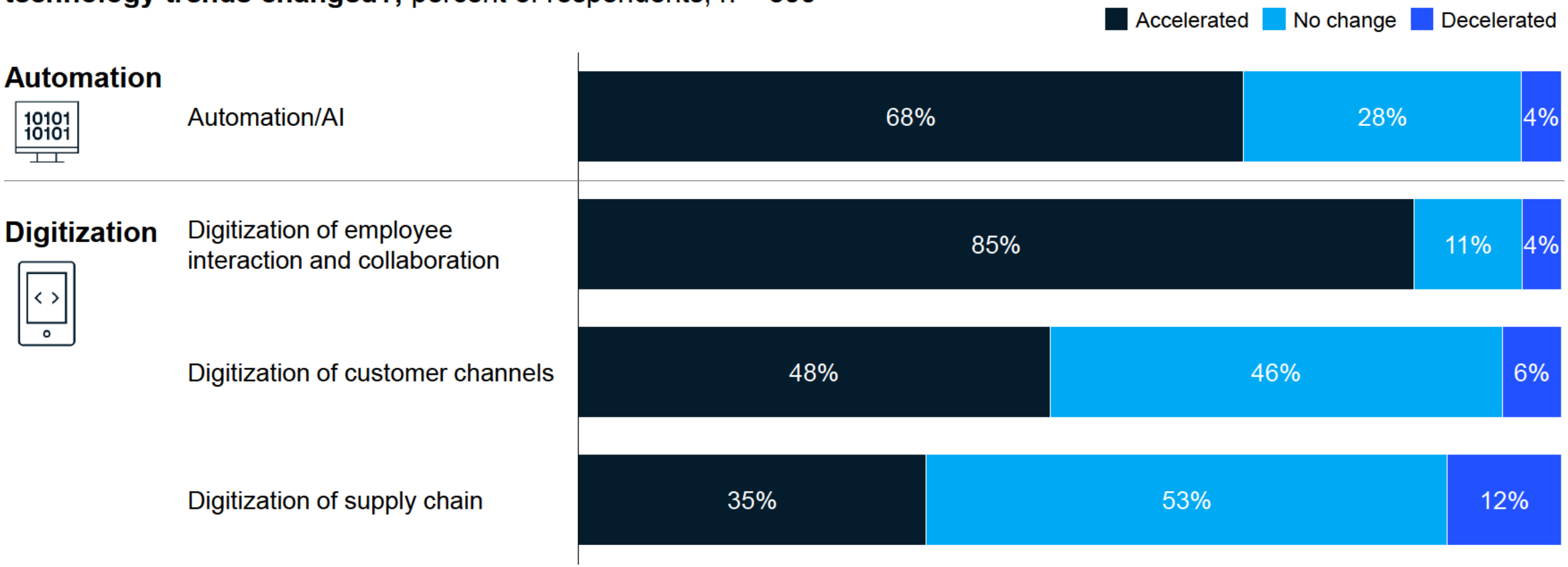
Source: McKinsey Global institute analysis

+16%

average increase in the share of workforce that will need to transition to jobs in a new occupation by 2030 due to automation and COVID-19[1]

Automation: There has been an acceleration in adoption of automation during COVID-19

Since the start of the COVID-19 outbreak, how has your company's or business area's adoption of the following technology trends changed?, percent of respondents, n = 800[1]



1. Excludes 6 respondents who selected the option "Not applicable; we have not yet adopted this trend"

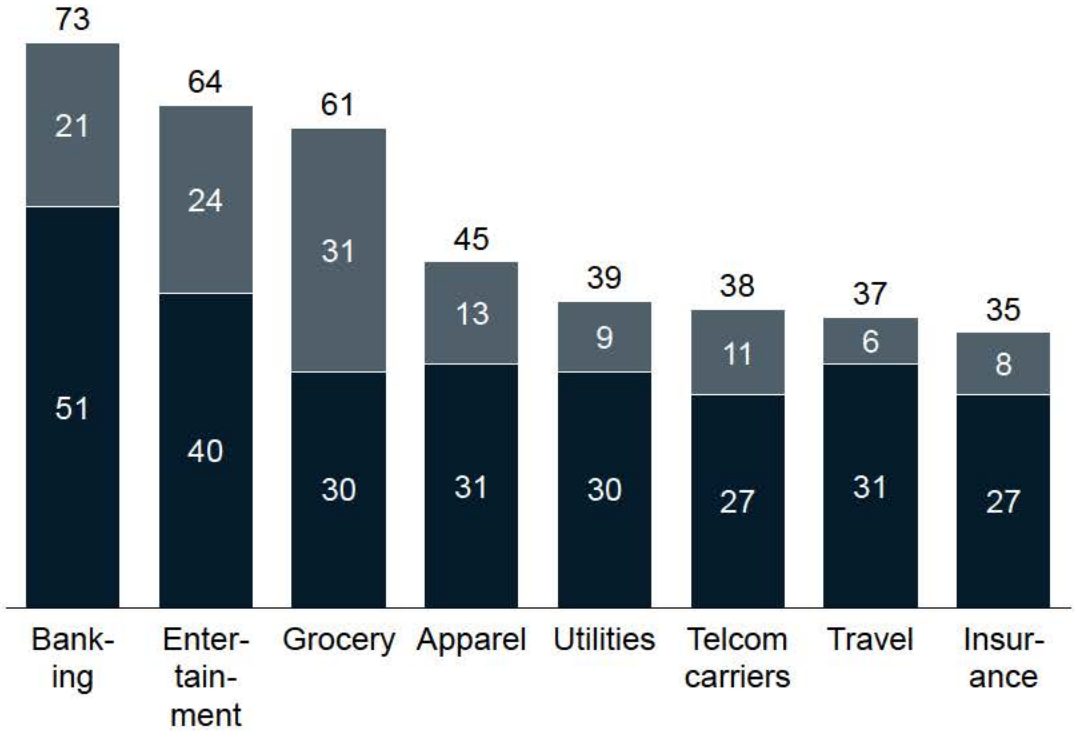
Source: McKinsey Global Business Executive Survey, July 2020, McKinsey Global Institute analysis

Flight to digital: Adoption of digital has skyrocketed

First-time users | Regular users

US consumers are accelerating adoption of digital channels, a trend seen across global regions

Digital adoption, by industry, percent of digital access



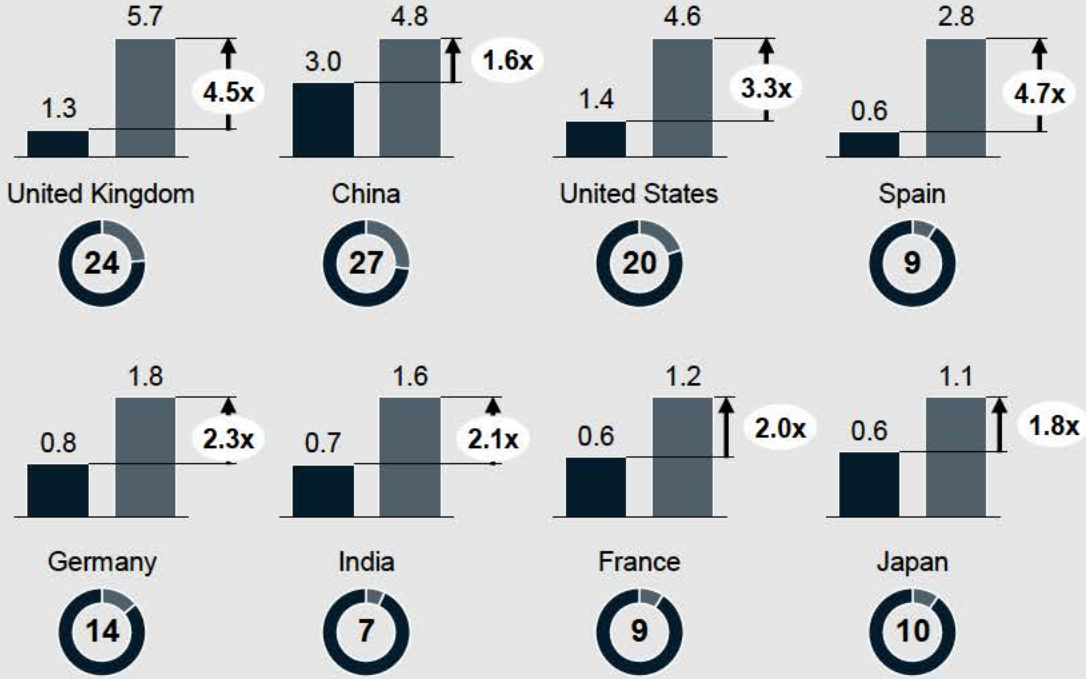
Note: Figures may not sum to listed totals, because of rounding

Source: McKinsey COVID-19 US Digital Sentiment Survey, Apr 25-28, 2020

XX E-commerce sales as % of total retail sales, 2020 | 2015-19 average | 2020

E-commerce has grown 2 to 5 times faster than before the pandemic

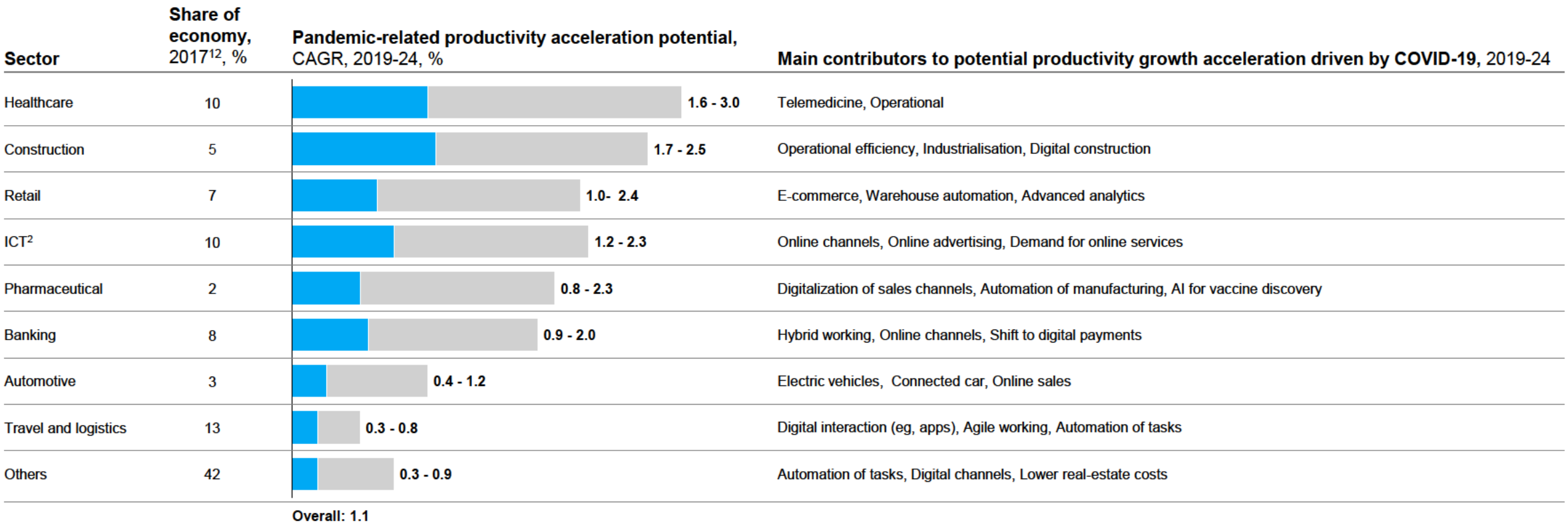
Year-over-year growth of e-commerce as share of total retail sales, percentage points



Source: retailing by Euromonitor International, 2021; McKinsey Global Institute analysis

Significant productivity improvements are expected to be linked to digital step-changes

The potential for incremental productivity growth from COVID19 is estimated to be ~one percentage point per year through 2024.



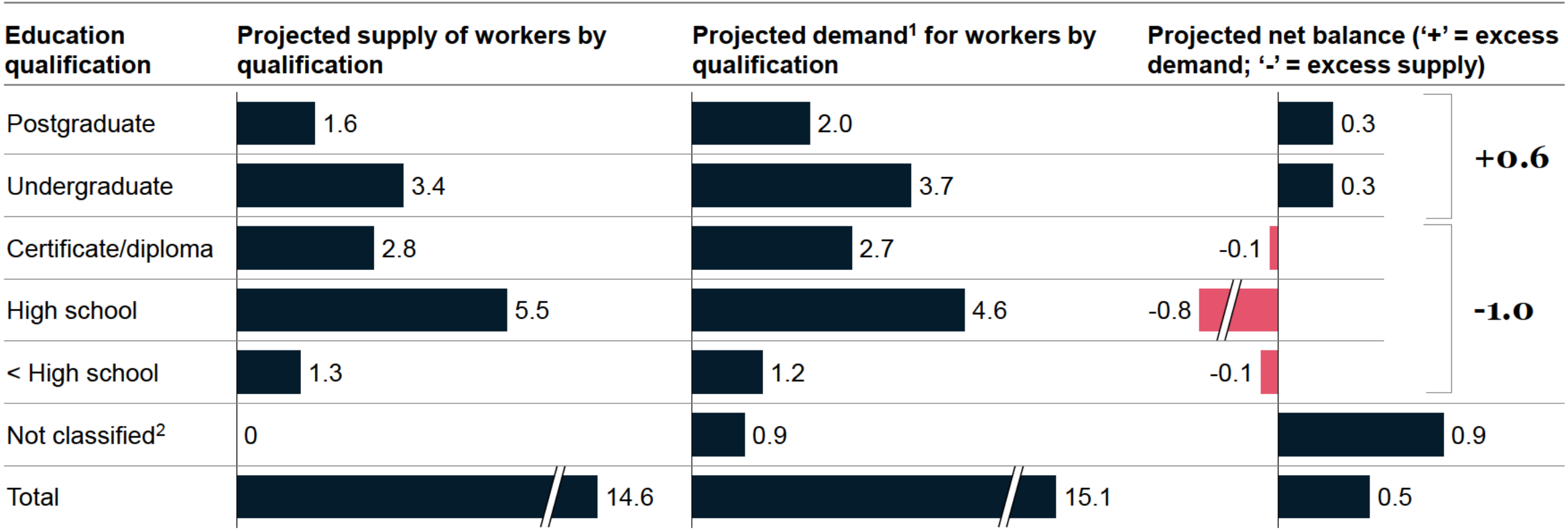
1. 'Weighted by total nominal GDP contribution of US (62%) and 6 European economies (38%) in our focus countries. Pharma includes chemicals and recreation manufacturing due to lack of breakdown for US and Sweden; automotive includes tramsaport machinery; travel and logistics includes arts and recreation, accomodation and food services , transportaion and storage, other services activities, and activities of househollds and extraterritorial units; other nonfar, business sectors include professional services, wholesales, mining and quarrying, maufactiring {excluding chemicals, pharmaceuticals, and automotives}. and utilities; excludes public administration and defense, real-estate activities, education, and agriculture. Sectors included amount to 74% of total economy in US and 75% in 6 European focus countries.
2. Information and communication technology.

Source: EU KLMES; Mckinsey Global Institute analysis: https://www.mckinsey.com/industries/public-and-social-sector/our-insights/will-productivity-and-growth-return-after-the-covid-19-crisis

Time for (more) school

Projected change (mid-point adoption scenario[1]) in employment supply and demand, by education qualification

Millions of jobs, 2030



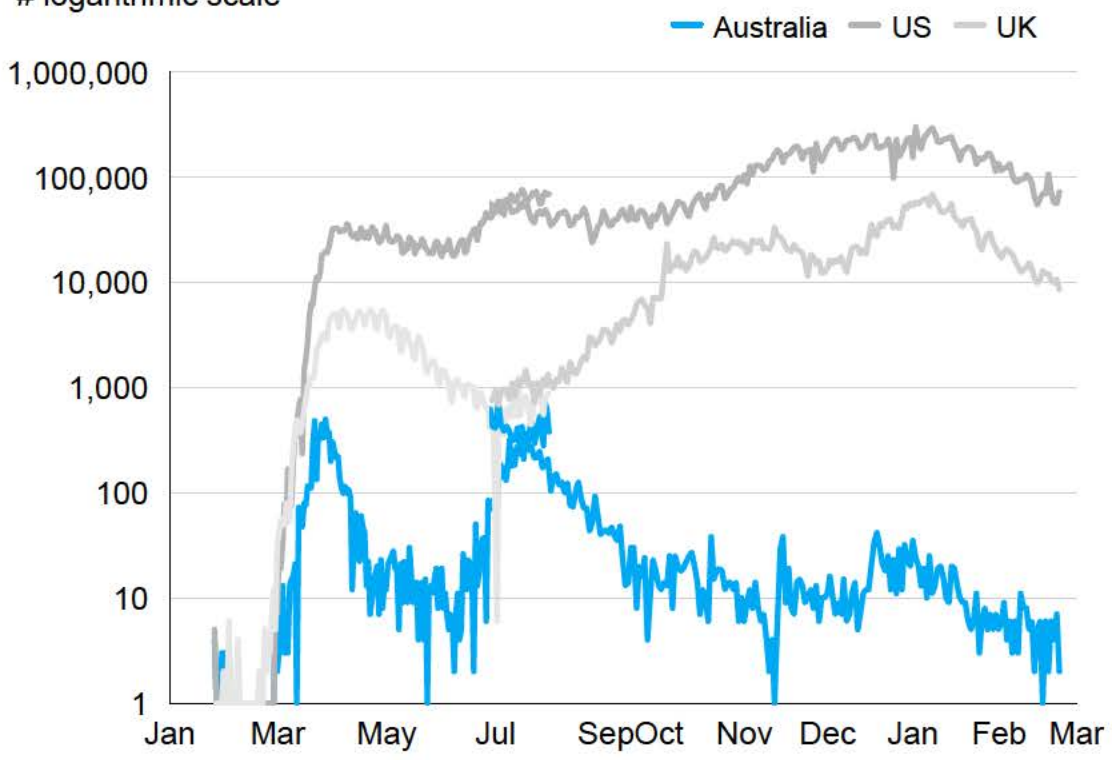
1. Mid-point automation scenario, step-up labour demand scenario
2. New occupations created by automation and technological change

Note: Mid-point of earliest and latest automation adoption in the 'step-up' scenario. Numbers may not add up due to rounding

Source: MGI Automation Model March 2018, Jobs Lost Jobs Gained December 2017; McKinsey Global Institute analysis

Attractiveness of Australia has grown with low infection rates

Number of confirmed COVID-19 cases per day
logarithmic scale



Source: COVID-19 Data Repository by CSSE at Johns Hopkins University; news reports

Rising education levels have reflected job market conditions

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Increase in post-graduate education:

- **~30% increase** in domestic postgraduate enrolments expected at UNSW
- **~12% increase** in first preferences from non-school leavers at UQ
- **~60% increase** in postgraduate applications at CDU

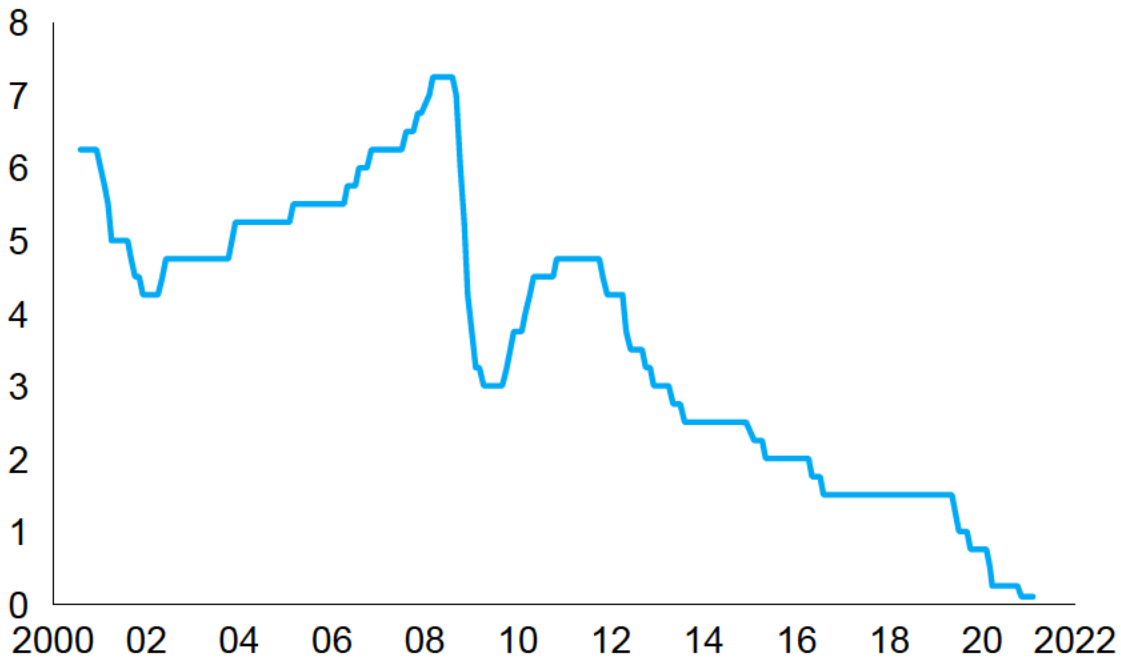
Overall increase in domestic enrolments:

- **~11% increase** in fee-help loan amounts across 36 public universities

Low growth & interest rates: Australia saw recession conditions

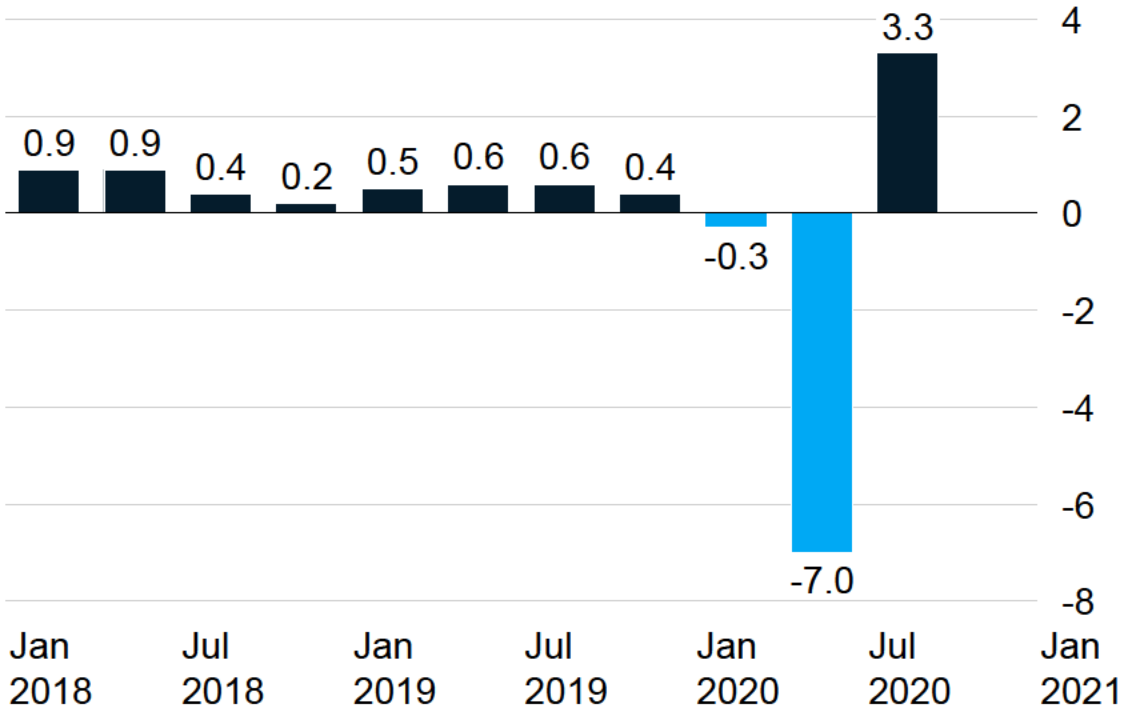
The RBA lowered the cash rate to 0.1%, it's lowest on record

Cash rate target, percent



And Australia saw two consecutive quarters of negative GDP growth

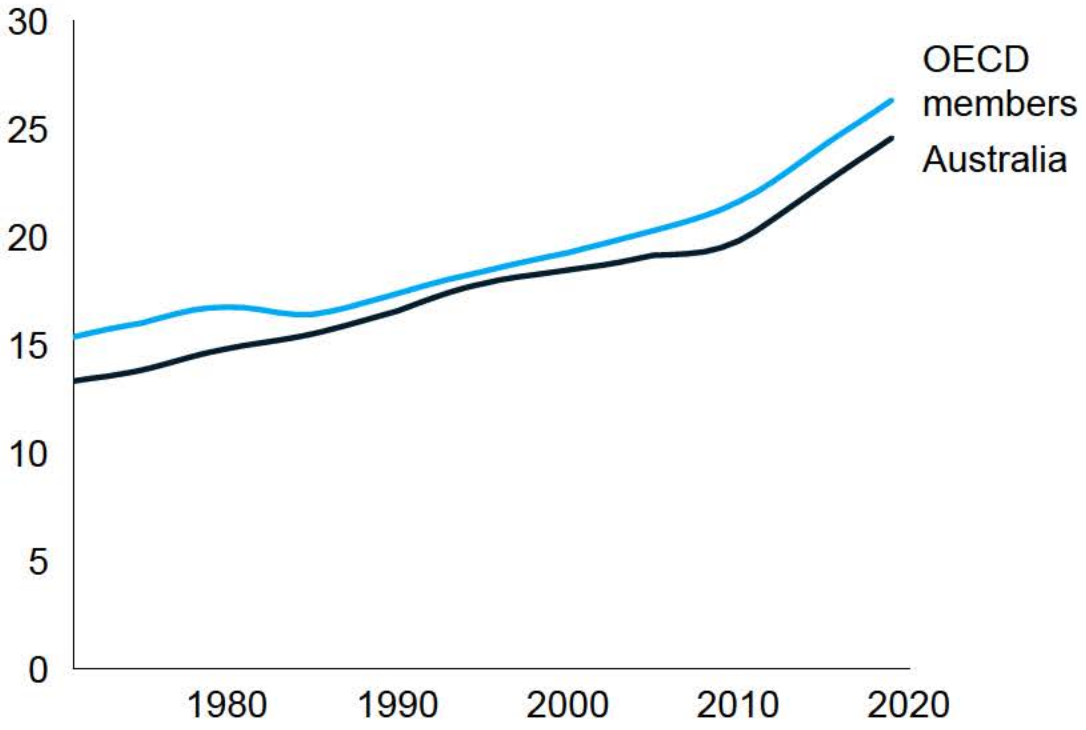
GDP growth rate, percent



Source: ABS, RBA

Dependency ratio is highest on record as our population ages

Age dependency ratio, old
Percent of working-age population



Source: World Bank, ABS

Increasing inequality: young, blue collar workers are more impacted

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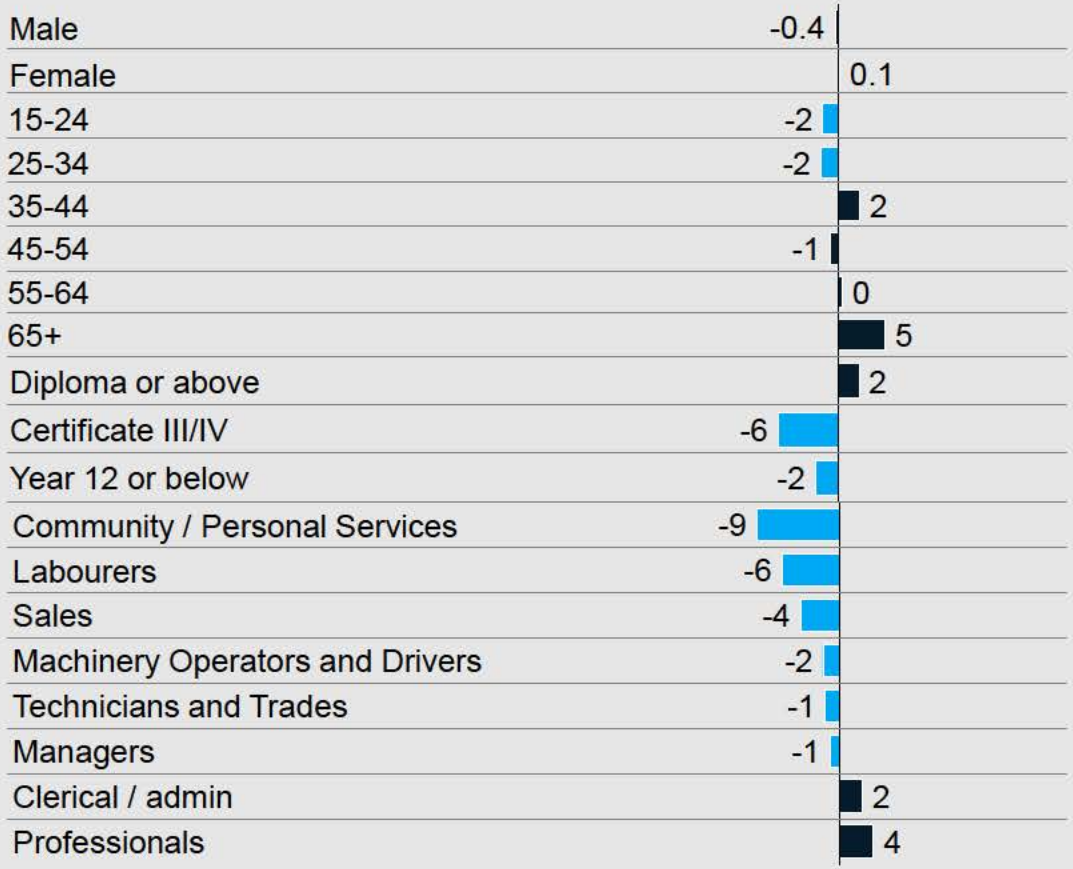
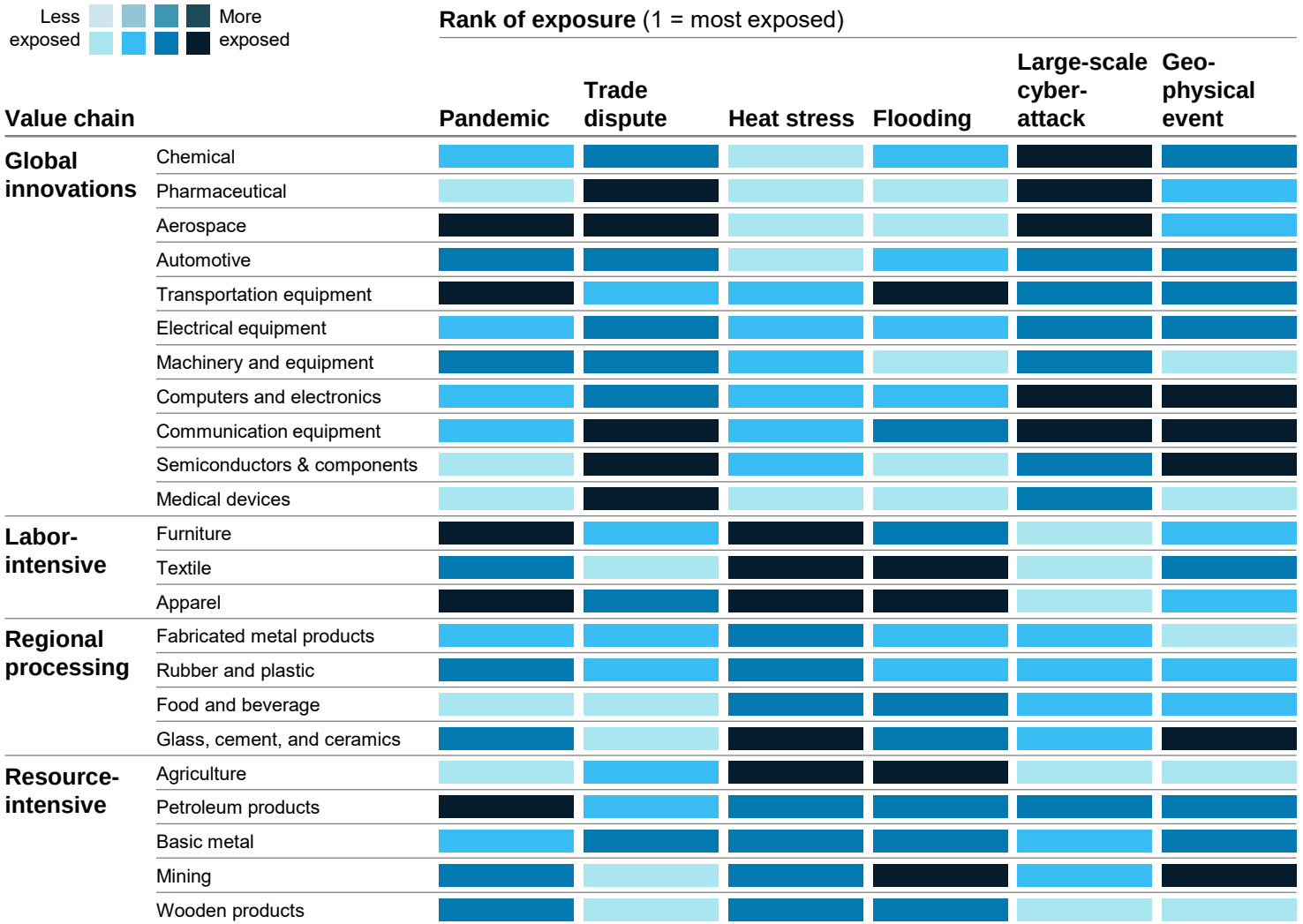
Job losses are concentrated among service workers with low education levels
Percentage gap to pre-COVID19 jobs



Some industries are more exposed to supply chain shocks



Source: McKinsey Global Institute

Key insights

- **Pandemics** are likely to predominantly impact **labour-intensive industries**, and industries linked to **travel and movement** (e.g., aerospace, transportation, petroleum products)
- **Trade disputes**, on the other hand, predominantly impact industries with a **high degree of knowledge intensity** and **high-value industries** (e.g., pharmaceutical, communication equipment, semiconductors and components)
- From an industry perspective, **labour intensive industries** are **particularly vulnerable** across multiple dimensions, as are those linked to **rare earth metals** (e.g., computer and electronics, communication equipment, and semiconductors and components)

Onshoring is not a viable option for all industries

Low High

Low High

Value chain		Share of value chain exports, %	Feasibility of geographic shift: Economic factors	Feasibility of geographic shift: Non-economic factors
Global innovations	Chemical	5-11		
	Pharmaceutical	38-60		
	Aerospace	25-33		
	Automotive	15-20		
	Transportation equipment	29-43		
	Electrical equipment	23-34		
	Machinery and equipment	19-25		
	Computers and electronics	23-35		
	Communication equipment	34-54		
	Semiconductors & components	9-19		
	Medical devices	37-45		
Labor-intensive	Furniture	22-45		
	Textile	23-45		
	Apparel	36-57		
Regional processing	Fabricated metal products	21-32		
	Rubber and plastic	20-30		
	Food and beverage	5-11		
	Glass, cement, and ceramics	11-21		
Resource-intensive	Agriculture	20-26		
	Wooden products	5-11		
	Basic metal	6-12		
	Petroleum products	9-18		
	Mining	6-13		
		16 **26**	**Total**	Low High

Key insights:

- **Economic feasibility** is determined by factors including:
  - Is there movement in the global distribution of the supply chain already?
  - Are the exports capital-intensive? Such industries have strong economies of scale, making them more costly to shift
  - Are the exports knowledge-intensive? Often these industries have specialised ecosystems in specific locations, with unique suppliers and talent
  - Is the production tied to geology or natural resources?
  - Is the production highly globalised, or already regionalised?
- **Non-economic feasibility** is determine by factors such as:
  - National security considerations
  - National competitiveness considerations
  - Self-sufficiency goals
- Value chains with the largest share of total exports potentially in play are **pharmaceuticals, apparel, and communication equipment**
- In most cases, **economic and non-economic considerations do not overlap**, meaning countries may have to expend considerable sums to induce shifts from what otherwise are economically optimal production footprints

These shifts will have a bigger impact on some industries than others

1. Note that 3 trends (increasing inequality; ageing population; rising education levels) have not been called out separately as their impact either does not vary significantly by industry, or is proxied by other shifts

Source: ABS; RBA, McKinsey analysis

There is significant variation in the exposure of industries to structural shifts

For example, some industries are highly exposed to digitisation (e.g., Financial and insurance services), while others are exposed low interest rates (e.g., Mining)

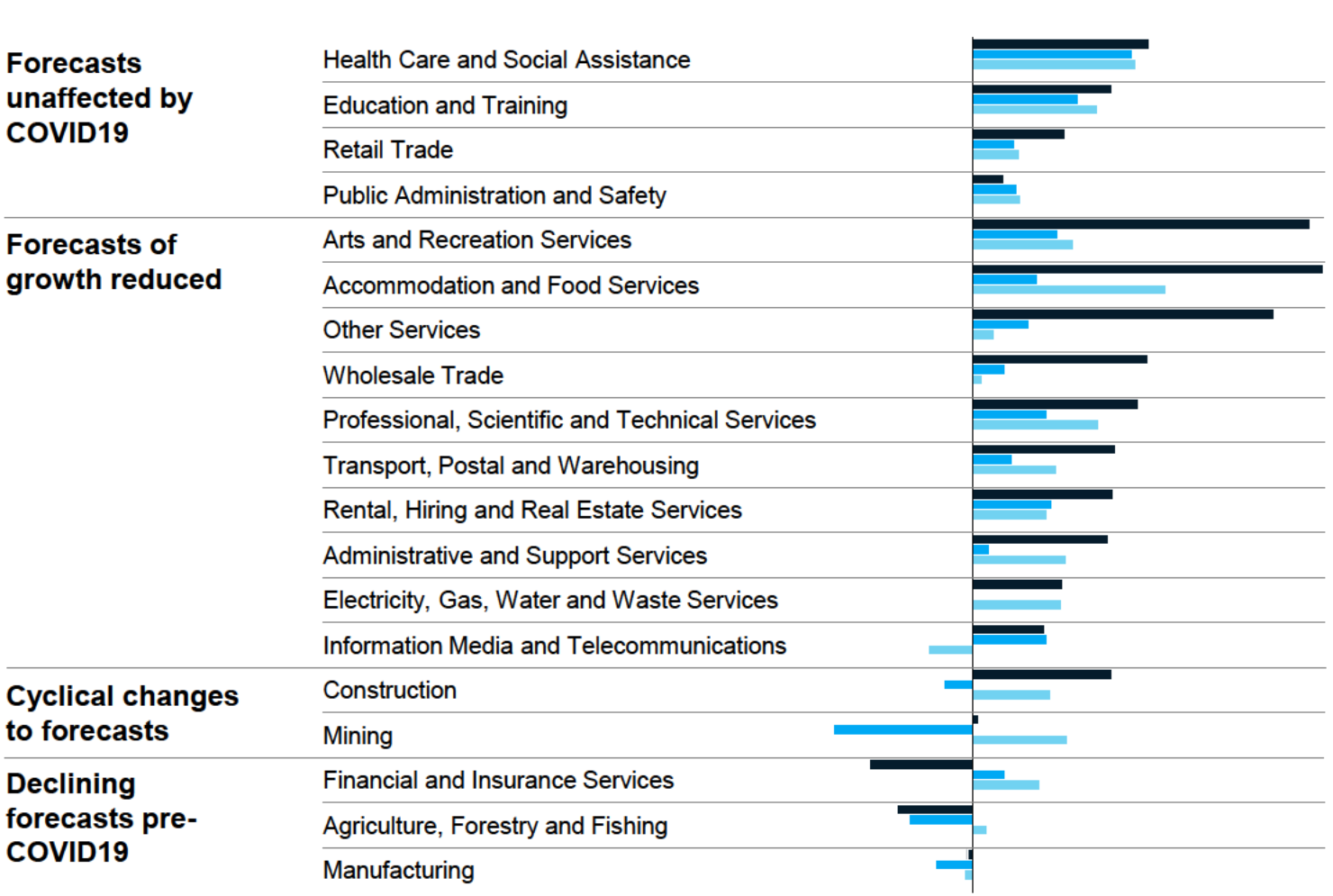
The acceleration of these structural trends has the potential to drive significant productivity improvement, and in turn, economic growth

The key challenge is ensuring this growth is inclusive of vulnerable cohorts and regions

These trends are expected significantly boost productivity in some industries – see appendix for details

Industry growth is generally expected to continue in line with pre-COVID19 trends

Job growth forecasts, 2020-2025, average annual % increase



Source: National Skills Commission, Shape of Australia's Post COVID-19 workforce; National Skills Commission 2019 Employment Projections; National Skills Commission 2020 Employment Projections, McKinsey Analysis

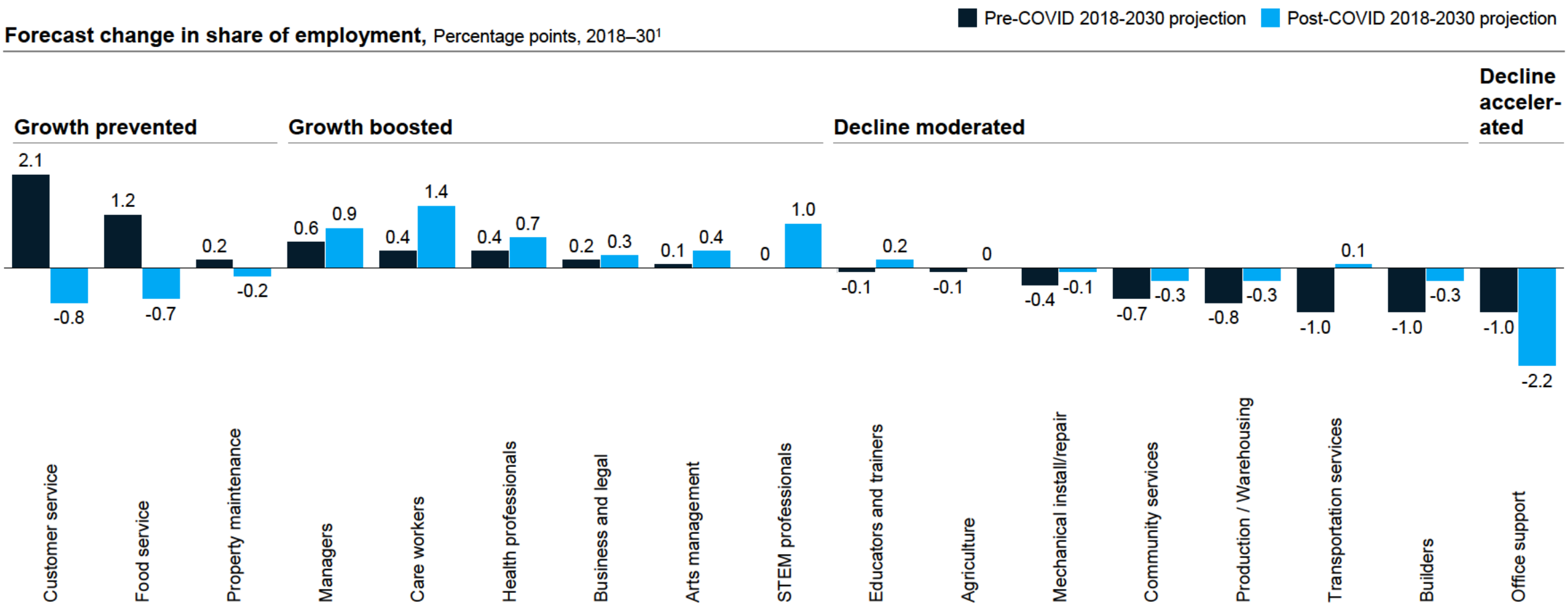
COVID19 accelerated existing trends, so has changed the pace of growth but not the direction

However, short term jobs forecasts remain extremely uncertain

- Recent jobs forecasts released by National Skills Commissions since Nov 2020 differ by ~150% on average
- Forecasts for some industries have been volatile across releases, for example Financial Services and Agriculture, Forestry and Fishing
- Part of this uncertainty is because structural shifts like automation improve productivity but have mixed impacts on jobs

The acceleration of structural shifts will benefit some occupations, but depress demand for others

Forecast change in share of employment, Percentage points, 2018–30[1]

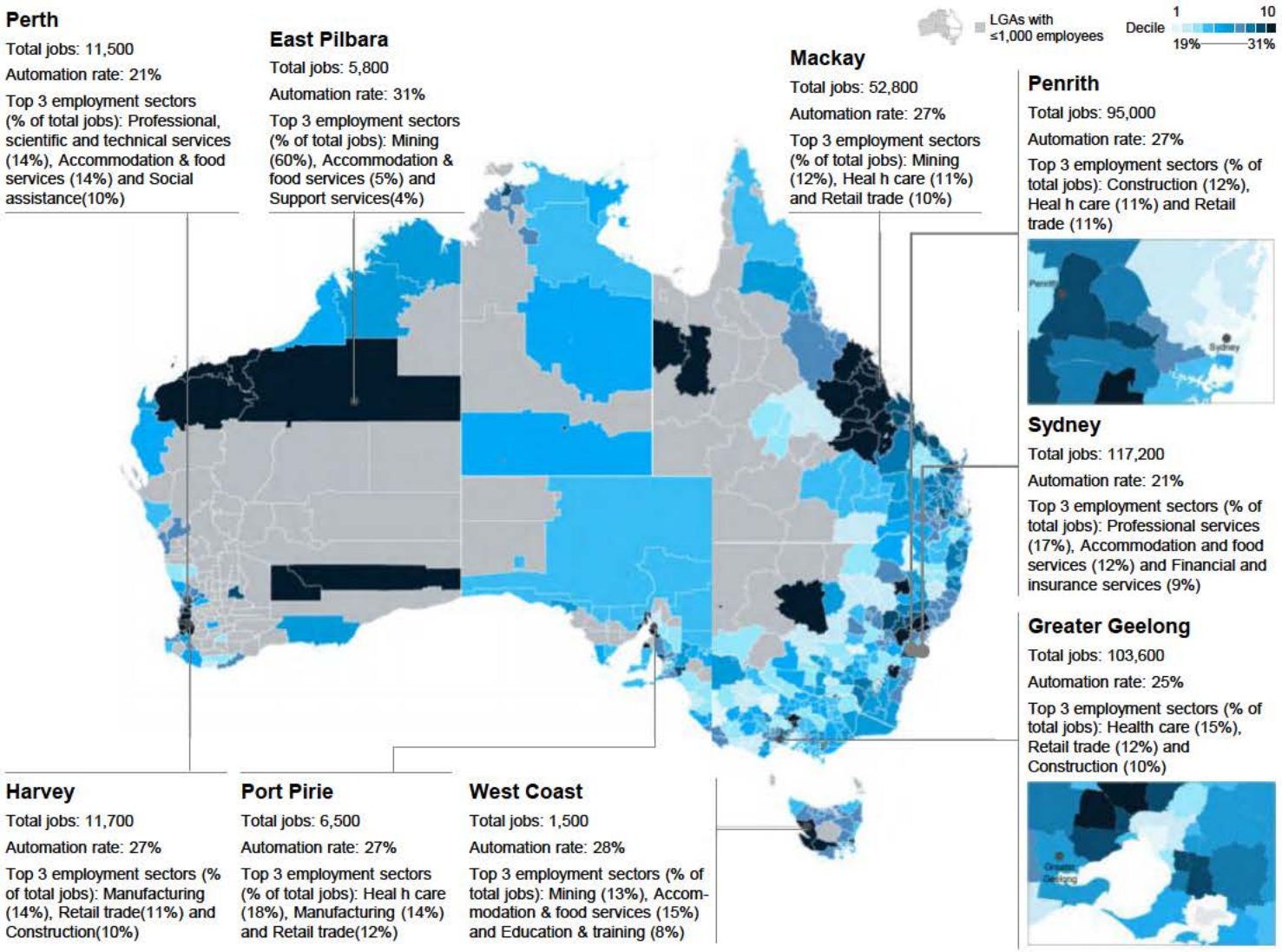


1. Estimates are for UK economy, which is structurally similar to Australia. Pre-COVID-19 scenario includes effects of eight trends: automation, rising incomes, aging populations, increased technology use, climate change, infrastructure investment, rising education levels, and marketization of unpaid work. Post-COVID-19 scenario includes all pre-pandemic trends as well as accelerated automation, accelerated e-commerce, increased remote work, and reduced business travel.

Source: McKinsey Global Institute, The Future of Work after COVID-19; ABS, Online sales data, Jan 2021

Job losses due to automation are likely to be concentrated in outer suburbs and regions

Impact of automation by 2030



Source: McKinsey and Company, 'Australia's Automation Opportunity', 2016.

High exposure to disrupted industries makes regions vulnerable to automation

Forecast share of jobs automatable by industry, %

Regions vulnerable to concentrated job losses due to automation are highly exposed to one or more of these industries

Lessons learned from global vaccine roll out

February 2021

Disclaimer

These materials are preliminary and non-exhaustive and are being made available on a non-exclusive basis SOLELY FOR INFORMATIONAL purposes in response to the urgent need for measures to address the COVID-19 crisis. They reflect general insight and may present potential options for consideration based on currently available information, which is inherently uncertain and subject to change, but do not contain all of the information needed to determine a future course of action. The insights and concepts included in these materials have not been validated or independently verified. References to specific products or organizations are solely for illustration and do not constitute any endorsement or recommendation. These materials do not constitute, and should not be interpreted as, policy, accounting, legal, medical, tax or other regulated advice, or a recommendation on any specific course of action. These materials are not a guarantee of results and cannot be relied upon. Future results may differ materially from any statements of expectation, forecasts or projections. Particularly in light of rapidly evolving conditions, these materials are provided “as is” without any representation or warranty, and all liability is expressly disclaimed for any loss or damage of any kind. The recipient is solely responsible for all of its decisions, use of these materials, and compliance with applicable laws, rules and regulations. Consider seeking advice of legal and other relevant certified/licensed experts prior to taking any specific steps.

This document contains nine sections

A	Overarching lessons learned for organisations responsible for delivering vaccine programs
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C	A top-down quantitative review of the vaccine roll out in 50+ countries
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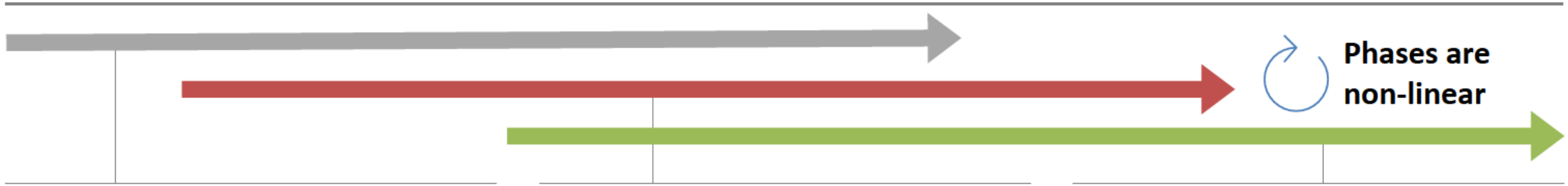
The speed of vaccine rollout will vary over time

Document intended to provide insight based on currently available information for consideration and not specific advice

Illustrative

Vaccine rollout timeline



Primary focus	Supply	Operational Efficiency	Demand
	Getting clarity on when doses will arrive and in what quantity	Selecting and ramping-up new sites	Ensuring accessibility for all eligible populations that want vaccine
	Optimising allocation of received doses	Managing site throughput, inventory levels and waste (as well as safety)[1]	Reaching/influencing hesitant population
	Managing supply disruptions	Fostering a positive consumer experience	

1. See appendix for indicative consumer journey and associated timings

Source: 20+ Expert interviews covering over 10 jurisdictions (i.e., UK, France, Germany, Israel, Canada and multiple US states)

Two challenges that all jurisdictions have in common: uncertainty and unprecedented scale of vaccine program

Observations based on experience of 10+ jurisdictions already vaccinating[1]

Current as of 27 Jan 2021
Non-Exhaustive (illustrative examples only)

Challenge	What other jurisdictions are doing about those challenges	
Managing in the face of uncertainty	**Proactively managing stakeholders**	**Managing expectations and clarifying accountabilities upfront** (e.g., 'not everyone will be vaccinated in week one', or 'sites are accountable for ordering sufficient supply')
	Scenario planning	**Small, dedicated teams in the central PMO 'thinking ahead'** (e.g., what is high and low case for supply and implication for allocation?) and **allocating time for all teams to periodically do the same**
	Clarifying decision rights and communication channels	**Workshops to run "water through the pipes" in central PMO** (e.g., US states using test cases: 'if X happens, who need to be involved? Who is the decider? How will we communicate to frontline? To public?') **Upfront investment to strengthen ties between different levels of govt** (e.g., regular cadence of engagement, reciprocal secondees), which is particularly important where responsibilities for roll out are shared and data sharing not straightforward
	Preserving optionality	**Flexible/scalable operations** (e.g., preferencing sites that can be easily scaled up or down, creating pools of flexible workforce)
Building and running a vaccine operation at a speed/scale never done before	**Reducing complexity**	**Wherever possible, leveraging existing systems, and using simple mechanisms to manage supply and eligibility** (more complex prioritisations and/or lack of clear communication has been associated with delays and inconsistent approaches at site level)
	Setting clear KPIs and tracking performance	**Clear, simple directions to sites:** e.g., " Every vaccine in an arm, no hoarding", "75% of allocation used within 3 days, 100% in 5 days"; tracked at the system level with **dashboards that allow drill down and follow up**
	Creating feedback loops	**Formal and informal mechanisms** (e.g., surveys, dashboards, but also interviews and informal check-ins) to keep the pulse and understand local barriers to scale

1. Observations primarily based on experience of UK, France, Israel, multiple US states

Source: Expert interviews

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There are 21 elements across the vaccine lifecycle

Preliminary

Focus of deep dives | Not covered in deep dives

A Source and manufacture

1. **Technology portfolio assessment**
   Understand volume needs and set volume targets; select tech platform(s) to pursue; understand, evaluate, and pursue commercial arrangements
2. **R&D strategy**
   Secure and develop approach for appropriate funding and agreements to invest in and support local production
3. **Purchase and manufacturing**
   Secure appropriate commercial agreements (local or int'l) for drug substance, fill/finish and packaging; support fast tracking of tech transfer; establish strategy for all inputs and outputs of domestic manufacturing
4. **Regulatory, liability, and legal processes**
   Communicate requirements for vaccine approval; fast-track where this can be done safely; set legal terms

B Distribute

5. **Importation**
   Identify all relevant priority imports for e2e sourcing, manufacturing, distribution, and administration; track timelines and proactively manage risks
6. **Domestic transport and logistics**
   Quantify total needs based on supply and specification scenarios, including cold chain capacity; survey all existing options and ensure agreements in place, including for waste disposal and for rural/remote cold chain delivery; plan quality assurance processes
7. **Warehousing**
   Identify total warehousing required by location, and plan contingencies for potential vaccine specifications, including cold chain storage capacity; identify temporary options in excess of 'owned' capacity; ensure strong quality assurance processes in place

C Administer

8. **Administration principles**
   Identify priorities for vaccination and national immunisation strategy; model roll-out based on scenario contingencies
9. **Vaccination points**
   Identify vaccination sites; plan for scheduling, personnel, equipment, comms, and expertise needs (particularly for rural and remote; multi-dose regimes)
10. **Ongoing tracking and research**
    Ongoing consumer sentiment monitoring; link in with relevant safety bodies; track required information; plan future research
11. **Workforce management**
    Ensure adequate recruitment, training and management of vaccine administration workforce

D Enable

12. **Governance and stakeholder engagement**
    Establish / confirm entities' decision-making roles; set frequency and mechanism for ongoing engagement with key stakeholders (e.g., state & local governments, industry and health peaks, key population groups)
13. **Access, funding, reimbursement**
    Set clear goals for access and funding; determine funding responsibility and set reimbursement plan; estimate total costs based on possible scenarios
14. **Capability building and education**
    Ramp up government capabilities on potential supply chain capacity gaps; support private sector tech transfer and manufacturing expertise; ensure effective training and messaging for HCPs; public education campaign
15. **Systems and integration**
    Identify monitoring needs for e2e supply chain; evaluate and address current systems' suitability
16. **Communications**
    Provide clear, coordinated messaging to the general public about how to access a vaccine once available, safety and effectiveness, transition plans, etc. Coordinate comms with key stakeholders, including regulatory bodies, industry peaks, healthcare peaks, state and local governments

E Align

17. **Proof of potential immunity**
    User-friendly, fraud-resistant proof of vaccination solution, for use across the private sector
18. **Transmission management**
    Integrated view of vaccination roll out, restrictions and protocol to manage COVID19 transmission under different vaccination contexts, and economic and social policy linked to restrictions
19. **Economic and social impacts**
    Anticipate the medium and long term implications of the pandemic, and ensure integrated policy design to support recovery
20. **Foreign policy and aid**
    Manage collaborations with allies, and integrate COVID19 vaccination into foreign aid policies, e.g. sourcing vaccines for developing countries, supporting with distr bution and administration
21. **Longer term health policy**
    Manage shifts in demand and supply (e.g. from deferred screenings, increased awareness of health literacy) and reconfiguration of the health system to address emergent needs/ behaviours

Summary of insights (1/3)

Current as of 27 Jan 2021
Non-Exhaustive (illustrative examples only)

Element	Key learning(s)	Examples
6 **Domestic transport and logistics**	**Jurisdictions have simplified where possible** (e.g., 1 vaccine type/site, same rhythm for allocations every week)	**Applied routine daily cadence for logistics and allocation. 10am)** War Room receives supply requests from sites **12pm)** War room finishes allocation decisions **5pm)** Logistics team starts repacking; **5pm-7am)** Vaccine is thawed and delivered to site; **8am)** vaccination commences **Set clear expectations to simplify logistics** ("order doses Monday, get them Tuesday, use 100% over Wednesday to Friday")
8 **Administration principles**	**A clear strategy from Day 1** has made it easier for jurisdictions to manage trade-offs between speed and coverage of priority cohort	**Expanded initial priority cohorts** (early focus 80+ population in resident aged care had translated to fewer vaccinations per day than neighboring countries and adverse media attention) **More flexibility in prioritisation from the outset.** End of day 'walk-ins' (post 5pm), and proactive outreach via social media for remaining slots
9a **Standing up vaccination points**	**Standard site set-ups** (layout, staffing) **and 'test and learn' mindset** has helped jurisdictions bring vaccination points online faster	**Developed standardised 'vaccination lane'** (two vaccinators, serving single queue of people – with associated staffing, equipment and set up); all sites are multiples of two or more 'lanes' (some up to 20) **Ramped up supply to avoid waste:** New vaccination sites start with doses for 25% of theoretical capacity – ramping up to 100% over 2+ weeks (same jurisdiction saw little to no required ramp up period or wastage at GP clinics) **Tested new vaccine in single sub-region:** All regions initially using Pfizer; when first batch of Moderna arrived, all doses sent to a single region – with goal of gathering learnings on vaccine switch that could help other regions make the switch later
9b **Operating vaccination points**	**A process engineering lens** has helped jurisdictions improve productivity at sites (i.e., breaking down steps, timing activities and re-allocating resource to balance load)	**Successfully targeted 10-12 vaccinations per person per hour in many jurisdictions** (i.e., 5-6 mins per vaccine). Many jurisdictions report that key bottleneck is not vaccination time, but registration / eligibility check / consent (if not performed prior) **Accelerated vaccination speeds through pre-briefing, eligibility and consent.** 'Advance team' visited aged care homes in weeks prior, saving 15-45 minutes per person **Drove systematic push to maximise doses extracted per vial (5.9 instead of 5.2),** enabled by low dead space syringes and video based training; subsequently adopted by many jurisdictions

Source: Expert interviews, Press search (further details in country case study and appendix sections of this document)

Summary of insights (2/3)

Current as of 27 Jan 2021
Non-Exhaustive (illustrative examples only)

Element	Key learning(s)	Examples
9c **Booking and patient experience**	Jurisdictions report **a centralised booking system** makes it much easier to manage demand and supply They also are making choices to **foster a more positive consumer experience** to promote public trust in program	**Reached out proactively with pre-booked appointment.** Health management organisations proactively contacting eligible groups in waves by SMS / apps and phone with pre-booked timing
		Reached out proactively to invite bookings. Geo-spatial data used to select location for mass-vaccination sites and letters sent to all eligible residents within 45 min driving radius inviting them to book in
		Pre-registered priority occupation groups (e.g. aged care workers, prison staff) to help inform planning of early sites
		Executed integrated PR campaign, *Ítalia rinasce con un fiore vaccinazione anti covid 19* a message of renewal, with accompanying graphics, colour scheme and architect-designed vaccination pavillions[1]
9d **Managing performance**	All jurisdictions are seeking **Dashboards to monitor KPIs** (and ability to drill down to site level for feedback and follow up); they also underscored the importance of **informal feedback loops** (e.g., daily calls/check ins) to stay across what's happening on the ground	**Early challenges getting clear picture of throughput** (due to lack of systems integration – i.e., number of vaccinations given was known, but not inventory levels or number of bookings, so difficult to get picture of efficiency)
		Used anonymised "league tables" to reduce variability in performance, for example comparing waste across vaccination sites to help local centres understand their standing against best practice and drive improvement
		Observed that throughput varied based on number of deliveries. Vaccination points that received 1 delivery per week (of 1 tray/ ~1000 doses) took 3.5 days to administer them; while sites that expected a second delivery later in the week typically took just 2 days
10 **Ongoing tracking and research**	Jurisdictions emphasised the **value of using proven systems,** and where purpose-built systems were required, having **workarounds** given inevitable IT issues	**Commenced vaccinations in parallel to system development.** Pharmacies using paper-based tracking (supported by call centre and manual data entry) while vaccination register and inventory system development underway
		Saw low rates of take-up for optional centralised systems, as a result highly decentralised model of data collection puts onus on individual to keep record of their vaccination (and what type of vaccine they received)
		Linked reimbursement for services to recording vaccination data in the national register to incentivise same day data entry

Source: Expert interviews, Press search (further details in country case study and appendix sections of this document). 1: CNN

Summary of insights (3/3)

Current as of 27 Jan 2021
Non-Exhaustive (illustrative examples only)

Element	Key learning(s)	Examples
11 **Workforce management**	**Workforce shortages the key bottleneck** for many jurisdictions (with caveat that Australia context is different – health system less burdened by COVID)	**Supplemented government operations with military and voluntary workers.** Ministry of Health engaged MDA (Red Cross equivalent) and United Hatzalah (medical group) – primarily for logistics/outreach to remote communities
		Stood up voluntary workforce, ~30,000 volunteers registered, including relevant skilled private sector workforce (e.g., airline staff, retired health care professionals)
		Incentivised physicians to join vaccination centres, awarding €120-150 per hour, >€1000 per day vs average GP salary of ~€7000 per month
16 **Communi-cations (public outreach)**	Jurisdictions **anticipate challenges reaching all eligible populations** and are collecting data/ exploring incentives to better understand drivers of refusal and lift uptake	**Surveyed eligible populations to understand drivers of vaccine refusal** (e.g., one survey saw >35% of HCW refuse vaccine, they were disproportionately younger, female, lower income and concerned about side effects) **Saw development of different private sector driven incentive models to encourage vaccination**. Some employers giving cash or 401K incentives (BRIA Health Services), paid time off (Aldi US) with others mandating vaccination as part of return to work (Norwegian Cruise Line)
		Incentivised vaccination through a "green passport": Offering vaccinated individuals ability to attend cultural events/restaurants 2 weeks after their second dose

Source: Expert interviews, Press search (further details in country case study and appendix sections of this document)

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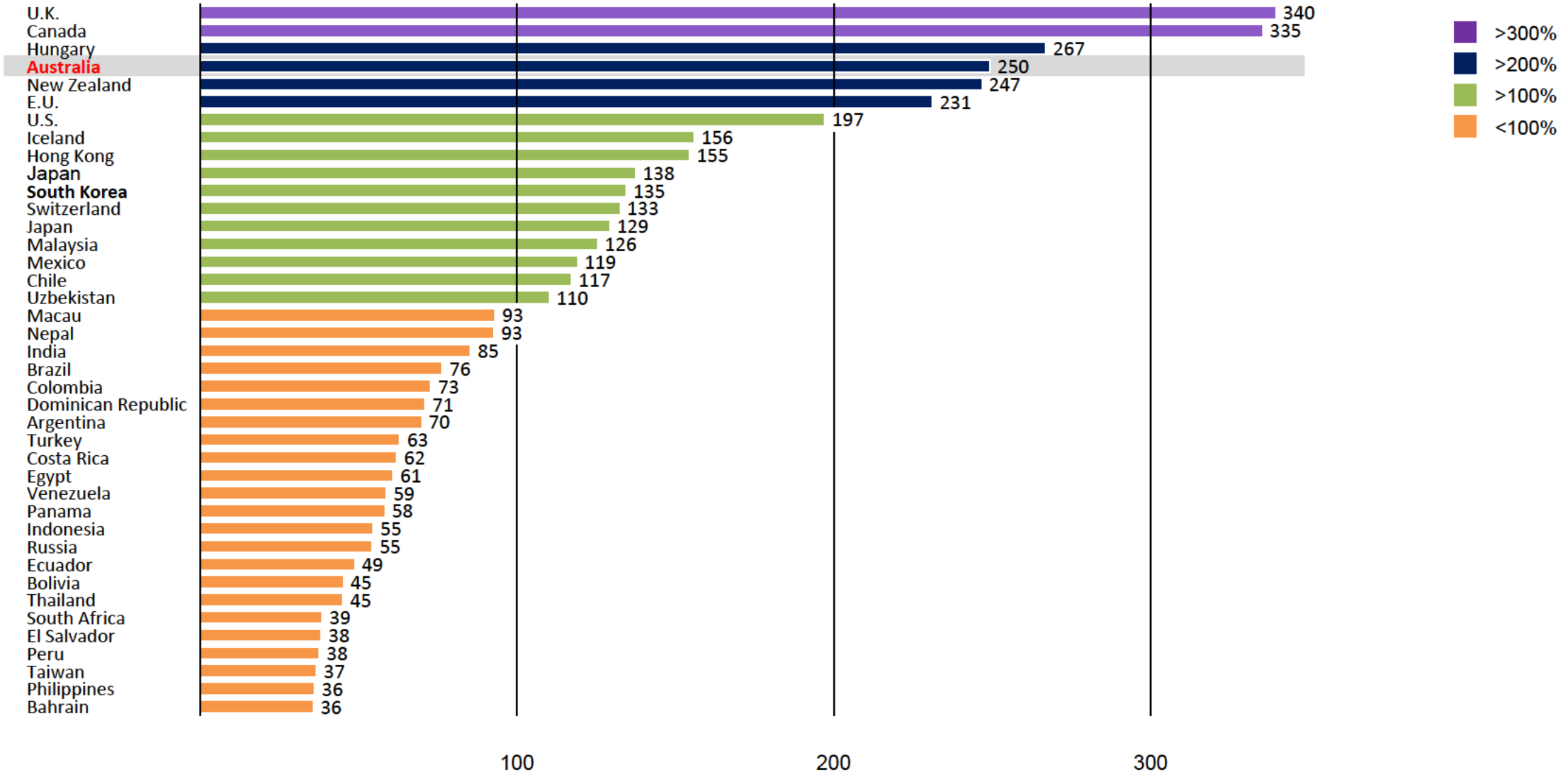
Updated 25/03

Many countries have purchased vaccines for >100% of their population

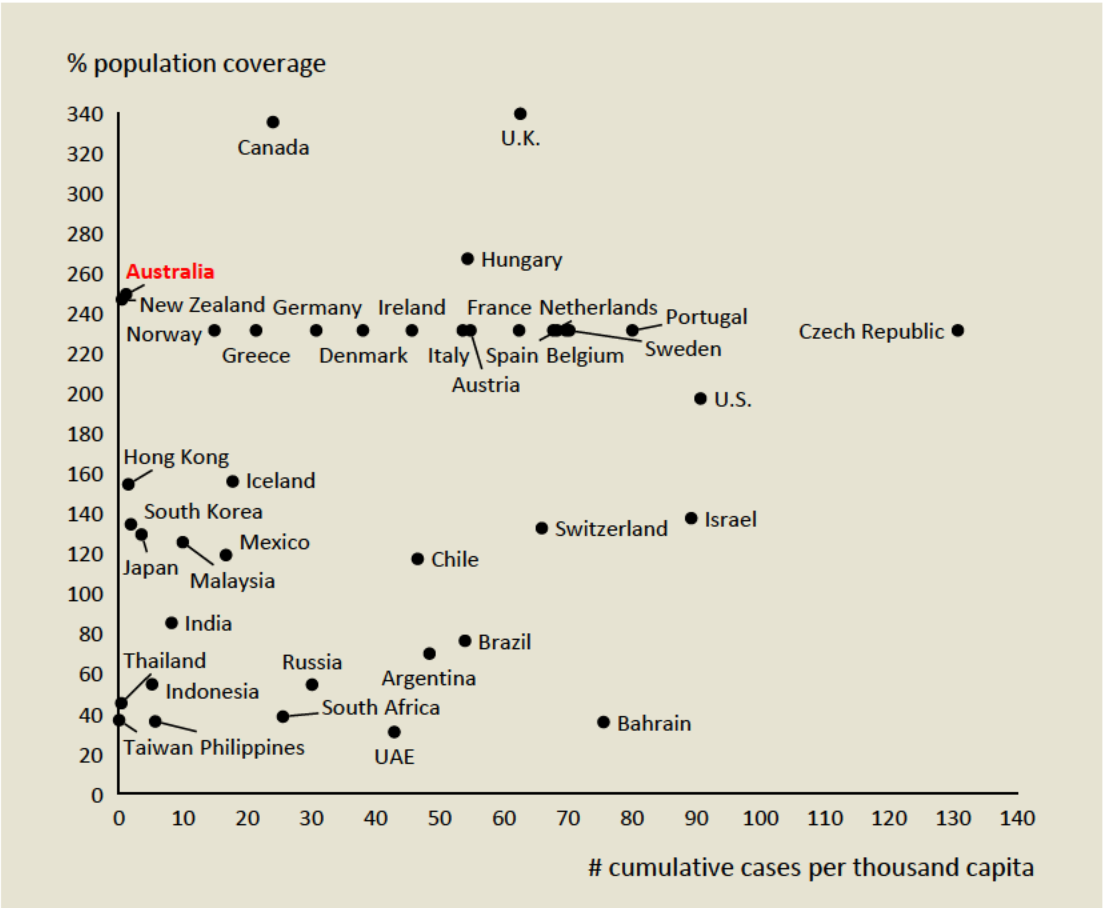
% population coverage, adjusting for number of doses required for each vaccine



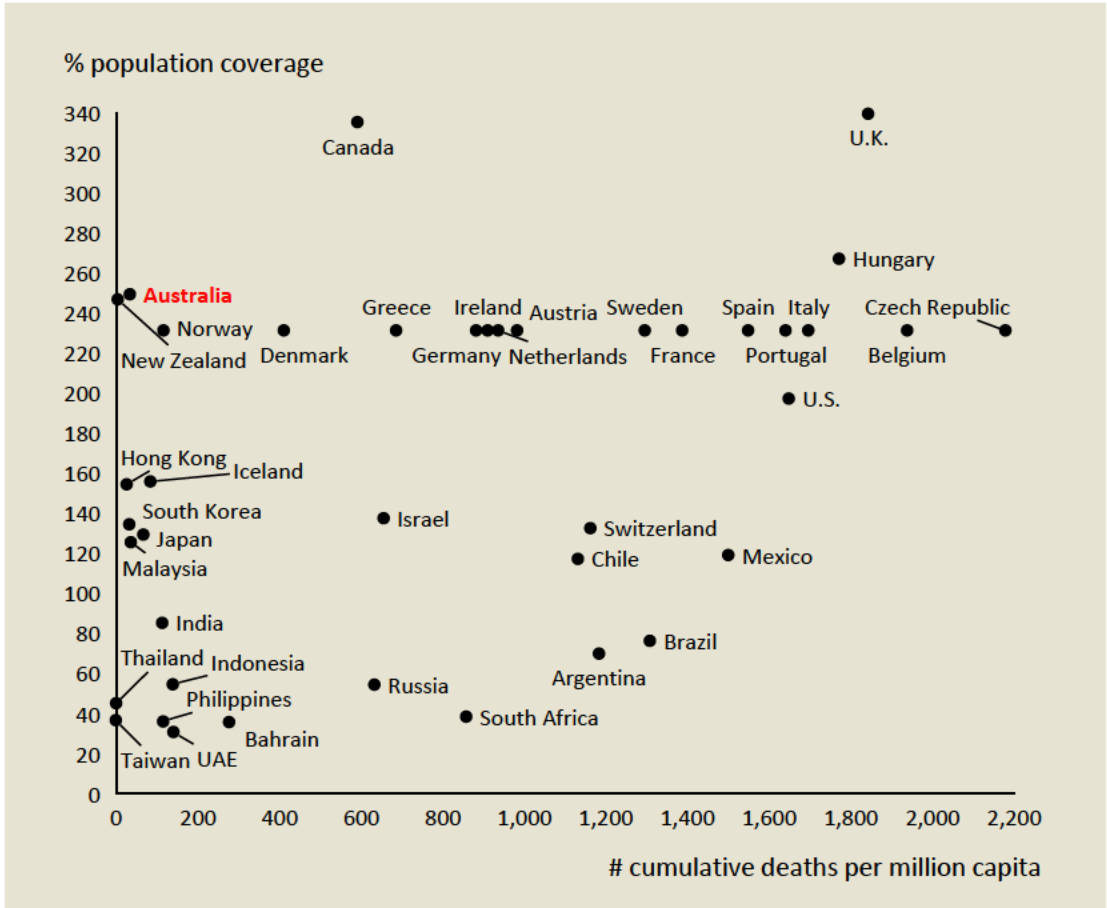
Source: Bloomberg L.P., latest available data (dates may differ between countries); top 40 countries shown (counting EU as a single country)

Purchased coverage does not clearly correlate with epidemiology

Purchased coverage vs cases



Purchased coverage vs deaths

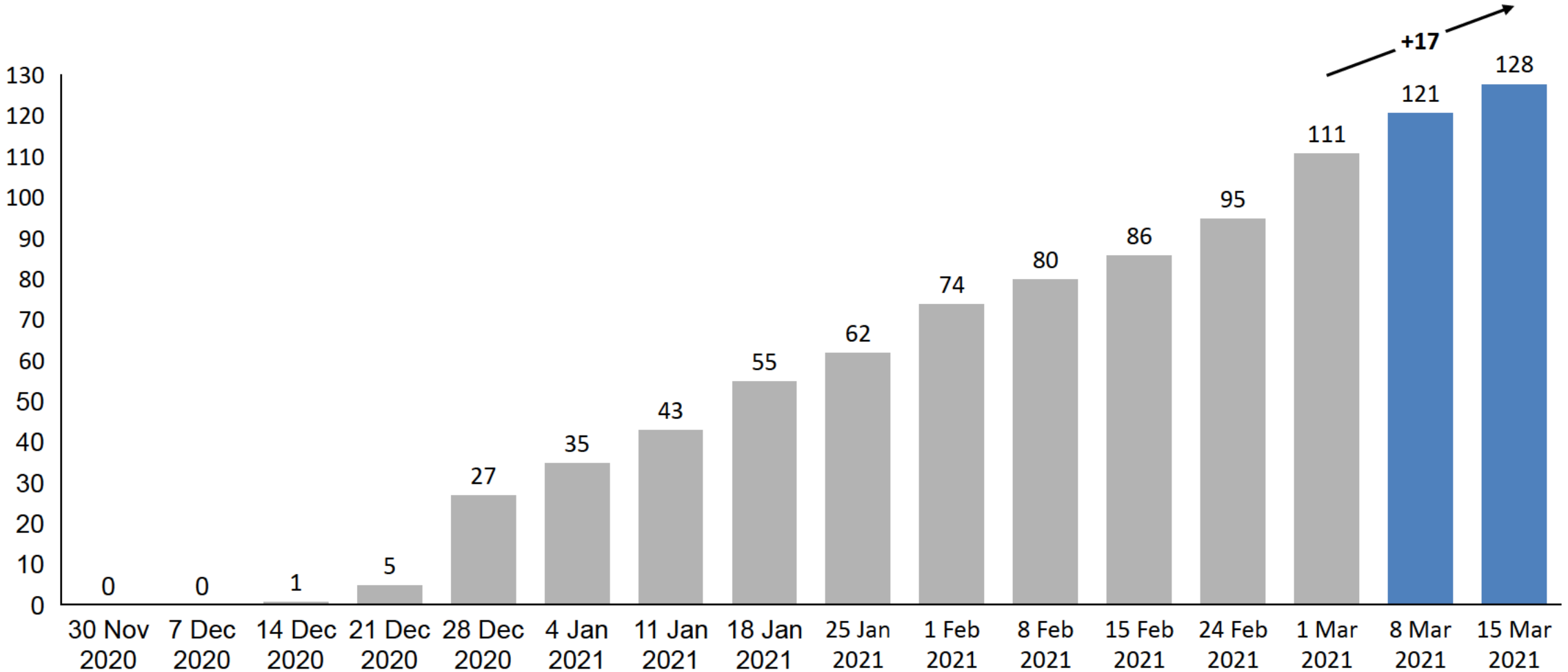


Source: Bloomberg L.P., latest available data (dates may differ between countries); Worldometer analysis/aggregation of real time COVID-19 data

Updated 25/03

128 countries have now commenced vaccine rollout

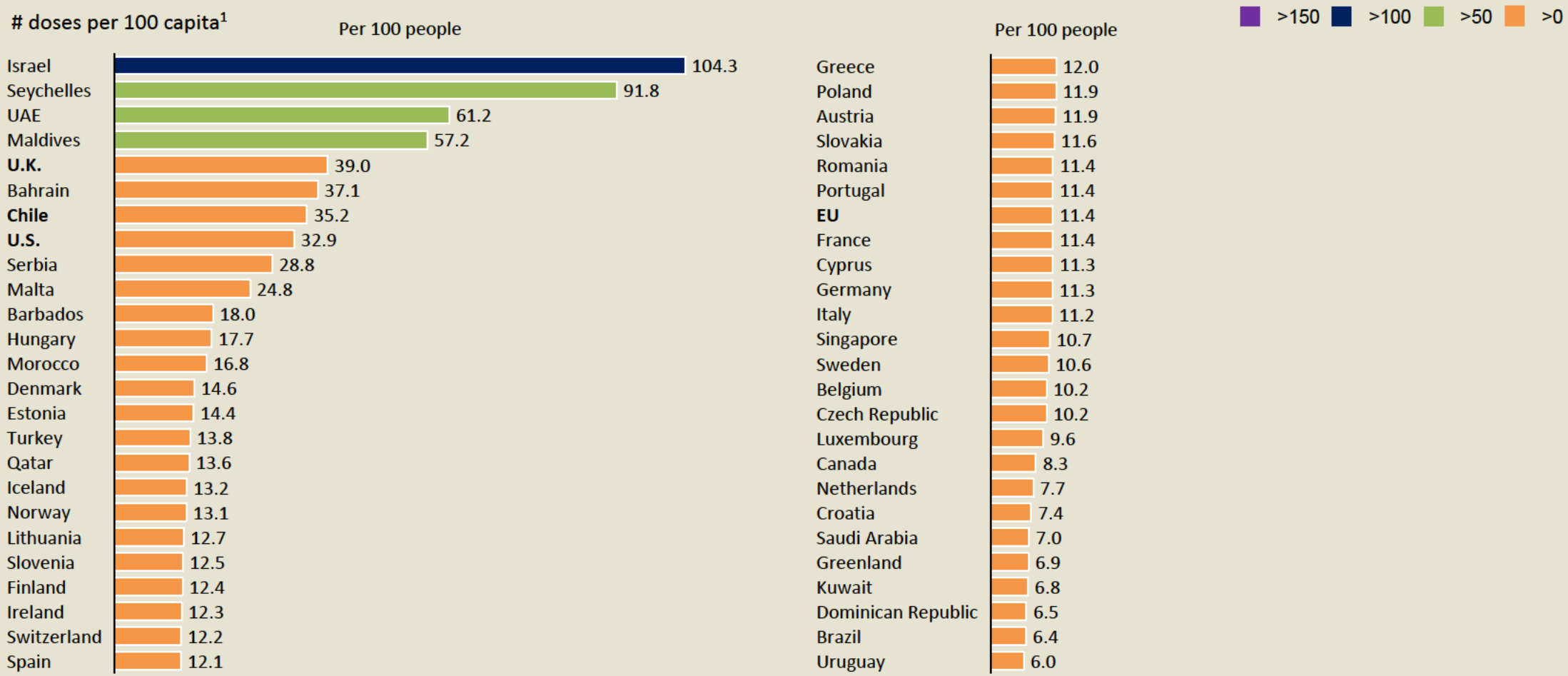
Cumulative number of countries vaccinating, by week



Source: Our World in Data COVID-19 dataset, number of countries with >0 total vaccinations

Updated 25/03

Countries such as Israel are ahead on total administered doses, despite lower purchased coverage



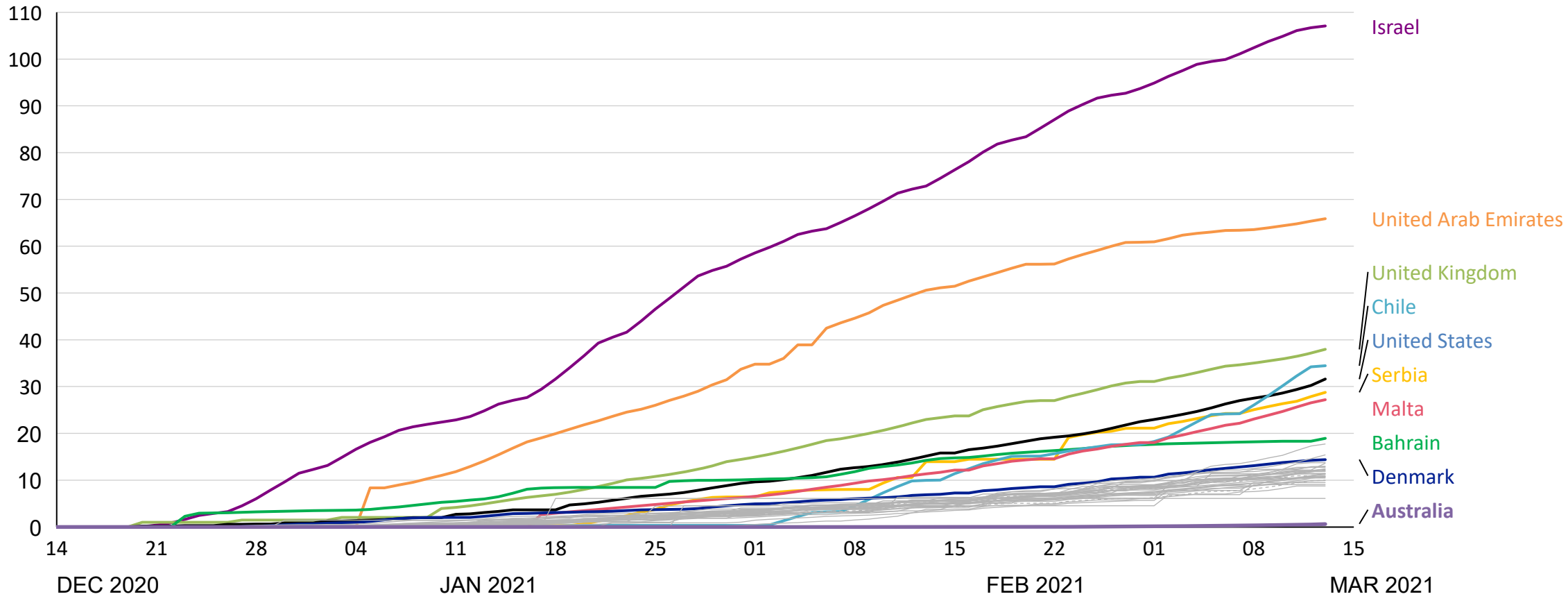
1. NB: this is counted as a single dose, and may not equal the total number of people vaccinated (e.g., where individuals receive multiple doses)

Source: Bloomberg L.P., latest available data (dates may differ between countries)

Ramp up speed is significantly different between countries

Updated 2

Total administered vaccine doses, # cumulative doses per 100 capita[1]



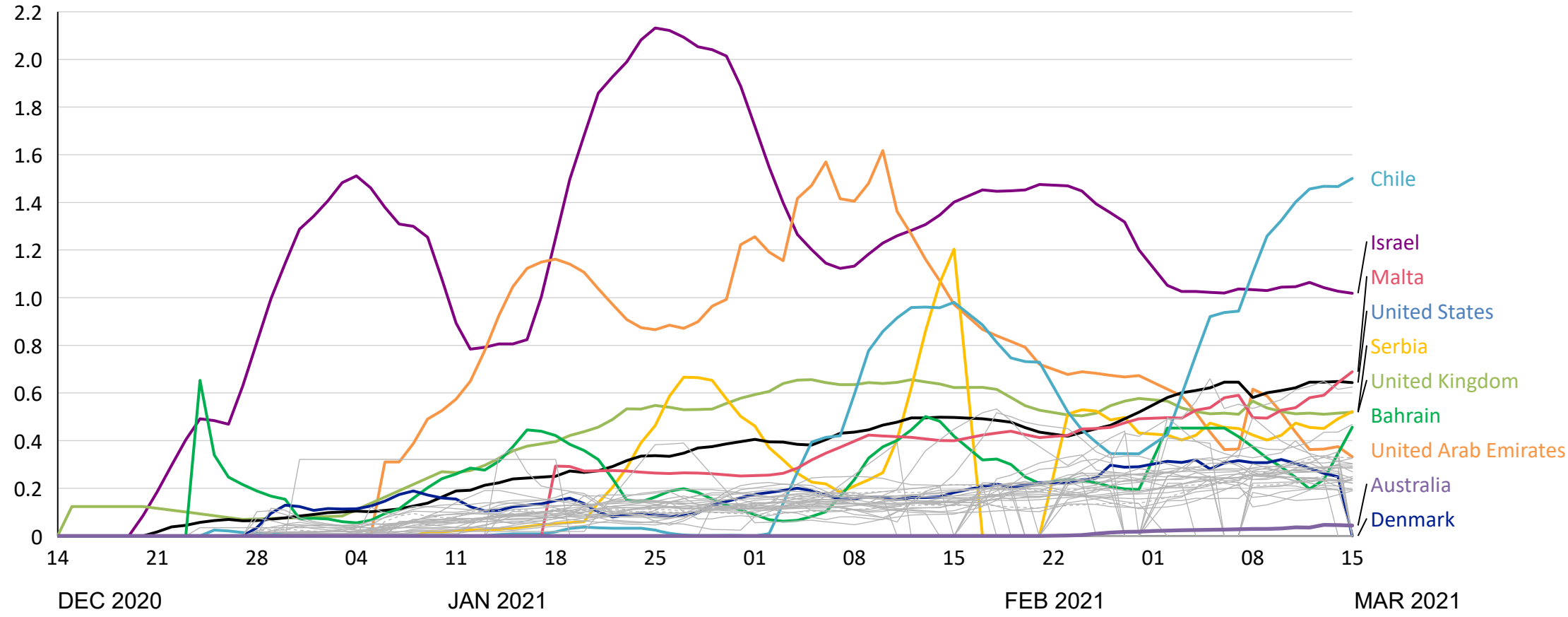
1. NB: this is counted as a single dose, and may not equal the total number of people vaccinated (e.g., where individuals receive multiple doses)

Source: Official data collated by Our World in Data. Dates refer to when the data was reported

Peak velocity in daily administered doses varies considerably across countries

Updated 2

Daily administered vaccine doses, # per 100 capita



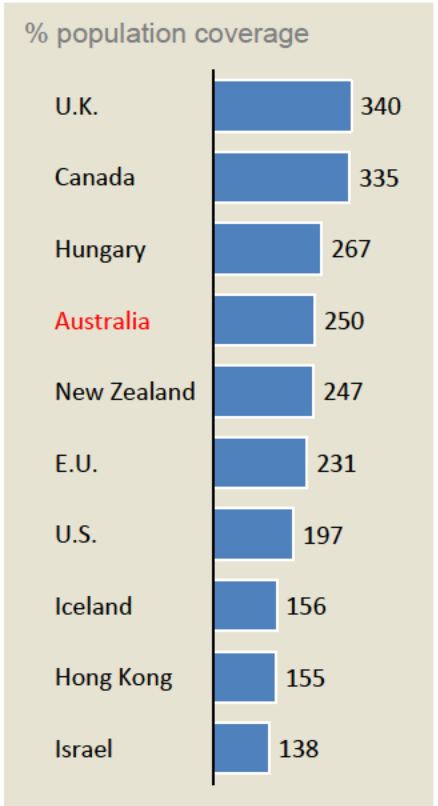
Source: Official data collated by Our World in Data. Dates refer to when the data was reported, smoothed on 7 day rolling average

Vaccination progress is dependent on a number of metrics

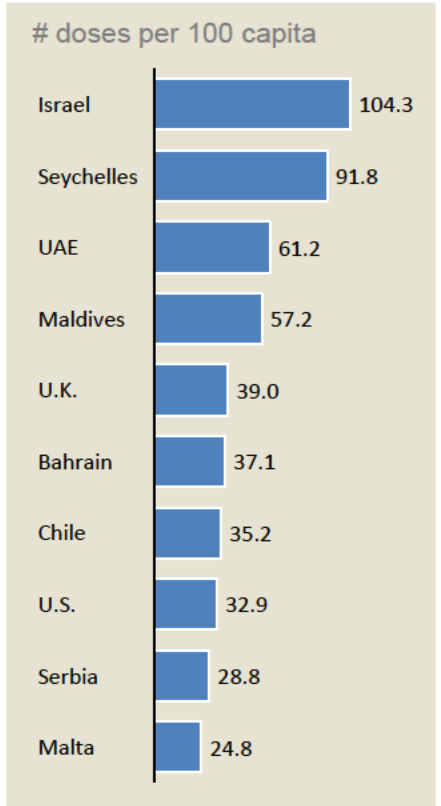
Updated

Per capita

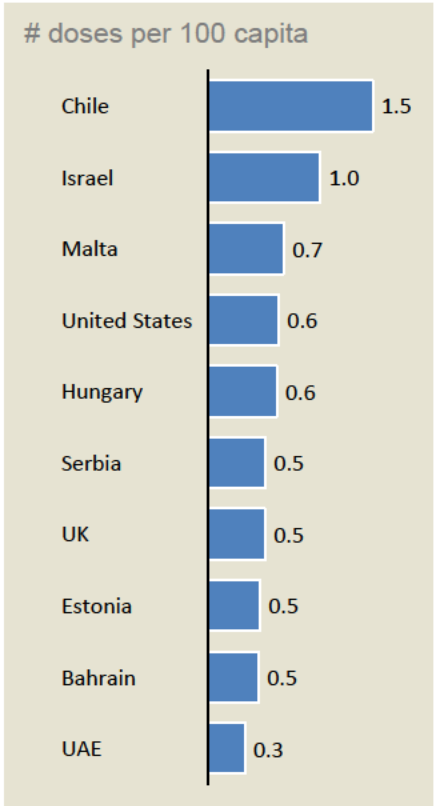
Total purchased coverage



Total administered

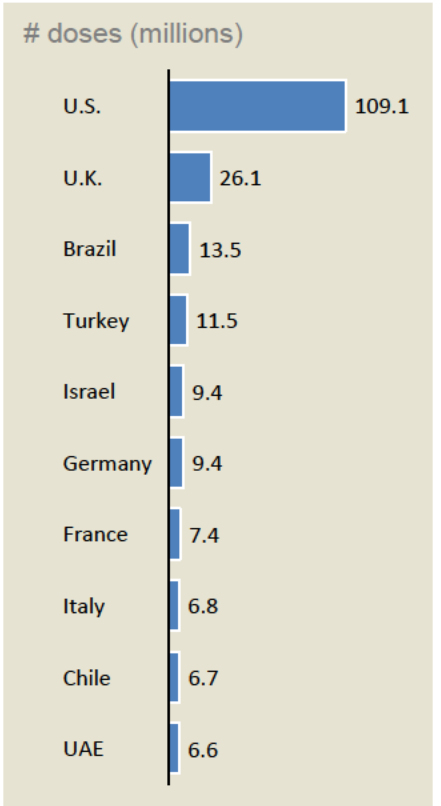


Current daily administered

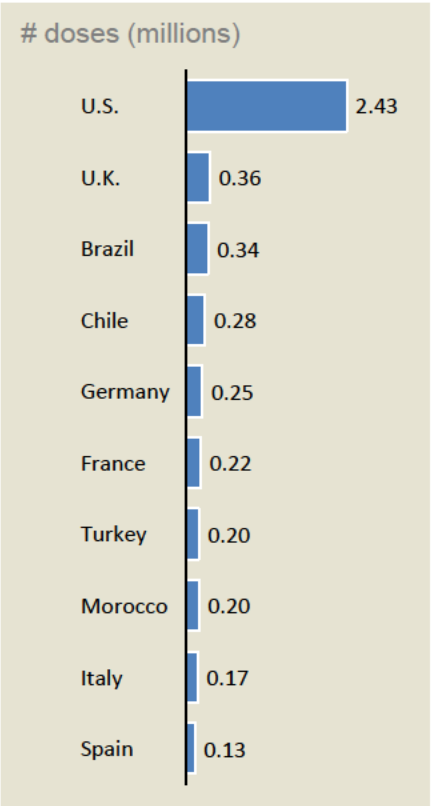


Absolute total

Total administered



Current daily administered

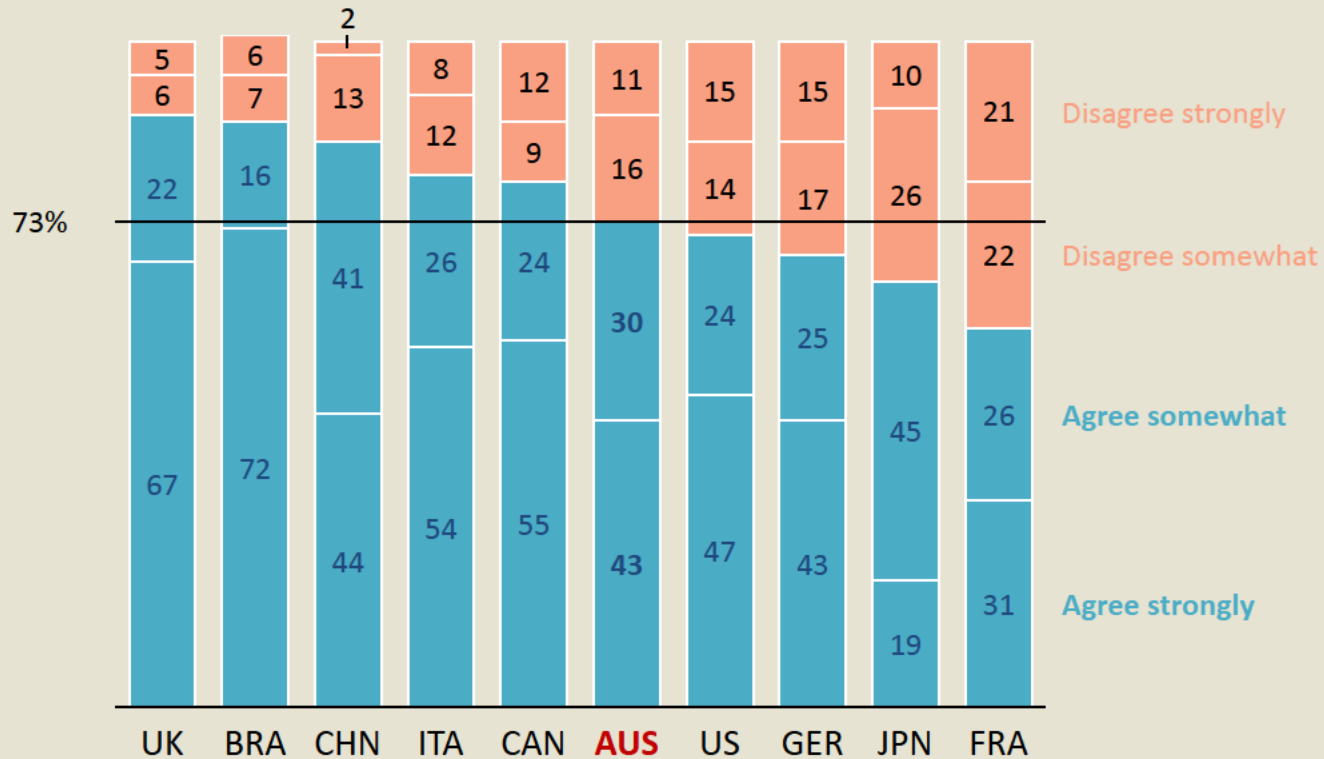


Source: Bloomberg L.P., latest available data (dates may differ between countries); Source: Official data collated by Our World in Data

Vaccine hesitancy may remain a challenge for Australia

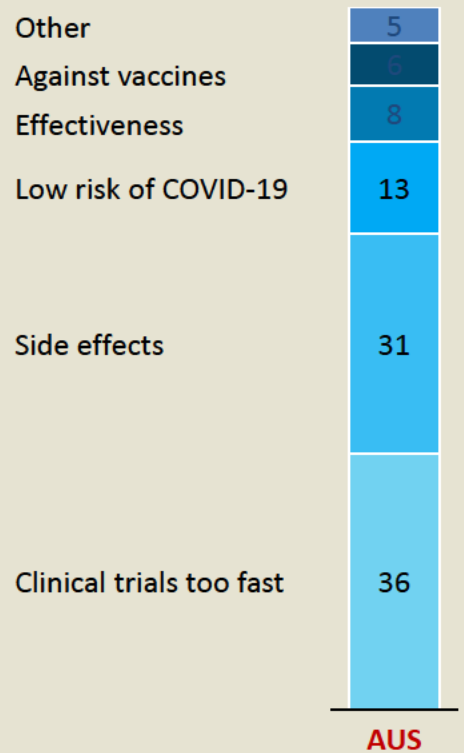
Agreement with "if a vaccine for COVID-10 were available, I would get it"

% of respondents, n = 12777 online adults



Concern about clinical trials drives hesitancy

Subset of respondents unlikely to get vaccine



Source: Ipsos Global Advisory survey January 28-31 2021 https://www.ipsos.com/sites/default/files/ct/news/documents/2021-02/global-attitudes-on-a-covid-19-vaccine-january-2021-report .pdf

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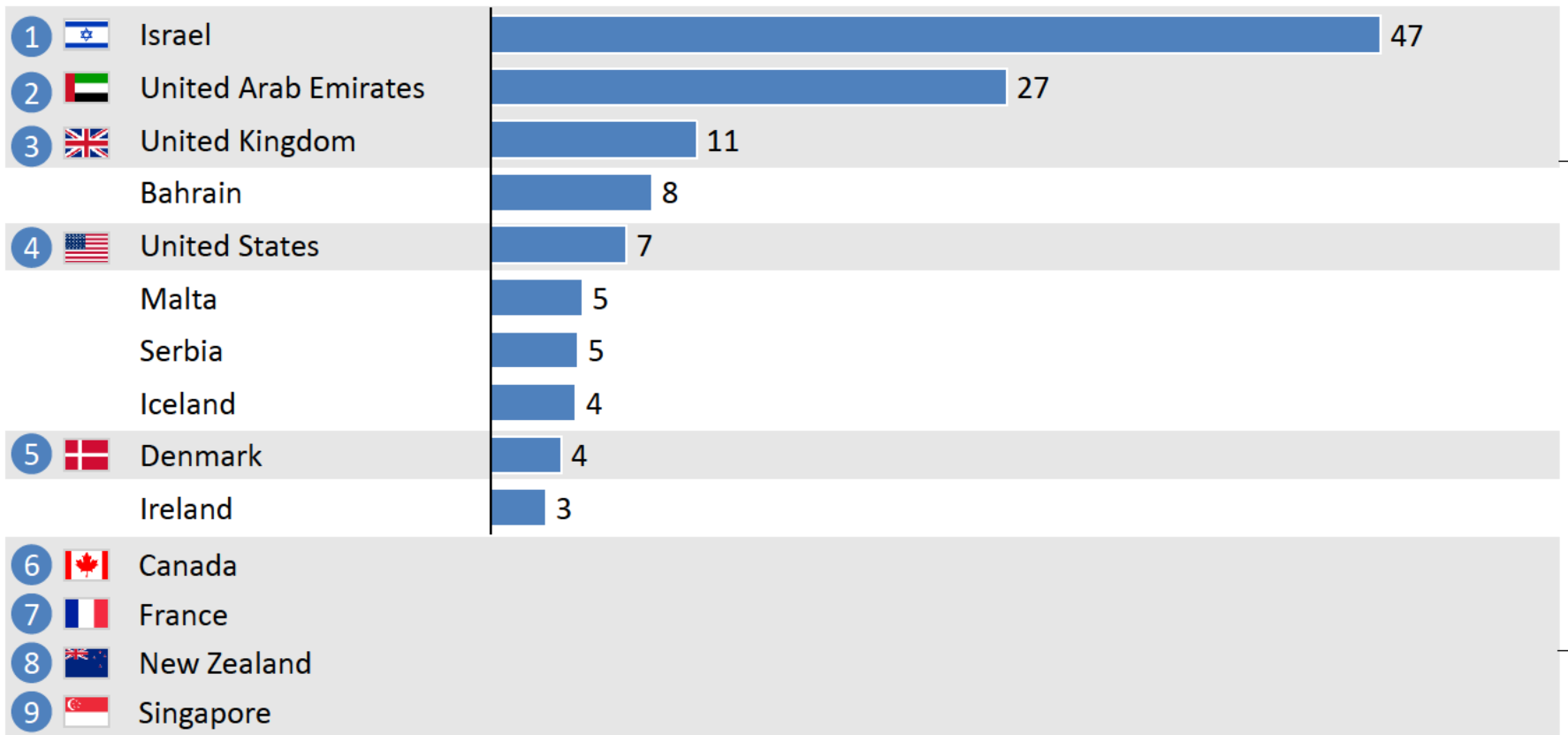
I Snapshot of countries phasing in and out of their major economic reform measure

Nine jurisdictions selected for priority deep dives

Current as of 27 Jan 2021
Not exhaustive (Illustrative Examples Only)

COVID-19 vaccine doses administered per 100 people (Top 10 countries), last reported data Jan 27, 2021[1]



1. Total number of vaccination doses administered per 100 people in the total population. This is counted as a single dose, and may not equal the total number of people vaccinated, depending on the specific dose regime (e.g. people receive multiple doses). Removed < 100k population e.g., Gibraltar, Seychelles, Bermuda

Source: Official data collated by Our World in Data, dates may differ between countries

Vaccination roll-out case example: Israel

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorized vaccines: Pfizer / BioNTech, Moderna[1]

Start date of first vaccine roll-out: Dec 19, 2020[2]

Percentage of population covered by purchased vaccines: 138%[3]

Number of doses administered to-date: ~4M[3]

Percentage of population given 1+ dose of vaccine: ~32%[4]

Historical flu vaccine coverage: 59.8%[6]

Reported consumer willingness to receive COVID-19 vaccine: 80%[5]

Source and manufacture

Purchased multiple vaccines early in the development process

- Purchased early access for Pfizer/ BioNTech vaccine; only vaccine distributed to date
- One of first countries to reach purchase agreement with Moderna (Jun 2020); not yet rolled out

Paid a premium for expedited delivery of Pfizer based on rationale of accelerating health and economic recovery

Distribute

Distribution by manufacturers to single centralised facility (SLE): small geographic footprint, no vaccination point > 3 hr drive

Used war room for logistics and allocation daily cadence

Disaggregate Pfizer boxes into smaller volumes to enable smaller sites to utilise delivered quantities

Distribute directly to vaccination endpoints: no intermediate locations

Administer

Leveraged existing and proven infrastructure to successfully and rapidly scale up (e.g. HMOs for coordinated distribution, digital health records / app). Scaled from average of 40k shots/day in wk1 to 165k shots/day by wk 5

~400 vaccination sites operational in 5 weeks, with plan to scale up to 1,200 sites, including mobile vans to reach peripheral towns

Systematic push to drive waste minimisation e.g., training videos on how to optimise syringe use shared with nurses via WhatsApp, flexibility for end of day walk-ins for leftover stock

Enable

High consumer uptake: a third of the population vaccinated in first 6 weeks

"Green badge" offered to enable gym/event/restaurant entrance and community leaders setting positive examples through live broadcasting and campaigns

Source: 1. Moderna, NYTimes 2. Reuters 3. Bloomberg 4. OurWorldInData 5. Assuta Medical Centres survey (published on Jerusalem Post, n=505, 17th – 18th Aug 2020) 6. Flu vaccination coverage for persons age 65+ from OECD;

Vaccination progress: Israel

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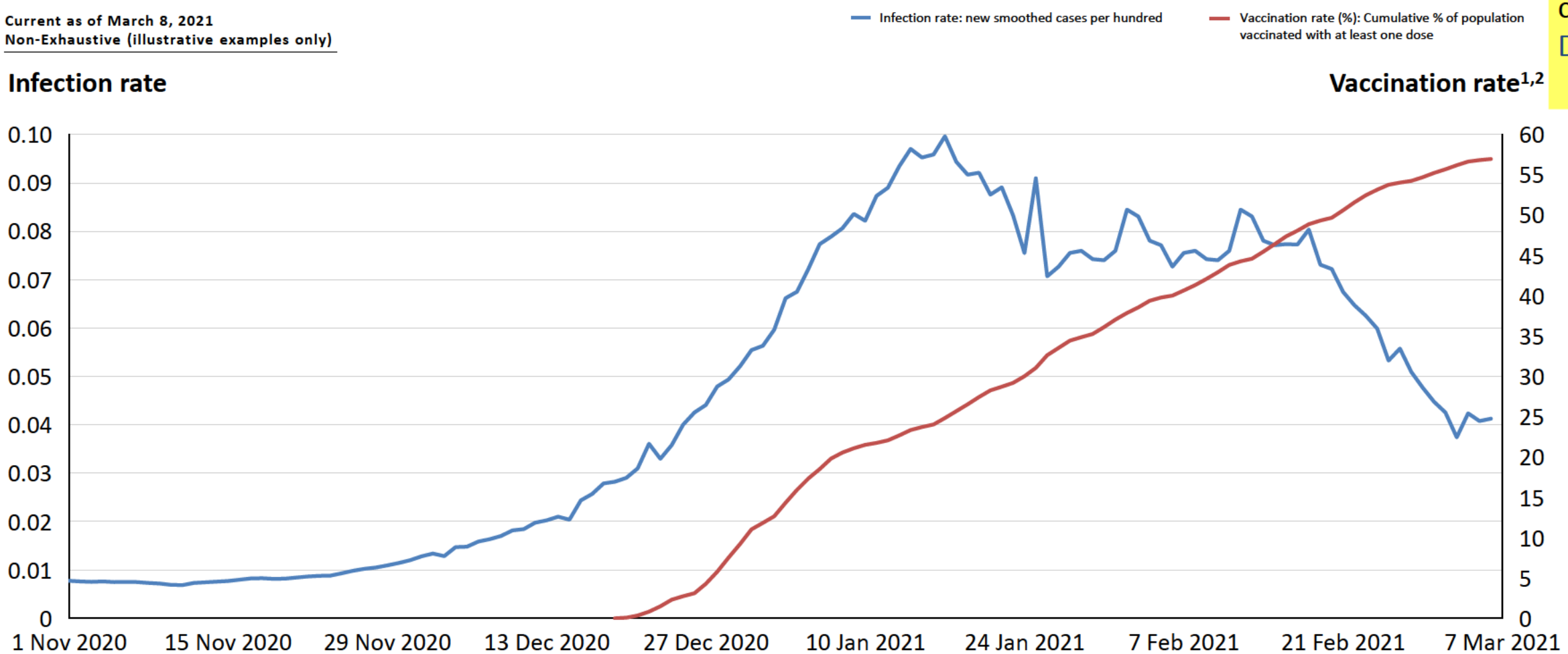
Current as of March 8, 2021
Non-Exhaustive (illustrative examples only)



1. Data interpolated where not available for vaccination rates (data set misses days)
2. Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World in Data

Deep dive: Israel (1/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 Transport and logistics	**Used strict daily cadence for logistics and allocation:** war room used with scheduled cadence of **10am)** requests received in war room from clinics (via Health Management Organisations - HMOs); **12pm)** War room completed allocation decisions; **5pm)** logistics team starts repacking; **5pm+)** Thawing occurs and deliveries are completed; **7am)** Vaccine staff commence preparation; **8am)** vaccination commences **All deliveries and orders managed via Excel:** HMOs collate excel orders at each site and send to war room; war room sends consolidated excel order to SLE. Existing B2B pharma logistics systems unable to be utilised due to constraints regarding inventory receipt and tracking **Repackage Pfzier / BioNTech vaccine into smaller pallet / box sizes at central facility** for further distribution; initially smaller pallet of 195 vials, now into micro-deliveries of 1, 5 or 10 vials
8 Administration Principles	**Continue to add and prioritise sub-groups:** ~40 people on a prioritisation committee, revised priority groups after the elderly (e.g., targeting senior high school students) **De-prioritised people with COVID-19 antibodies as evidenced by PCR test:** not required to receive the vaccine and automatically receive the "green card"; exception was in aged care homes where all residents received the vaccine **Vaccine rates lower for Arabs and Orthodox communities compared to general population**, however these groups have had higher rates of COVID. Given people with COVID antibodies are deemed as safe (i.e. get green card) the average across all cohorts is roughly the same **Allowed flexibility in prioritisation to maximise daily immunisation:** end of day 'walk-in' option (post 5pm) available to anybody, and proactive outreach via social media to fill remaining slots **Booked and reserved second dose at first vaccination,** to close vaccination loop within 3 weeks and ensure second dose not reallocated

Source: Reuters, The Government of Israel,, Expert Interviews

Deep dive: Israel (2/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9a Standing up vaccination points	**Leveraged proven infrastructure for rapid scale up:** drive-through testing clinics repurposed for vaccinations (with vaccine 'dry runs' in October 2020 using flu vaccine) **Variety of vaccination points utilised:** nursing homes, primary care clinics, pop-up and drive-thru clinics in parking lots and city squares. ~400 vaccination sites already open with plan to scale up to 1,200 sites, including mobile vans to reach peripheral towns **Challenges with utilisation of hospitals as vaccination sites:** overbooking, no shows and hospital sites not effectively utilising leftover vaccinations resulted in reduced emphasis of hospitals as vaccination sites Completed first dose vaccinations in ~700 nursing homes in 2 weeks
9b Operating vaccination points	**Immunisers instructed to extract 6 doses** from each Pfizer / BioNTech vial, reducing supply waste; achieving 5.7 doses at vaccination sites and 5.9 doses in hospital settings out of a Pfizer recommended 5 dose vial **New design syringe key to maximising dose extraction:** an improved syringe design that eliminates dead space at the top where the needle is added was rolled out at scale (replacing all old syringes) to increase average number of doses per vial by ~15% **Vaccination rates ~10-15 people per hour** (not including registrations / check-in and / or post-vaccination wait times) **Set aside 100% of stock for second dose shot** with daily or weekly readjustments of allocations for first shot based on supply received from Pfizer and what is required for second dose shots
9c Booking and patient experience	**Reached out proactively to eligible patients:** initial wave of SMS sent to 75+ year olds with pre-booked timing; those eligible for vaccinations are contacted by their HMO/personal GPs to book an appointment at their nearest clinic **Digital capabilities utilised** for appointment booking and immunisation recording, including easy to use apps

Source: NCBI, CNBC, Times of Israel, ABC, Expert Interviews

Deep dive: Israel (3/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9b **Managing performance**	**Clear KPIs utilised for daily performance management:** e.g., number vaccinated (split by first or second dose), days after first dose that second dose is received, breakdowns of no show reasons (e.g., quarantine, illness, etc.)
10 **Ongoing tracking and research**	**Utilise HMO systems,** including electronic medical files for all citizens **Mandatory reporting of patient's vaccine administration into national vaccination registry:** used to monitor progress of the coronavirus vaccine program and remind people (via email or text) when they can receive their second shot
11 **Workforce management**	**Supplemented government operations with military and voluntary workers.** engaged MDA (Red Cross equivalent) and United Hatzalah (medical group) – primarily for logistics/outreach to remote communities (e.g., mobile vaccination team on motorcycles with approved fridges on the back responsible for home vaccination)
16 **Communi-cations (public outreach)**	**Incentivised vaccination through a "green badge":** Offering vaccinated individuals access to a "green badge" enabling them to attend gyms/cultural events/restaurants 2 weeks after their second dose; accessed via a standalone smartphone app (or paper copy for communities such as the Ultra-orthodox community) **Encouraged elderly people to get vaccinated through 1+1 bonus:** Strategy used in East Jerusalem which allows elderly people to bring a young person with them to get vaccinated **Thought leaders promoting a positive message:** Prime Minister received vaccination on live television; leveraged use of community leaders (e.g., religious) to promote message that vaccination is safe; Justice Ministry launched an active campaign against anti-vaccine content, with 4 Facebook accounts closed for "deliberately mendacious content designed to mislead about coronavirus vaccines"

Source: The Atlantic, The Times of Israel, The Times of Israel, Expert Interviews

Vaccination roll-out case example: United Kingdom

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorised vaccines: Pfizer / BioNTech, Oxford / AZ, Moderna[1]

Start date of first vaccine roll-out: Dec 8, 2020[2]

Percentage of population covered by purchased vaccines: 302%[3]

Number of doses administered to-date: ~7.3M[3]

Percentage of population given 1+ dose of vaccine: ~10%[4]

Historical flu vaccine coverage: 72%[6]

Reported consumer willingness to receive COVID-19 vaccine: 86%[5]

Source and manufacture

Centralised procurement by Public Health England

Negotiated ~355m doses across seven different suppliers, three of which are manufactured in the UK)[1]

Distribute

Centralised distribution, coordinated by the National Health Service (NHS)

Vendor providing distribution service to hospital sites for first phase

Utilising existing vaccination logistics systems, with only one vaccine type allocated per site

Administer

Adopted posture of delayed second dose: delayed second dose from 3 wks to 12 wks in order to increase reach of first dose

Outreach program via mail: target population received invitation letter to make booking via NHS website

Utilised mix of vaccination sites to accelerate throughput: primarily local sites (and GPs), Hospital Hubs and some large vaccination sites

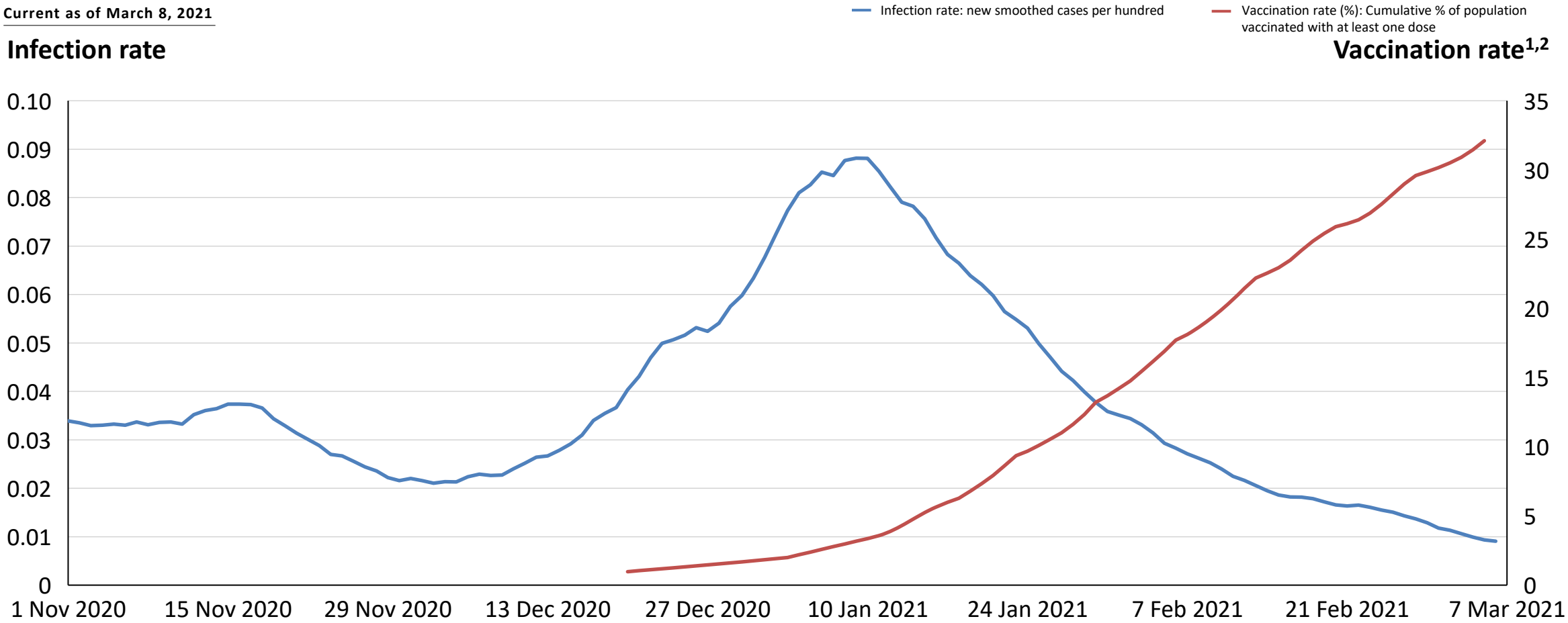
Enable

Publicly available online training and in-person assessment/supervision provided to vaccinators

Community engagement supported by local authorities and minority groups

Source: 1. UK, UK, UK , UK 2. BBC 3. Bloomberg 4. OurWorldInData 5. Consumers who "strongly" or "somewhat agree" to statement "If a vaccine for COVID-19 were available, I would get it" from "Ipsos Global Consumer Survey 2021" 6. Flu vaccination coverage for persons age 65+ from OECD; BBC, BBC, UK, FiercePharma

Vaccination progress: United Kingdom



1.Data interpolated where not available for vaccination rates (data set misses days)
2.Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World in Data

Deep dive: United Kingdom (1/4)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Both frozen and thawed vaccine products transported:** Pfizer performing vaccine logistics to major transport hubs and wholesalers (used for redistribution around country) to speed up logistics and drive best practices in vaccine handling. Vaccines are either delivered (a) directly to hospital hubs frozen, (b) thawed and given to GPs or (c) given to care homes by being packed into smaller boxes with dry ice Transport hubs have a daily distribution schedule, with sites receiving average of 1 delivery per week Hospital hubs also transporting to their satellite locations (defrosted), or in mutual aid circumstances (e.g. local GPs short on supply) – this outreach transport requires some additional processes involving Chief Pharmacist signoff Hubs receive "pizza box" packages daily; **unpacked manually with temperature data downloaded from each box** before being distributed to authorised sites **to maintain cold storage integrity** **Initially used Pfizer in care homes but later pivoted to AstraZeneca** due to the logistical complexity of transporting thawed Pfizer vaccine to these sites
8 **Administration Principles**	**Focus on rapid reach of first dose protection** in the context of limited supply. GPs and sites cancelled second dose appointments, and rescheduled to 11-12 weeks post first dose (compared with 3 weeks as per manufacturer recommendations) **Tightly centralised focus on priority populations:** goal to ensure priority groups receive first dose opportunity before mid February (residents in care homes, frontline health and social care workers, clinically extremely vulnerable individuals and ages 70+). Sites that vaccinate outside priority populations risk of losing future dose allocation **Occupation-based prioritisation under discussion,** post 'at risk' groups vaccinations (e.g., police officers, teachers, cleaners)

Source: UK UK; NHS, BBC, Expert Interviews

Deep dive: United Kingdom (2/4)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9a **Standing up vaccination points**	**Three primary site types:** Targeting (a) 206 hospital hubs, (b) 1,200 local, community-based vaccination centres (including GPs) (c) 50 larger vaccination centres in operation by end January, with government as the sole operator of the three vaccination site types **GPs able to ramp up almost immediately** (as premises already set up for vaccinations); dedicated vaccination sites starting at ~25% of planned capacity, ramping to 100% over two weeks (due to set up of infrastructure, and new site 'teething issues') **Developed standardised design for vaccination 'lanes':** equipment, personnel and workflow designed at lane level. All vaccination points are comprised of a number of lanes, dependent on site size and vaccination needs in the area. Standardised units have enabled flexibility to rapidly set up, scale-up and scale down **Government provision of infrastructure to GPs enrolled in program:** with fridges and laptops and other equipment for roving visits to care homes and house-bound patients
9b **Operating vaccination points**	End-to-end flow at vaccination sites includes arrival and check-in, clinical assessment, delivery of vaccination, record updating and station wipe down **Patients instructed not to arrive until 5 minutes before appointment**: consent and documentation able to be completed in 5 minutes before administration **Average delivery of vaccine dose takes ~ 5-6 minutes;** more time with elderly and less time (~3-4 minutes) with young and fit people **Observed that throughput varied based on number of deliveries.** Vaccination points expecting a second delivery in a week typically completed ~1,000 vaccination within 2 days vs 3.5 days for those not expecting a second delivery **High-risk staff from the hospital use up any left over doses** to ensure no vaccine wastage **Waste typically low:** GPs in particular have performed well in using all allocated vaccinations, even going to roaming the streets with leftover Pfizer at the end of the day, if needed

Source:UK; The Independent; The Telegraph; BBC Expert Interviews

Deep dive: United Kingdom (3/4)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9c **Booking and patient experience**	**Geo-spatial data used to proactively identify priority groups to plan network of vaccination sites;** letters sent to all eligible residents within 45 min driving radius; there was some double up with outreach as GP practices simultaneously reached out to patients on their registries **Centralised booking system rolled out December 2020** to manage appointment bookings for Vaccination Centres and Community Pharmacies (GP practices used individual scheduling systems for their regular patients)
9d **Managing performance**	**Rivalry between GPs has encouraged high performance:** Informal Twitter competitions encourage vaccinators to maximise number of doses per vial **Early challenges in determining accuracy of productivity and waste data** with many sites are getting more than 5 doses per Pfizer **Vaccination performance variability driven by demand expectation:** hospitals or clinics expecting a second delivery in a week typically complete ~1,000 vaccination within 2 days vs 3.5 days; planning delivery ahead of time allows clinics to book in more patients **Qualitative tools used to improve data picture:** used one off survey and stock take of inventory levels, to fill data gaps
10 **Ongoing tracking and research**	**Mandatory immunisation reporting to national register and self reporting for post-vaccination events**: mandatory reporting into National Immunisation Vaccination System (NIVS), requisite technology provided to all sites for free **Linked clinic reimbursement to recording vaccination data** in the national register to incentivise same day data entry

Source: UK, Pfizer, Expert Interviews

Deep dive: United Kingdom (4/4)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
11 **Workforce management**	**Private sector supported workforce** with 30,000 volunteers including non-conventional workforce (e.g., airline staff, students, retired health care professionals) recruited and trained for ancillary roles in the vaccination process; recruitment campaign under the slogan "Your NHS needs you". NHS working with St John Ambulance as well as other voluntary groups to help coordinate the training and deployment of volunteers **Military support enlisted**, for supply chain, site logistics expertise (e.g., site set up) and additional medical support teams (e.g., to boost capacity of sites with unexpected staff shortage) **Bonus for GPs:** receive £10-30 bonus for every patient vaccinated in care homes, with higher bonus in achieving for earlier timeframes
16 **Communi-cations (public outreach)**	**Community champions for Black, Asian and Minority Ethnic (BAME) groups** responsible for getting vaccinations live on television and have been driving vaccination centre set up in mosques, temples, and other areas where people may be more hesitant **Public figures promoted vaccines:** Buckingham Palace released official statements promoting the Queen and Duke of Edinburgh receiving their vaccines

Source: UK, NHS, NHS, The Independent; British Medial Association, ABC, Expert Interviews

Vaccination roll-out case example: United States

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorised vaccines: Pfizer / BioNTech, Moderna[1]

Start date of first vaccine roll-out: Dec 14, 2020[2]

Percentage of population covered by purchased vaccines: ~169%[3]

Number of doses administered to-date: ~24.5M[3]

Daily cases (7 day moving average): ~166K[4]

Weekly new hospitalisations (as at 17 Jan 2021): ~27K[4]

Percentage of population given 1+ dose of vaccine: ~6%[4]

Historical flu vaccine coverage: 69%[5]

Reported consumer willingness to receive COVID-19 vaccine: 63%[6]

Source and manufacture

States planning for vaccine shortages: disruptions to Pfizer availability and uncertainty on timing of approvals for AstraZeneca and Johnson and Johnson has led to uncertainty on supply. Several jurisdictions have stood up workstreams to model different levels of supply (i.e., high and low cases) and implications for vaccine delivery (i.e., which sites scale up/down, turn on/off)

Some states have unsuccessfully lobbied vaccine producers to contract their own supply directly[7]**:** vaccine procurement for all states managed centrally by Federal Centers for Disease Control and Prevention

Distribute

Clear Federal guidelines for prioritisation and allocation of vaccines **with State discretion** to manage distribution and allocation at a county level

Increased focus on throughput: allocation to states based on size of elderly population as well as how quickly it can administer shots[8]

Clear weekly cadence to simplify logistics: order, receive and vaccinate on set days, minimising coordination complexity

Administer

State allocations primarily driven by portion of target demographic within each county (supported by geospatial data); and ability to handle vaccine types i.e., sufficient cold storage capability

States are setting performance targets for each site (e.g., 100% of vaccination usage expected within 3-7 days of arrival)

Wide variation in "burn rate" across US states (% shots administered / delivered): average of 61% across the country, high performing states achieving 80-90%[9]. Key drivers for variation are decisions re. site mix and ability to scale up rapidly.

Flexibility in vaccination prioritisaition and scale **driving step change in performance,** with some sites acheiving 4 – 8 minutes per vaccination

Varying mix of sites mix; **at least one State planning for mass vaccination sites to drive majority of volume**

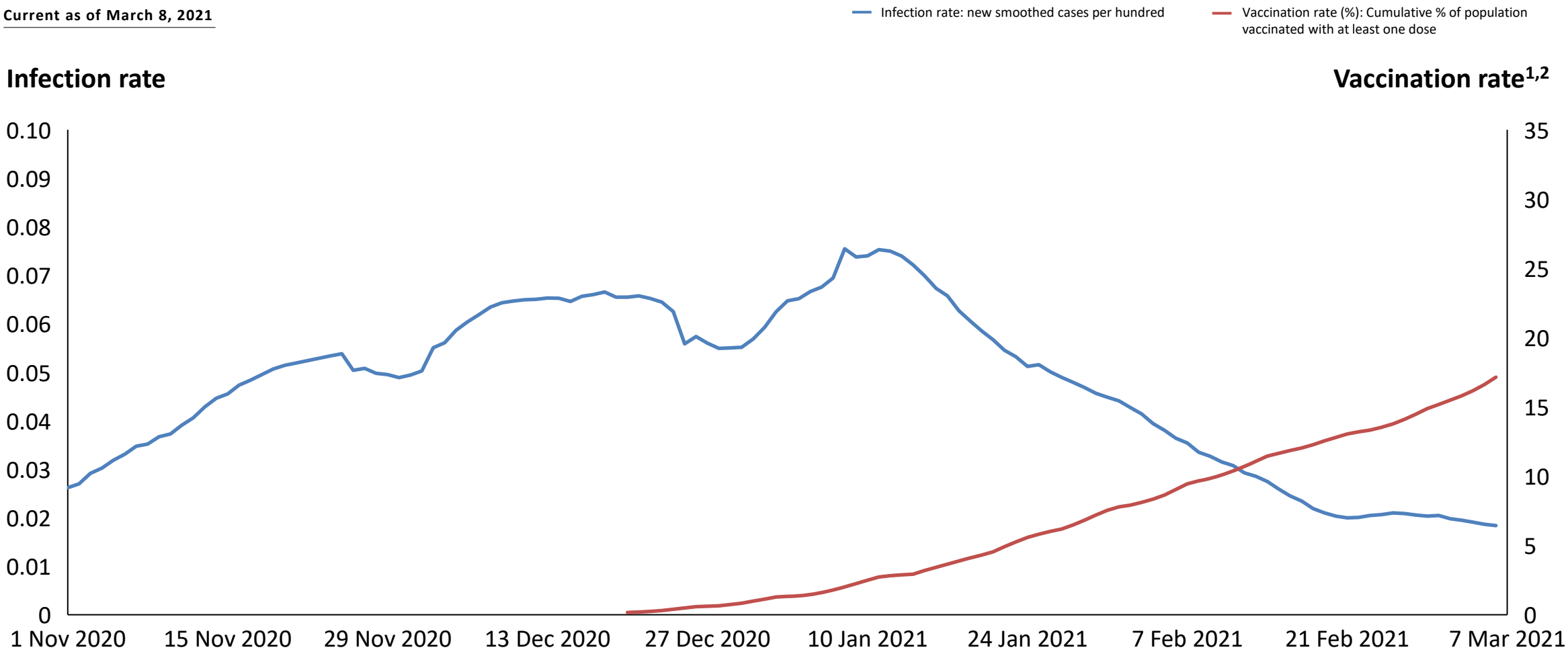
Enable

Delays in setting up centralised systems for states has resulted in decentralised model for bookings etc. – with local healthcare providers and counties using their own systems

Surveying eligible populations to understand drivers of vaccine refusal **yielded three clear segments** correlating to prior flu vaccine related surveys: ~40 likely to be vaccinated, ~40% unsure and ~20% unlikely to be vaccinated

Source: 1. CDC; 2. BBC; 3. Bloomberg; 4. Our World In Data; 5. Flu vaccination coverage for persons age 65+ from OECD; 6. Consumers who "strongly" or "somewhat agree" to statement "If a vaccine for COVID-19 were available, I would get it" from "Ipsos Global Consumer Survey 2021" 7:NBC 8: CNBC 9: Bloomberg; Expert interviews

Vaccination progress: United States



1. Data interpolated where not available for vaccination rates (data set misses days); 2. Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World In Data

Deep dive: United States (1/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Domestic transport**	**Developing scenarios for logistics planning due to uncertainty** in Pfizer vaccination deliveries and approval timeframes for AstraZeneca and Johnson & Johnson vaccines**; e.g., Low)** Assumes that Pfizer and Moderna catch-up to commitments commencing from June 30, J&J and AstraZeneca only receive FDA approval in June; **High)** Pfizer and Moderna will catch up to commitments in March, J&J and AstraZeneca will receive approval mid-February. Resulting plans will affect State decisions on distribution logistics planning, site workforce, booking availability and allocation of second doses **Many states have simplified logistics**, ("order doses Monday, get them Tuesday, use 100% over Wednesday to Friday"), to reduce complexity in distribution through counties and multiple health districts
8 **Prioritisation**	**Clearly published Federal guidelines for prioritisation phases, with most states still in first phases** 1A) Long term care facilities, assisted living facilities, health care personnel; 1B) First responders, ages 70+, K-12 school personnel; 1C) Ages 60+, Ages 16+ with CDC highest risk C19 risk conditions, all essential workers; Ages 40+; Ages 16+ 4) Children under age 16 if vaccine approved **Given early stages of rollout there has been limited details shared regarding targeting of specific cohorts** in 1C beyond essential workers (e.g. transportation, prison staff). There have been reports of challenges targeting occupations (i.e., difficult to reach and establish eligibility). California has recently announced a simplified prioritisation framework based on age rather than occupation[1] **Smokers prioritised as a high risk group in New Jersey and Mississippi:** prioritising smokers over essential workers such as teachers has triggered strong community response[2] **States have discretion on how they allocate doses between counties:** some states are allocating 1) to counties based proportion of their target demographics e.g., aged care residents within each country; 2) Pfizer to sites with sufficient cold storage capability; 3) Moderna to sites with small volumes; however **in general are following the Federal guidelines[3]** **States are setting performance guidelines for each site to follow,** with some considering reallocating unused vaccines or reducing second dose volumes • One State has mandated all vaccine providers must administer doses received within 72 hours otherwise the State plans to move unused doses to another site • Another state has mandated Hospitals must administer 70% of the vaccines within 3 days of vaccine receipt and 100% within 6 days otherwise they will not receive subsequent allocations • A third State has asked sites to prioritise 2nd dose requests over first dose and performing allocations accordingly

Source: 1: LA Times 2: Washington Examiner; 3. Kaiser Foundation comparison of US State adherence to Federal guidelines Expert Interviews

Deep dive: United States (2/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9a **Standing up vaccination points**	**Many states are utilising a combination of vaccination site types**: mass and pop up vaccination sites, GP clinics, elderly homes and pharmacies **Scale has been important factor in achieving high performance with larger sites** typically able to achieve greater throughput due to space availability for additional staff and waiting areas; As an example one stadium based vaccination site is achieving ~4 minutes per vaccination dose, and acute hospitals have been achieving up to ~1000 vaccinations per week vs non-acute 300 vaccinations per week; with **at least one state focusing on large vaccination sites**, expecting that these will drive the bulk of vaccination volume
9b **Operating vaccination points**	**Retail pharmacy performance varies significantly by size**, set-up and opening days, ranging from ~10 to 200 vaccinations per day. West Virginia has opted to use small / local pharmacies instead of large pharmacy chains; the local knowledge and relationships of the smaller pharmacies was a key factor in this state becoming the first state in the US to offer vaccinations to all of its nursing home residents[1] **Policy choices around prioritisation has been a large driver of variation in speed of vaccination roll out across states;** those achiving higher rates of total vaccines administered are encouraging end of day walk-ins, oberving less strict adherence to age brackets e.g., vaccinating 74 year olds when priority group is 75+, and less strict on eligibility checks for profession based vaccination prioritsation **Pre-registration of priority occupation groups** (e.g. aged care workers, prison staff) is helping to inform planning of early sites **Weekly vaccination throughput estimates have been published by the CDC** by site type[2]: • Hospitals: 600 • Doctor offices and clinics: 400 • Health department: 680 • Workplace: 120 • Chain pharmacies: 470 • Supermarket pharmacies: ~380 • Mass merchant pharmacies: 420 • Independent pharmacies: 330
9c **Booking and patient experience**	**Almost all jurisdictions have decentralised appointment bookings** using a range of channels including call centres, booking sites and walk-ins to schedule vaccinations. This has given rise to need for 'appointment scrapers' – essentially code that scrapes various booking tools for available appointments and centralises them for consumers to view, Alaska posted the code for public consumption in GitHub. **Consent and basic eligibility checks completed online** (to reduce time required on site for vaccination)**;** medical questions asked on site at vaccination appointment due to confidentiality concerns

Source: 1: Brookings 2. CDC; Expert interviews

Deep dive: United States (3/3)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9d **Managing performance**	**States are leveraging both externally published and internal stakeholder dashboards** on vaccination performance 1. Actively monitoring throughput/performance of each site and performing subsequent allocations based on performance; 2. Actively calling sites to share best practices and understand what else could be improved; 3. Working with sites to vaccinate beyond their premises e.g., Some hospitals are running vaccinations at the hospital and mass vaccinations sites; 4. Setting up clear channels for knowledge sharing including allocating a vaccination channel manager per site type of health district
10 **Ongoing tracking and research**	**Experiencing low rates of take-up for optional centralised systems** as a result highly decentralised model of data collection, **with onus on individual to keep** paper based **record of their vaccination** and what type of vaccine they received**.** **One State is mandating mass vaccination sites and 'local'/community sites leverage the State central system** whilst allowing hospitals and GP clinics to use their existing systems. Local or county systems set-up while central systems were being developed are allowed to co-exist for ~6 weeks before transferring to use of the central system, with the state taking responsibility for data integration for the ~6 weeks
11 **Workforce management**	Standard vaccination rates are being applied for GP vaccination compensation; with limited financial incentive to prioritise vaccinations over other routines Some States are taking innovative approaches to source surge workforce; allowing medical professional retires (<5 years) to come back; supplementing vaccination workforce with Dentists
16 **Communications**	**Surveyed eligible populations to understand drivers of vaccine refusal** (e.g., one survey saw >35% of HCW refuse vaccine, they were disproportionately younger, female, lower income and concerned about side effects). In general there has been high observed correlation between COVID and Flu vaccine hesitant population, therefore some states using prior flu vaccination research to drive targeted communications **Some states are customising communications to appeal to State customs** e.g., New Orleans promoting vaccines with local targeted messaging using neighborhood personas and invoking reminders of Carnival season that would typically commence in February pre-COVID[2] **Private sector companies are implementing innovative incentive models to encourage vaccination**. Some employers giving cash or 401K incentives (BRIA Health Services), paid time off to vaccinate (Aldi US) with others mandating vaccination as part of return to work (Norwegian Cruise Line)

Source: 1. Public health-LA County; 2. NY Times; Expert interviews

Vaccination roll-out case example: Denmark

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorised vaccines: Pfizer / BioNTech, Moderna[1]

Start date of first vaccine roll-out: Dec 27, 2020[2]

Percentage of population covered by purchased vaccines: ~184%[3]

Number of doses administered to-date: ~214K[4]

Daily cases (7 day moving average): ~1K[4]

Weekly new hospitalisations (as at 17 Jan 2021): ~650[4]

Percentage of population given 1+ dose of vaccine: ~3.2%[4]

Historical flu vaccine coverage: 52%[5]

Reported consumer willingness to receive COVID-19 vaccine: 87%[6]

Source and manufacture

Purchased both Pfizer and Moderna vaccine (i.e., 3.9m doses, enough to cover 33% of population) . AstraZeneca approved for use in the EU in late January 2021; dates and volumes for delivery of vaccine to EU countries are not currently confirmed

Pfizer has announced a supply reduction of deliveries by ~10% in the first quarter of 2021

Distribute

Distribution is centrally controlled (doses are allocated to the public vaccine institute as top priority, then to other sites)

Distribution slowing due to supply constraints, anticipating ~85k to 100k fewer vaccinations than planned in the first quarter of 2021

Administer

Leading the EU in administered doses per 100 capita by:

- **Leveraging strong existing vaccination infrastructure** to rapidly administer all available vaccines; with focus on GP clinics as primary vaccination site type and use of existing databases, IT systems, registers and regional health care processes
- **Maximising first dosage roll out** by extending time of second dose to six weeks (vs. 3 weeks recommended by Pfizer), with no Pfizer supplies reserved for second dose
- **Extracting 6 doses per vial** by utilising GPs and nurses skilled in vaccinations
- **Testing and learning roll-out of newer vaccines,** sending Moderna to only one region to codify best practices before rolling out to others

Regular workforce in use for first phase; by utilising GPs there has been limited requirements for a surge workforce for vaccine rollout

Enable

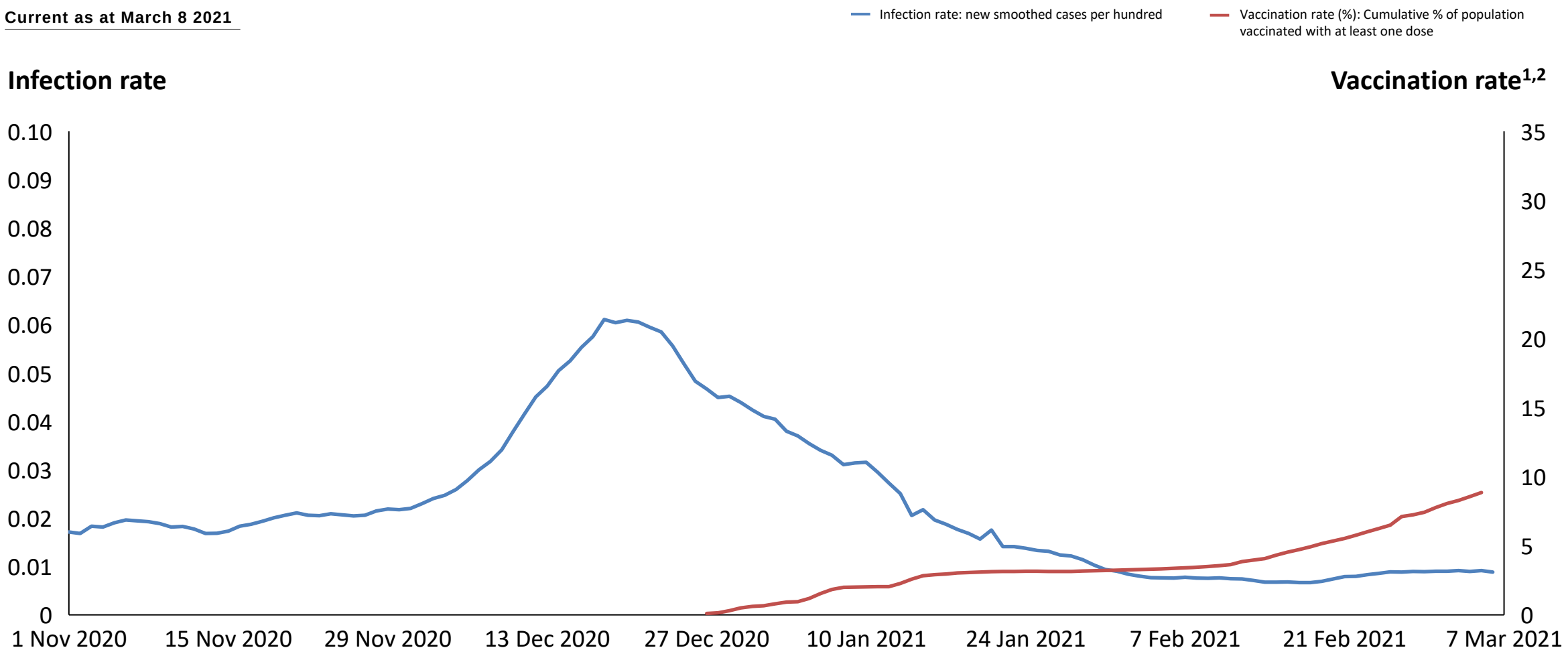
High consumer willingness to get vaccine, increasing from 76% to 87% in mid January[6] – attributed to success of early roll out, and relatively low incidence of unexpected side effects

Roll out of "vaccine passport" for Danish travelers by the Department of Health

Reducing impact of mis-information through centrally published short videos

Source: 1. Danish Health Authority; 2. The Local ; 3. Bloomberg; 4. Our World In Data; 5. Flu vaccination coverage for persons age 65+ from OECD; 6. Consumers who would take the COVID-19 vaccine from HOPE project survey 13th – 19th January 2021; The Local; Medical Xpress; ABC; Danish Health Authority

Vaccination progress: Denmark



1. Data interpolated where not available for vaccination rates (data set misses days); 2. Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World In Data

Deep dive: Denmark (1/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Vaccines are first delivered to the country's public vaccine institute**, then allocated and distributed to the five regional health authorities in the country in proportion to the size of their population; thawing occurs at each of the 5 hubs and subsequently transported to GP clinics for vaccination **Several benefits from central allocation**: • Allows piloting and sharing of lessons e.g., only allocated the first Moderna batch to a single region to pilot and share best practices before expanding it to other regions • Better enforcement of vaccination coverage to priority groups through clearly mandated prioritisation policies • Faster feedback loops through data collection than neighbouring countries, enabled through mandated use of existing systems
8 **Administration Principles**	**Defined policy to maximise volumes of first dosages**: conversely to many countries electing to keep half of their COVID-19 vaccine allocation for second doses, the government has extended the time between first and second dose to six weeks (vs 3 weeks recommended by Pfizer) and elected to use up their first Pfizer doses with no stock reserved for second dose vaccines **Published target to vaccinate all citizens by June 2021,** with clearly published priority groups and national progress dashboards **The Danish Health Authority has prohibited 'vaccine shopping'** and will select the vaccine brand that will used for each target segment **Homeless and marginalised groups have been classified at risk** and have been included in priority segments (after successful campaign from non-profit groups and some political figures given the heightened transmission rate amongst the demographic) **First doses for health care workers have recently been deprioritised** post Pfizer's announcement of vaccine delivery delays, with plans to cover second doses for at risk and aged populations as a higher priority
9a **Standing up vaccination points**	**Vaccination sites leveraged strong existing infrastructure,** primarily GP clinics, population-based medical databases, IT systems to identify and contact citizens, vaccination registers and scheduling systems (similarly, regional health care providers had strong processes and infrastructure for comms and distribution that has been beneficial)
9b **Operating vaccination points**	**GPs are the primary delivery mechanism.** In home vaccinations are only performed in rare cases; generally patients are transported from home to vaccination sites (using established patient transport providers where necessary) **Vaccinating ~5 patients per hour** ("one nurse per patient every 12 minutes") with goal of vaccinating 100,000 Danes per day

Source: Irish Times; The Local; Bloomberg; Medical Xpress; The Local; NCBI; Danish Health Authority expert interviews

Deep dive: Denmark (2/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9c **Booking and patient experience**	**Pre-existing technology enables identification and notification of priority cohorts:** citizens' national identification numbers (and associated personal data) are used to identify citizens eligible for vaccination; notifications sent through e-Boks (government app), emails, and employers. **Booking CX for elderly was rated poorly** as large amounts of scrolling was required to seek available slots. Perception was worsened when slots were reduced due to limited vaccine ability and without corresponding communications.
9d **Managing performance**	**Limited focus on performance management as supply is primary constraint (not operational efficiency)**. However, daily and weekly performance reports are published on Government websites
11 **Workforce management**	**Leveraged existing GP staff** to administer vaccinations in order to 1) leverage spare capacity at GPs (due to lower visitation during COVID) and 2) use experience of GPs who are already trained vaccinators **The association for GPs negotiated an umbrella agreement for GPs** with standard payment structures defined to accelerate workforce sourcing (GPs are typically individual contractors)
16 **Communications**	**Embarked on a rapid campaign in the country's nursing homes**: completed rollout of vaccine to almost all residents in nursing homes by mid January **Large emphasis on free will** in government messages to public, and limited focus on 'celebrity' or 'leader first' role modelling **Launched videos to explain how vaccines work** and to 'fact-check' what has been written about the COVID vaccine; a pamphlet and letters are being sent to each citizen to inform them about the vaccination program

Source: Danish Health Authority; Danish Health Authority; Danish Health Authority; Danish Health Authority; Medical Xpress; The Local, expert interviews

Vaccination roll-out case example: Canada

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorised vaccines: Pfizer / BioNTech, Moderna[1]

Start date of first vaccine roll-out: Dec 14, 2020[2]

Percentage of population covered by purchased vaccines: 330%[3]

Number of doses administered to-date: ~840k[3]

Percentage of population given 1+ dose of vaccine: : ~2.2%[4]

Historical flu vaccine coverage: 59%[5]

Reported consumer willingness to receive COVID-19 vaccine: 79%[6]

Source and manufacture

Public Health Agency of Canada (PHAC; a federal agency)**, is responsible for the immunisation strategy**, advised by a public-private COVID-19 Vaccine Task Force

- Public Services and Procurement Canada (federal) and PHAC (federal) have been working together to procure vaccines and vet contractors for distribution.
- Health Canada (federal) is responsible for vaccine authorisation

Distribute

Centrally co-ordinated and outsourced distribution by Public Health Agency of Canada's National Operations Centre with the third party provider FedEx Express Canada / Innomar Strategies Inc.; Armed Forces assisting with planning for the distribution and logistical challenges

Administer

Split responsibility between Federal, Provincial and Territorial Governments: Federal Government is providing overarching strategy and guidance while Provincial & Territorial Government is responsible for overall execution and implementation

Provinces are responsible for identifying and running vaccination sites – initial focus is long term care facilities and healthcare settings, with pharmacies and mass vaccination sites also expected to form part of the roll out

Variation in the speed of vaccination roll out between States, primarily driven by policy choices (e.g., some provinces are reserving second doses, while others are using all available doses to vaccinate and relying on future supply for second doses)

Enable

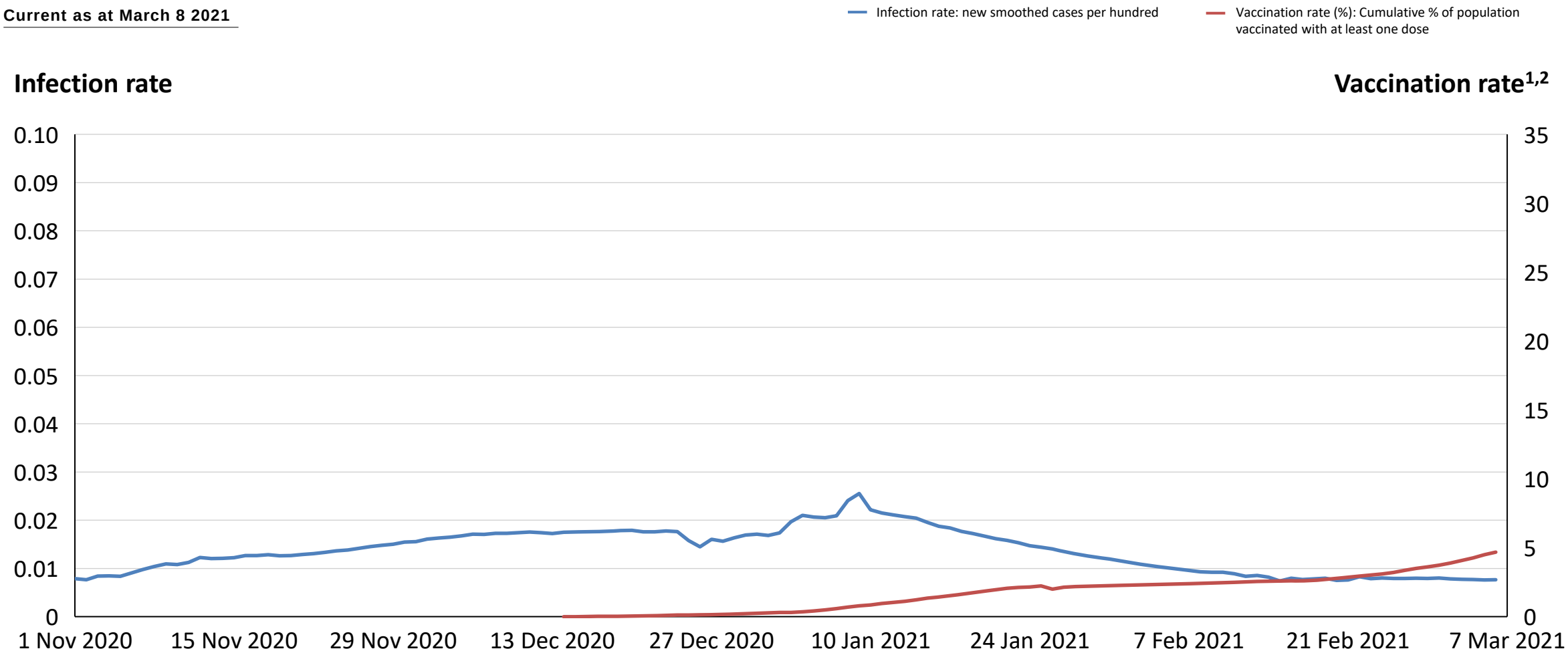
Vaccinations are free for eligible populations

Dedicated planning underway on how to vaccinate hard-to-reach populations (with tailored vaccination plans and close collaboration with First Nations, Inuit and Métis leaders)

Source: 1. Health Canada 2. NPR 3. Bloomberg 4. Our World In Data 5. Flu vaccination coverage for persons age 65+ from OECD; 6. Consumers who "strongly" or "somewhat agree" to statement "If a vaccine for COVID-19 were available, I would get it" from "Ipsos Global Consumer Survey 2021";

Vaccination progress: Canada

Current as at March 8 2021



1. Data interpolated where not available for vaccination rates (data set misses days)
2. Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World in Data

Deep dive: Canada (1/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Centrally co-ordinated and outsourced distribution support:** FedEx Express Canada and Innomar Strategies Inc. are contracted for the end-to-end logistics solution, including for those in remote and isolated locations; third party logistics providers have also been responsible for management of some provincial level logistics e.g., warehouses, last mile distribution; and Armed Forces have planned for the distribution and potential logistical challenges (e.g., distribution to remote communities in northern Ontario)
8 **Administration Principles**	**Federal Government and its subsidiaries are responsible for overarching strategy and guidance; the Provincial & Territorial Government for deployment and end prioritisation :** e.g., The Federal Government's National Advisory Committee on Immunisation (NACI) provides guidance on vaccine prioritisation groups; provinces and territories may also have their own immunisation committee and are responsible for roll-out of prioritisation **Flexibility in prioritisation to avoid wastage:** recommended approach is to provide vaccinations first to those eligible, followed by those likely to be eligible soon and then to others as appropriate
9a **Standing up vaccination points**	**Provinces are responsible for setting up vaccination sites, and there has been variability on speed of ramp up:** sites that were already doing flu vaccinations at scale ramped up quickly; for new vaccination sites, typically closer to four to six weeks to reach expected maximum capacity
9b **Operating vaccination points**	**Canadian Government has published guidelines on expected throughput for purposes of scheduling:** i.e., 12-14 vaccination/hr (depending on whether immuniser needs to pre-load their own syringes), experience on the ground and in other jurisdiction is that rate of vaccination is slower when working with elderly populations **Segregated tasks to improve efficiency:** (e.g., having consumers pre-fil consent forms with other staff before confirming verbally consent with immuniser)

Source: The Government of Canada The Government of Canada, The Government of Canada The Government of British Columbia, Global News expert interviews

Deep dive: Canada (2/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9c **Booking and patient experience**	**Booking tools controlled by each vaccination clinic:** relying heavily on existing tools used by health centres **Patients are turned away until the time of their appointment**: it is recommended to clinics that upon arrival, a patient's phone number should be taken and texted or called at the time they are able to return to the clinic
10 **Ongoing tracking and research**	**No centralised national vaccinations registry** to track administered doses; data is typically collected by province or territory using electronic or paper-based databases; Canadian Immunisation Registry and Coverage Network (CIRC) are facilitating collection and sharing from different jurisdictions **Leveraged existing vaccination safety systems** to report adverse event (but federal government has contracted a third party to build additional functionality)
11 **Workforce management**	**Workforce constraints the primary bottleneck:** this was seen in testing, then tracing and now vaccinations **Provinces are tapping into new cohorts to expand workforce –** e.g., regulation was changed to enable pharmacists to administer vaccinations; dentists used for pre-loading syringes; non-health care providers (e.g., public health staff and volunteers) assist in site administration, e.g., consumer registration, information sharing roles

Source: The Government of Canada The Government of Canada; The Government of Canada Global News, expert interviews

Canada COVID-19 vaccination tracker

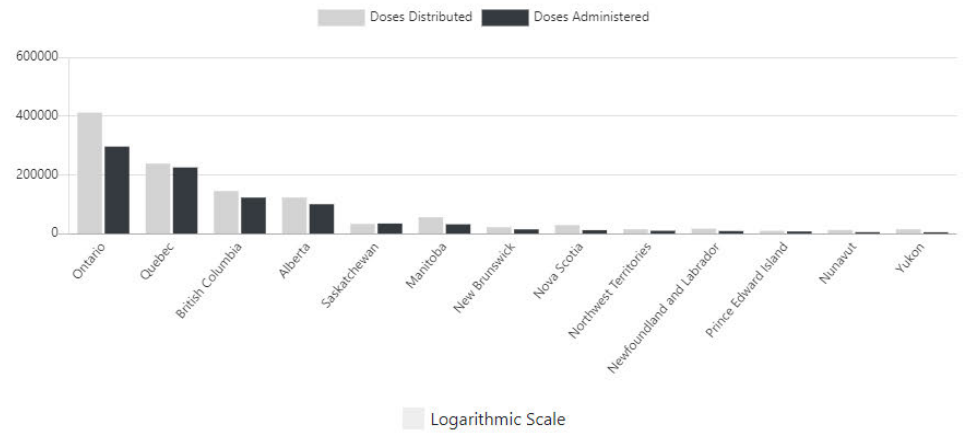
COVID-19 Vaccination Tracker

868,454 doses administered
(+28505 today)
People

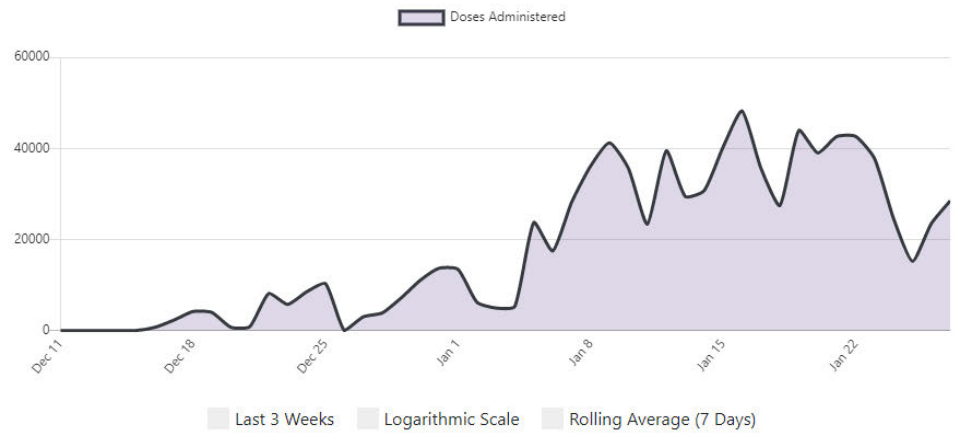
1,122,450 doses delivered
77.4% of doses delivered have been administered

1.984%
of the Canadian population has received at least one dose

Doses By Province



Canada New Doses



Doses By Province

Province	Total Doses Administered	Total Doses Delivered	% of Doses Administered	Doses Administered / 100k Population	People Fully Vaccinated
Ontario	*295,817 (+9707 today)*	*411,650*	*71.86%*	2,007.83	*83,285*
Quebec	*224,879 (+4164 today)*	*238,100*	*94.44%*	2,622.25	*N/A*

Source: Noah Little (COVID-19 tracker Canada)

Vaccination roll-out case example: France

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Key statistics

Authorised vaccines: Pfizer / BioNTech, Moderna[1]

Start date of first vaccine roll-out: Dec 27, 2020[2]

Percentage of population covered by purchased vaccines: ~184%[3]

Number of doses administered to-date: ~1.1m[4]

Percentage of population given 1+ dose of vaccine: ~1.6%[4]

Historical flu vaccine coverage: 51%[5]

Reported consumer willingness to receive COVID-19 vaccine: 55%[6]

Source and manufacture

Ultimate decision maker on all aspects of roll out is French national government (on advice from National Health Authority '*HAS*' on vaccination strategy)

Vaccine sourced via EU's centralised procurement mechanism, but France (like other European countries) exploring independently sourcing additional doses

French manufacturer Sanofi is expected to starting manufacturing Pfizer vaccine onshore

Distribute

Pfizer delivering vaccines to dedicated locations with ultra cold chain storage capacity (i.e., 11 pharmaceutical warehouses, and ~100 hospitals)

Pharmaceutical warehouses distribute to selected city pharmacies (who in turn supply aged care homes)

Designated hospitals distribute to their affiliated aged care homes as well as vaccination centres

Administer

Initial focus on the most vulnerable resulted in fewer vaccinations per day in early days and weeks vs. neighbouring countries: France focused on elderly in long term care settings (a group with complex needs, where it takes longer to vaccinate). By comparison, other countries vaccinated healthcare professionals in parallel with most elderly

Slower roll out attracted public/media scrutiny. France subsequently expanded reach of initial phase to include HCW (that are over 65 and with co-morbities)

France's vaccine program predominantly relies on existing health care network, i.e., physicians and nurses in nursing homes and smaller dedicated vaccination centres, then GPs, pharmacies in community. No use of mass vaccination sites

Booking vaccinations is centralised - via phone, internet (using private sector platforms, e.g., *Doctolib*)

Enable

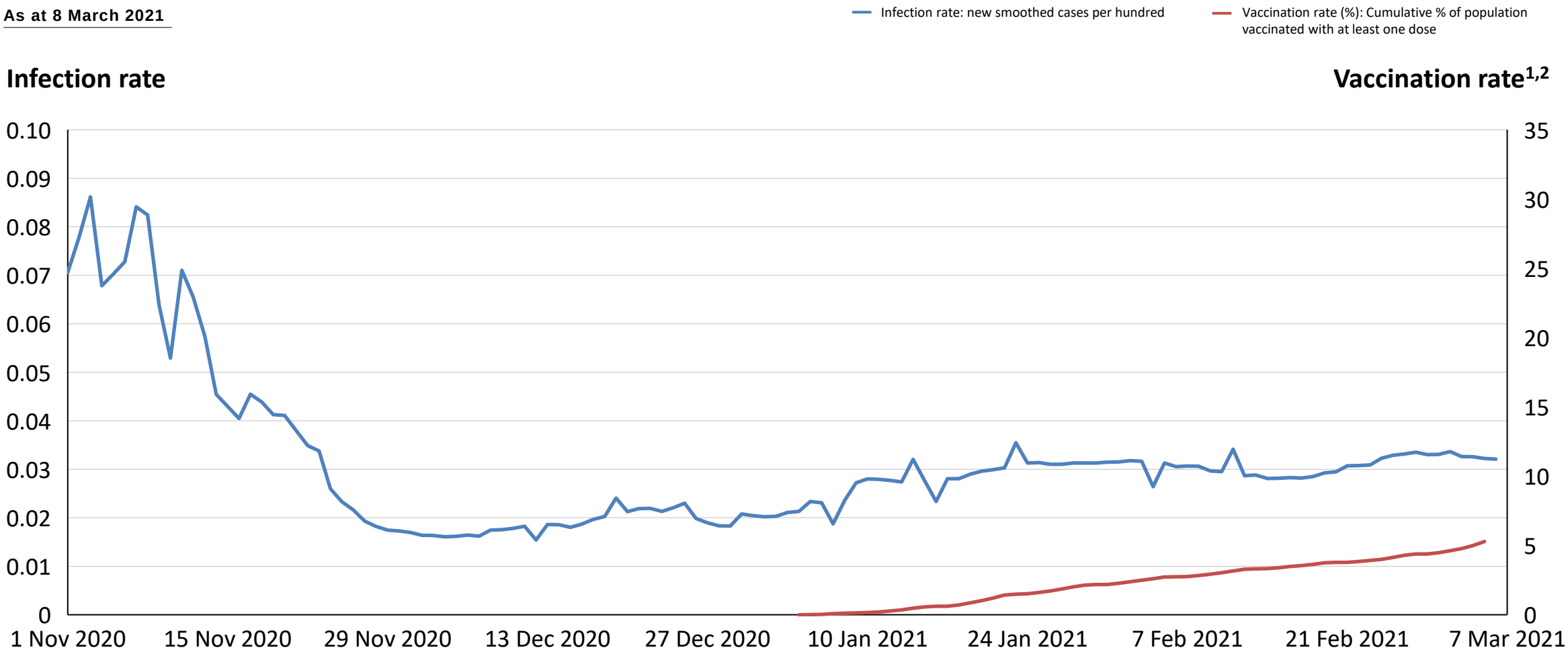
High rate of vaccine hesitancy (~45% of population reportedly unwilling to get vaccine), while this number has fallen in recent months, expectation that it will make roll out more challenging, particularly once priority cohorts expand and supply is no longer a constraint

There is a requirement for all vaccinations to be recorded in purpose-built database *Si Vaccin COVID*

Vaccine is free to eligible population

Source: 1. The Local 2. Le Monde 3. Bloomberg 4. OurWorldInData 5. Flu vaccination coverage for persons age 65+ from OECD; 6. Consumers who "strongly" or "somewhat agree" to statement "If a vaccine for COVID-19 were available, I would get it" from Ipsos Global Consumer Survey 2021

Vaccination progress: France



1. Data interpolated where not available for vaccination rates (data set misses days)
2. Total number of people who received at least one vaccine dose. This may not equal the number of people that are fully vaccinated if the vaccine requires two doses.

Source: Our World in Data

Deep dive: France (1/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Pfizer delivering vaccines to dedicated locations** with ultra cold chain storage capacity: • 11 pharmaceutical warehouses (which thaw and deliver to ~4000 pharmacies responsible for covering ~2,500 aged care homes) • ~100 hospitals (which administer vaccines onsite, and thaw and deliver to affiliated aged care homes as well as vaccination sites) **Plans to allocate other vaccine types to different purposes**: (i.e., ARNm vaccines for vaccination centers/ hospitals, the more temperature-stable Astra Zeneca for pharmacies and GP offices)
8 **Administration Principles**	**Vaccine roll out planned for five phases**: • Phase 1 includes GPs, the most elderly, nursing home residents (and carers with comorbidity aged 65+) (~1 million people) • Phase 2 includes 75+, then 65+ as well as healthcare professionals (~14 million people) • Phase 3 includes 50+, essential workers, persons with high risk of exposure given their occupation (e.g., teachers, social workers, first responders) • Phases 4 and 5 will cover individuals highly exposed to the virus and mass vaccination for people 18 years and older **Initial focus on the most vulnerable resulted in fewer vaccinations per day than neighbouring countries**: Because elderly in long term care settings take longer to vaccinate than HCW (which were part of priority 1 in many neighbouring countries). **Slower roll out in weeks 1&2 attracted public/media scrutiny.** France subsequently expanded reach of initial phase to include HCW (over 65 with comorbities)
9a **Standing up vaccination points**	**France's vaccine program predominantly relies on existing health care network,** i.e., hospital/ nursing homes staff, pharmacies, GPs **Rapid ramp up of smaller vaccination sites** – i.e., 1000+ set-up within 3 weeks in January; total number of vaccinating points is **8000+** (i.e., nursing homes and dedicated vaccination sites) and will further increase with GP offices and pharmacies **No use of mega sites** that are more common in neighbouring European countries (e.g., Germany, UK)

Source: Expert interviews, press search

Deep dive: France (2/2)

Current as of January 27, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9b **Operating vaccination points**	**Measures in place to improve efficiency in aged care setting** (e.g., consents from residents gathered in the weeks beforehand, vaccine able to be administered by nurse, as long as doctor somewhere in the facility) **Number of doses allocated to a site adjusted weekly** based on bookings volume and site performance
9c **Booking and patient experience**	**Registration for a vaccination** via phone, internet (using third party platform, e.g. *DoctoLib*) with ~1 million bookings in the first 24 hours **Bookings are centralised,** and consumers have choice with respect to location and time of appointment
10 **Monitoring and tracking**	**Government developed a central vaccine tracking system** ("SI Vaccin Covid“) – System will allow users to identify priority populations, monitor the vaccine uptake; and also enables reimbursement of the vaccine. GPs will also have access to patient data such as date and location of 1st injection, vaccine type, etc
11 **Workforce**	**Standard workforce in use for Phase 1** with plan to mobilise and train other medical staff to administer vaccines in subsequent phases
16 **Communications**	**High rate of vaccine hesitancy** (~45% of population reportedly unwilling to get vaccine), while this number has fallen in recent months, expectation that it will make roll out more challenging, particularly once priority cohorts expand and supply is no longer a constraint

Source: Expert interviews, press search

Vaccination roll-out case example: United Arab Emirates

Current as of January 22, 2021 **Non-Exhaustive (illustrative examples only)**

Demographic summary

Authorized vaccines: Pfizer BioNTech SE (Dubai), Sinopharm CNBG (UAE), and Sputnik (UAE)
Start date of first vaccine roll-out: December 23, 2020 (Pfizer vaccine)
Percentage of population covered by purchased vaccines: 35.8%
Number of doses administered to-date: ~2M

Percentage of population given 1+ dose of vaccine: 24%
Historical flu vaccine coverage: 24.7%
Reported consumer willingness to receive COVID-19 vaccine: ~75%

Source and manufacture

Centralised procurement of **Sinopharm and Sputnik** by The Hope Consortium (HC – public-private partnership), which is led by the Abu Dhabi Health Authority (DoH)

Sinopharm is currently manufactured in China with local production expected to start later in 2021. It doesn't require subzero cold-chain infrastructure

Pfizer only available in Dubai and manufactured in Puurs, Belgium

Distribute

Vaccines stored at the Abu Dhabi Port, which can distribute and store over **70 million vaccines** in its 19,000 square metre temperature-controlled warehouse facility

Sinopharm is distributed to hundreds of locations (including **public and private hospitals**, health centers, National Screening Centers, and local councils) by the govt-owned Abu Dhabi Health Services Company (SEHA)

Pfizer vaccine was distributed to multiple **DHA health facilities**

Administer

Dubai Health Authority (DHA) vaccinating priority groups using the Pfizer vaccine, while the UAE federal government, through The Ministry of Health and Prevention (MoHP) and the DoH, is conducting a **nationwide vaccination campaign** (Sinopharm initially used for **frontline workers** and government officials, however has since extended it to **all nationals)**

Flexible vaccination plan allows for quick addition of locations to meet increased demand

In Sharjah, care teams pay **home visits to older adults and those with disabilities** to make the vaccines more accessible. Visits can be scheduled using a free hotline

Enable

Vaccines voluntary and **free of charge** to all nationals.

Government employees and contractors that refuse to take the vaccine without valid medical reasons have to provide **frequent negative test certificates**, at their own expense

Several government education campaigns launched (incl. active social media presence and extensive use of public figures as examples)

Country's higher religious authority, the **Fatwa Council** released a widely publicised statement saying that the vaccine does not break Islamic rules

Source: Press search

Deep dive: United Arab Emirates (1/3)

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Hope Consortium manages "the first, middle and the final mile through different partnerships."** The vaccines are moved from the original aircraft by miles partners. Etihad Cargo 1 then clears the cargo, and the Ports' teams leverage their logistics arm MICCO to move the vaccines on temperature-controlled vehicles to the storage site. The cargo is then moved to the facility and into the temperature-controlled storage area which takes approximately two hours. The Emirate SkyCargo airside, storage, and distribution hub in Dubai has the **capacity to store up to 10 million doses**
8 **Administration Principles**	UAE divided its **population into four categories**: (1) People with chronic diseases, elders (60+), and people of determination (those with disabilities and special needs); (2) Frontline workers; (3) Vital-sector workers; (4) General Public. **Phase 1 only allowed the first three groups** to be inoculated and specific numbers were set for each category. The campaign "Choose to Vaccinate" started on Jan 4 in Abu Dhabi, marking the beginning of Phase 2 in which **Sinopharm vaccines were then made available to all groups nationwide** on Jan 6. **Pfizer vaccine is only available to citizens and residents who are part of the first three categories**. Dubai is planning to officially offer the Pfizer vaccine to the general public in April. Dubai residents on Abu Dhabi visas cannot take the vaccine. **Second dose** is taken after a period averaging between **21 to 28 days**
9a **Standing up vaccination points**	The **UAE** is **rapidly expanding number of vaccination locations** across the country from 120 to 218, including **healthcare facilities and majalis (local councils)**. All the new centers will be operated by the Abu Dhabi Healthcare Services (SEHA) and will administer the **Sinopharm vaccine**. The SEHA is offering **companies** the opportunity to book appointments to **mass vaccinate their workforces** in order to reduce queues and incentivise immunization. For **large companies**, there is also the option to do **on-site vaccination**. In **Dubai**, vaccines are available at **DHA health facilities**, including the One Central facility, with capacity to receive 4,000 daily visitors. Pfizer and Sinopharm vaccines are **available at different locations** In **Sharjah**, the vaccine is available at **medical centers and suburb councils** In **Abu Dhabi**, the vaccine is available at **all clinics run by Seha**, the emirate's public health operator, and at **hospitals and clinics run by VPS Healthcare**. The DoH is also organising **drive-through locations** outside of Abu Dhabi, and it's starting to use **mobile units**

Source: Press search

Deep dive: United Arab Emirates (2/3)

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9b **Operating vaccination points**	UAE has a **public national healthcare system**, which makes coordination and access to resources much easier. Large facilities are able to inoculate thousands of residents every day. Hospital administrators report that there are "**dedicated pre-trained staff and reserved areas for pre-vaccination counselling and paperwork**, and 30 minutes of the post-vaccination monitoring period inside the hospital Many centers are **open to the public everyday**, from **8:00 am to 10:00 pm**, but it can vary according to the region and location
9c **Booking and patient experience**	**Healthcare data is decentralised and digitised**, so citizens can access an app or call a hotline and **receive an immediate appointment** for a jab if they are eligible **Booking requirements vary according to emirate** - in Sharjah, prior booking is not required; in Dubai, residents must book an appointment using the DHA app or toll-free phone number; In Abu Dhabi, health centres accept walk-ins, appointments are needed for vaccination centres and drive-through centres operated by the Seha public hospital operator. Residents have been able to get the vaccine without any appointments in Dubai and Abu Dhabi after waiting for long hours (flexibility allowed to avoid wastage) Upon arrival, residents are **registered and undergo comprehensive health assessment to confirm their eligibility**. All the necessary tests are done at the vaccination centers, free-of-charge.
10 **Monitoring and tracking**	Pfizer's vaccines come with **trackers to monitor the location and temperature of the vials**. Digital technology infrastructure provided by the Hope Consortium is used to manage storage and distribution Institutions in Dubai **report COVID-19 and vaccine data** using HASANA, an **integrated unified electronic public health system** for disease surveillance and management
11 **Workforce**	The vaccine is administered **exclusively by healthcare workers**. Volunteers are sometimes used for administrative tasks, such as registration of residents.

Source: Press search

Deep dive: United Arab Emirates (3/3)

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
16 **Communications**	UAE government is using **social media, traditional media, and press releases** to assure the population that the vaccines are safe. Multiple campaigns were launched, including "Choose to Vaccinate," urging residents to get vaccinated. DHA released a document called **"COVID-19 Awareness Guide"** explaining the vaccine journey and answering the most common questions and **held webinars** to raise **awareness among government employees** All government levels and officials, including the religious councils, **worked together to raise awareness and engage the population**. There were no apparent conflicts. **Officials were among the first to be vaccinated**, increasing public trust. **UAE Fatwa Council also issued a 'fatwa' (Islamic ruling)** allowing the coronavirus vaccines to be used in compliance with Islamic Sharia's objectives MoHP is **fighting fake information** circulating online about the vaccines and has declared that those spreading fake information would be held legally accountable

Source: Press search

Vaccination roll-out case example: Singapore

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Demographic summary

Authorized vaccines: Pfizer-BioNTech[1]
Start date of first vaccine roll-out: Dec 30, 20201
Percentage of population covered by purchased vaccines: N/A[2]
Number of doses administered to-date: ~6,200[3]

Percentage of population given 1+ dose of vaccine: 0.1%[3]
Historical flu vaccine coverage: 14%[4]
Reported consumer willingness to receive COVID-19 vaccine: 68%[5]

Source and manufacture

Centralised procurement by the Ministry of Health with agreements signed with Pfizer-BioNTech, Sinovac, and Moderna

Pfizer-BioNTech to be manufactured in the US, Moderna in the US and Sinovac in China[1]

Distribute

Highly centralised distribution under the supervision of the Ministry of Health

Pfizer vaccine packed in **thermal shipper boxes** with temperature and GPS trackers

Vaccines delivered by Singapore Airlines and distributed to the designated location by DHL, where they are then thawed and diluted

Administer

Administered at **public and private health centres, GP clinics, polyclinics and designated vaccination centres**
Vaccination centres will have a **medical fridge** and will operate **8am-10pm daily** (including public holidays and weekends)
First phase will **prioritise groups considered to be at a greater risk** such as health care and frontline workers and will aim to vaccinate **2,000 people per day.** Second doses will be administered after recommended 21 day period
Appointment must be made **online** to get vaccinated
Post-vaccination monitoring compulsory and Singaporeans encouraged to report side effects

Enable

Vaccination is **voluntary** and **free for all Singaporeans** and long-term residents
Vaccinators given **relevant on-the-job training** and can access quizzes, job aides, and downloadable presentations prepared by the World Health organization in partnership with UNICEF

Source: Press search

Deep dive: Singapore (1/2)

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
6 **Transport and logistics**	**Ministry of Health** is in charge of distribution and works directly with the manufacturers for transport and post-vaccination monitoring Pfizer-BioNTech vaccine is packed in **thermal shipper boxes** crafted to keep the recommended temperatures. Each box contains **temperature trackers with a GPS** to monitor the temperature and location of each box. Boxes will remain unspoiled for 10 days if left unopened Once in the **healthcare facility,** the deep frozen vaccine is **thawed and diluted** before use. Each Pfizer-BioNTech vial has five vaccine doses which can be kept at a room temperature for just a few hours or in a standard refrigerator for five days **Pfizer collects temperature data** being monitored by trackers in the storage boxes from the factory in Brussels to the final destination
8 **Administration Principles**	First phase will **prioritise groups considered to be at a greater risk** such as health care and frontline workers. Other vulnerable groups such as the elderly, construction, marine and process workers will be prioritised before mass rollout. Vaccination programme aims to vaccinate **2,000 people per day** and will keep the **recommended 21 day period in place for second doses** Ministry of health aims to **vaccinate ~37,000 frontline workers** in the marine and aviation sectors within **two months**
9a **Standing up vaccination points**	Main vaccination hubs in Singapore are **public and private health centres, GP clinics, polyclinics and designated vaccination centres**. By the end of February, the ministry wants to have eight operational vaccination centers to ensure that all at-risk groups are vaccinated. In the **second phase**, the ministry plans to appoint a vendor to set up 36 vaccination centers and 10 mobile teams to help in the roll-out.[6] Locations such as vacant schools, sports halls and community clubs will be used for vaccination centres A typical vaccination center has a **medical fridge** which can store the Pfizer-BioNTech vaccines at - 70˚C

Source: Press search

Deep dive: Singapore (2/2)

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Element	Detail of approach
9b **Operating vaccination points**	Vaccination centers are working **8am-10pm** daily including public holiday and weekends
9c **Booking and patient experience**	Singaporeans are required to make a **booking** prior to visiting the vaccination centers for the vaccine in order to **optimise** the cold-chain requirements of the vaccine and ensure operational efficiency
10 **Monitoring and tracking**	**Vaccine administration data** is maintained by the Ministry of Health Pfizer is mandated to conduct **post-vaccination monitoring** to determine the duration of protection against the virus and ensure the patients safety. The data collected is then forwarded to HSA for evaluation as a requirement for full registration. Beyond the post-administration period there is **no mandatory reporting** in Singapore, although people are encouraged to report any side effects experienced Given roll out has only started**, performance metrics** are yet to be recorded in the country. **Operations managers** at the vaccination centers observe the flow of people and prepare the sufficient number of jabs to ensure efficacy
11 **Workforce**	Vaccine administration in Singapore is currently done by **health care professionals** however the start of mass roll-out may require the input of volunteers. **Qualified health professionals** involved in administering the vaccines have been trained on how to handle and store the delicate vaccine
16 **Communi-cations**	Government is **strongly encouraging eligible groups to get vaccinated** and reassuring public of the safety and importance of the vaccine**.** Singapore's prime minister, Lee Hsien Loong, took the vaccine publicly as a way of leading by example

Source: Press search

Vaccination roll-out case example: New Zealand

Current as of January 22, 2021
Non-Exhaustive (illustrative examples only)

Demographic summary

Authorized vaccines: Medsafe approval for Pfizer / BioNTech, Awaiting approval for Janssen, Oxford / AZ, and Novavax

Start date of first vaccine roll-out: Planning for March/April 2021

Percentage of population covered by purchased vaccines: 247%

Number of doses administered to-date: 0

Percentage of population given 1+ dose of vaccine: 0%

Historical flu vaccine coverage: 25%

Reported consumer willingness to receive COVID-19 vaccine: 74%

Source and manufacture

Centralised procurement of four different vaccines by the New Zealand government

Distribute

Centralised distribution, coordinated by the New Zealand's Ministry of Health

Vaccine will likely be distributed from **two to six storage warehouses** in Auckland and the South Island to more than **1000 distribution points**. Government has **purchased nine -80°C freezers** to store 1.5 million doses of the Pfizer-BioNTech vaccine

Government currently working to lock in logistic providers

Administer

Three vaccine roll out scenarios developed based on different COVID-19 transmission cases. Scenario 1 (assuming low transmission) prioritises border workers, health care workers and their households before moving to high-risk frontline workers and vulnerable people
National Immunisation Solution (NIS) being developed to track and trace vaccines and consumables, monitor volumes, temperature and expiry dates, record vaccination data and enable citizens to access their vaccination records
Locations are still being decided by District Health Boards, however will likely include **pharmacies, GP practices, hospitals and pop-up clinics** (including drive through centres)

Enable

Vaccination will not be mandatory and will be **provided free to the public** and surrounding Pacific nations
Will use **12k current health professionals** and train **~2-3k additional volunteers** (incl. medical students, retired nurses, and doctors) to help scale. MoH has developed a **COVID-19 Surge workforce database** for volunteers to register interest. **Online and in-person training** for vaccinators will be provided from February 2021
Public education campaign will begin before the roll-out; Science and Technical Advisory Group (STAG) will **provide scientific and technical advice**; MoH working with Māori/Pacific community leaders to increase uptake

Source: Press search

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I Snapshot of countries phasing in and out of their major economic reform measure

Organisations are tackling vaccine hesitancy in different ways, often depending on the primary role of the organisation (1/2)

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Type of organisation & key role in addressing vaccine hesitancy

	Example organisations	Key roles	Examples
Government	CDC; Public Health England; NHS England; Public Health Agency of Canada / Agence de la santé publique du Canada; Ministry of Health	Issues guidance, information on vaccine safety, efficacy to providers and citizens Establishes/provides funding and technical support for to address vaccine hesitancy	In Israel, the MoH mobilised special government funding, established clear policies and roles and orchestrated efficient vaccine sign-up efforts US CDC provides funding, guidance for providers to build confidence in vaccines among patients
Health organisations	World Health Organization; Vaccine Confidence Project; Sabin Vaccine Institute; EU-JAV; NACI	Provide technical/policy guidance and assistance to national/regional governments Builds consensus on best practice programs/policies to guide gov't response	In Canada (NACI), US (NAM) and other countries, independent advisory groups guide government policy, incl. recommendations that address hesitancy EU-JAV established to enhance the public confidence in vaccination across EU countries
Providers (incl. prof. assn.'s, pharmacies)	CVS pharmacy; Walgreens; Magen David Adom in Israel; Coalition for Vaccination; British Islamic Medical Association; American Academy of Pediatrics; EFN	Provides vaccines, builds demand for vaccination among population Communicates guidance and priorities for/among associated providers (nurses, pharmacists, etc)	In the US, pharmacy networks advertise immunisation services, and can provide incentives (e.g. gift cards) #ThisIsOurShot campaign in the US working to elevate providers' voices in support of vaccines across social media
Research / academic institutions	Children's Hospital of Philadelphia; Oxford Vaccine Group; London School of Hygiene & Tropical Medicine; CPME; International Vaccine Access Center; Johns Hopkins Bloomberg School of Public Health; Vaccination Acceptance Research Network	Provides evidence on scope / scale of vaccine hesitancy Established evidence for best practice programs/policies	Imperial College London, LSHTM, others tracking vaccine hesitancy and behaviors globally Sabin's Vaccine Acceptance Research Network working to close knowledge gaps and provide guidance on how to address vaccine hesitancy

Source: Organisation websites; press search

Organisations are tackling vaccine hesitancy in different ways, often depending on the primary role of the organisation (2/2)

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Type of organisation & key role in addressing vaccine hesitancy

	Example organisations	Key roles	Examples
Pharma companies (incl. prof. assn.'s)	IFPMA, Pfizer BioNTech, moderna	Issues guidance, information on vaccine safety, efficacy to providers and citizens Establishes/provides funding and technical support for to address vaccine hesitancy	Pharma companies increasing transparency to build confidence with and public, e.g. vaccine clinical trial protocols and trial recruiting updates PhRMA communicating standards of US pharma industry to build confidence in development process
Employers	DOLLAR GENERAL, DANSK ERHVERV Danish Chamber of Commerce, amazon, DI Confederation of Danish Industry, instacart	Offering flexibility, incentives for employees and/or consumers to get vaccinated	Employers, e.g. Dollar General, in the US are offering paid time and other incentives for employees to get vaccinated Gov't and industry partnering in Denmark to develop digital passports to ease restrictions for vaccinated
Tech companies	Google, facebook, CommonPass, twitter	Clarifying and providing guidance on information about vaccination; limiting availability and/or spread of misinformation Developing technology to identify vaccination status	Google adding new searches for COVID-19 vaccines, funding fact-checking initiatives and efforts to remove misleading content CommonPass designed to share travels test results and vaccination status
Other (e.g. religious leaders, payors)	 	Communicating organisational / community stance on vaccination Sharing vaccination stories to build public / community trust	Prominent Orthodox Rabbi Shmuel Herzfeld shared video of his vaccination Sheikh Muhammad Tahir ul-Qadri, a prominent Muslim scholar, sharing with followers that "Saving lives is an act of worship"

Source: Organisation websites; press search

Key players are active with efforts to address the core elements of vaccine hesitancy established by the SAGE

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Illustrative

Geographic focus (examples)	Element of vaccine hesitancy: Complacency	Confidence	Convenience
United States	#GETVACCINATED, CDC, American Academy of Pediatrics, AMA	Children's Hospital of Philadelphia, CDC, Google, twitter	instacart, Trader Joe's, CVS pharmacy, Walgreens, CommonPass
Europe	EU-JAV, EFN, CPME, Fondation Mérieux, Coalition for Vaccination, British Islamic Medical Association	Vaccine Confidence Project, twitter, Google, British Islamic Medical Association, EU-JAV	DI Confederation of Danish Industry, Dansk Erhverv Danish Chamber of Commerce
Japan	JMA	twitter, Hokkaido University, Google	
Global / LMIC focus	Immunization Advocates, SABIN Vaccine Institute, Vaccination Acceptance Research Network, PAHO, World Health Organization, vaccine safety net	Google, twitter, World Health Organization	MOV Missed Opportunities for Vaccination, International Vaccine Access Center, Johns Hopkins Bloomberg School of Public Health

Source: WHO SAGE, Report of the SAGE Working Group on Vaccine Hesitancy (2014); organisation websites

Many organisations focused on addressing vaccine hesitancy are active in outreach to diverse communities

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Example programs/efforts that address key components of vaccine hesitancy by targeting outreach to culturally and linguistically diverse communities

Complacency

BRITISH ISLAMIC MEDICAL ASSOCIATION

Provides an information hub to debunk COVID-19 vaccine myths and conducting webinars, media outreach to encourage immunisation among Islamic community

Immunization ADVOCATES SABIN

Connects journalists to immunisation experts across 18 languages to increase access to accurate local-language information

Confidence

VACCINE CONFIDENCE PROJECT™

Shares evidence for engaging religious community to build confidence in immunisation, a strategy proven in literature to be effective at increasing immunisation uptake

ecdc

Provides guidance on tailoring healthcare worker approaches to address hesitancy, including hesitancy stemming from religious contexts

Convenience

CDC

Outlines social vulnerability (incl. Minority status & language as factors) with a Social Vulnerability Index; provides additional funding, training to address barriers to access in high SVI areas

CANImmunize

Provides standardised, digital tool to track and receive immunisation info; push to reach indigenous populations to improve historically poor information sharing

Source: WHO SAGE, Report of the SAGE Working Group on Vaccine Hesitancy (2014); organisation websites

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Engagement with culturally and linguistically diverse communities varies between countries (1/3)

Details by country

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Country	Booking and on-site translation services available	Vaccination sites and staff training	Public information campaigns	Community engagement
Australia	Medical providers working with interpreters to provide translation services on site	Providers trained to work with culturally, ethnically and linguistically diverse communities to ensure services are delivered in a culturally appropriate way	Department of Health vaccine hub translates information into 63 languages online A$1.3 million of A$31 million COVID-19 vaccination public information campaign dedicated to reach culturally and linguistically diverse (CALD) communities Campaign includes advertising across platforms in 32 languages; as well as targeted messages for different religious communities	Culturally and Linguistically Diverse (CALD) Communities Health Advisory Group established to support Australian Government COVID-19 response
Canada	Government will provide translators in clinics for linguistically diverse communities (or at the very least, access to telephone translation services)	NACI collaborated with experienced community leaders, groups, and individuals to plan and set up immunisation clinics across the cultural territories in Canada	MoH investing $64 million in education campaigns to help combat vaccine hesitancy and misinformation. Communications officer responsible for ensuring written materials are translated into appropriate languages, are culturally appropriate and written at an appropriate reading level	Indigenous Services Canada (ISC) working closely with provinces and territories, First Nations, Inuit and Métis partners, the National Association of Friendship Centres and other partners to communicate and coordinate vaccination campaign
Israel	Multilingual health workers available to book appointments and follow-up	Vaccination sites established, Army mobilised to deliver vaccines in remote areas	Ministry of Health established dedicated public relations teams to target indigenous communities and diverse groups Public information campaign broadcast in multiple languages, using multiple platforms (e.g. YouTube channel with tailored content)	Health Maintenance Organisation (HMO) engaged ultra-orthodox communities in Israel through in-person support rather than through technology Information campaigns promote endorsements from religious leaders

Source: Australian Department of Health (CALD Implementation Plan and Press Release); Israel Journal of Health Policy Research, Israel's rapid rollout of vaccinations for COVID-19 (link Jan 2021), The Telegraph, As the NHS franks mail, Israel uses state-of-the-art digital messaging to execute vaccine drive (link, Jan 2021), Forward, Why Israel's multilingual approach to vaccination works — and why our monolingual one doesn't (Jan 2021); Canada Public Health Agency (link), Indigenous Services Canada (link), CTV News, Federal government investing $64M to fight misinformation, encourage vaccine uptake in Canada (link, Feb 2), Healthcare Policy, Eliminating Religious and Philosophical Exemptions: The Next Step in Ontario's Campaign against Vaccine Hesitancy (link Nov 2020)

Engagement with culturally and linguistically diverse communities varies between countries (2/3)

Details by country

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Country	Booking and on-site translation services available	Vaccination sites and staff training	Public information campaigns	Community engagement
 **United Kingdom**	Information not available	Place-based locations were chosen for the delivery of the vaccine to the BAME group with no registered primary care Healthcare staff trained to deliver culturally tailored conversations to address vaccine beliefs among the different ethnic groups	UK COVID-19 Vaccines Delivery Plan outlines that all material will be available in a range of formats, including translations, easy read, braille and accessible for those with hearing impairment NHS' Equalities Board established a team to support effective tailored communications with BAME communities	Local community and religious organisations establishing resources and events, e.g. Interlink Foundation and Faiths Forum for London targeting Orthodox Jewish and Muslim communities with tailored messages and approaches
 **New Zealand**	Information not available	MoH considering a range of vaccination points to target indigenous and underserved communities, including mobile services in rural communities and pop-up clinics in churches for religious communities	$3 million vaccine ad campaign launched focused on instilling trust and confidence and building support for the country's vaccine plan. Ministry of Health ensuring that resources and information will be available in multiple languages (e.g. Māori)	Government and health sector are working with the Maori and ethnic communities to give strategic guidance and advice for the vaccine roll-out. The health ministry is working with the Maori providers empowering them to deliver the Covid-19 immunisation to their communities Community leaders encouraging immunisation, e.g. the country's Catholic bishops urging everyone to get immunised
 **UAE**	Online booking available via the Ministry of Health and Prevention (MOHAP) website, with English and Arabic translations available	UAE government establishing health facilities to encourage indigenous residents to receive the vaccine	Government encouraging population to get immunised, e.g. Sheikh Mohammed bin Rashid al-Maktoum, Dubai's ruler, shared image of his immunisation to build trust	The UAE Fatwa council announced that using vaccines permissible, based on concerns about HALAL status of the vaccine

Source: UK COVID-19 vaccines delivery plan (link), Centre Daily, Ultra-Orthodox Londoners roll up sleeves to fight COVID (Feb 15); Stuff, Covid-19: Who in New Zealand will get the vaccine and when? (link, Jan 22) and Covid-19 vaccines and equity: Some Kiwis may get more effective jabs than others (link; Jan 20); New Zealand Catholic Bishops Conference (link); UAE MOHAP (link), Telegraph, UAE virus cases surge despite world-leading vaccine programme (link, Jan 2021)

Engagement with culturally and linguistically diverse communities varies between countries (3/3)

Details by country

Current as of February 19, 2021
Non-Exhaustive (illustrative examples only)

Country	Translation services available	Vaccination sites and staff training	Public information campaigns	Community engagement
US	Some tribal nations have supplemented IHS and state efforts with call centers, often staffed by fluent Native language speakers, to answer inquiries, book appointments and reach out to citizens	The Indian Health Service (IHS) provides a health service delivery to American Indians and Alaska natives in 37 states; Indigenous tribes can choose their preferred distribution method between state health agencies or the federal IHS	US CDC guidance to states calls for all communication materials to be culturally and linguistically appropriate (e.g. translations available, Braile and ASL, low literacy, etc.) CDC provides Toolkit for Community and Faith-Based COVID-19 communication efforts; states also include guidance for tailoring messages and engaging with local religious communities	Prominent US gov't leaders are addressing hesitancy concerns among faith communities, e.g. Anthony Fauci joined "Facts & Faith" webinar hosted by sate of VA; NIH Director Francis Collins addressing misconceptions in national media
Denmark	Booking available in Danish and English No information on translation services at the vaccination centers	Information not available	Danish Health Authority will launch campaigns to keep the public informed about vaccines and target groups Information from Danish Health Authority available in multiple languages	The Danish Health Authority worked with community leaders to produce a video to inform the target groups about the Covid-19 vaccine in several languages
France	Government's online platform, medical apps such as Doctolib, and telephone are offered only in French No indication of translation services available at vaccination sites	Information not available	Information not available	The Economic, Social and Environmental Council (CESE; represents non-profit organisations) developed a Citizen's Panel, a random but demographically representative group established to guide government strategy on COVID-19 vaccinations
Singapore	Information not available	Information not available	Housing Board estates will offer information in different languages	The Islamic Religious Council of Singapore encouraging Muslims to get vaccinated, highlighting that vaccine is in line with Islamic principles and values

Source: CDC, COVID-19 Vaccination Program Interim Playbook for Jurisdiction Operation (link), Kaiser Family Foundation, Addressing Racial Equity in Vaccine Distribution (link, Dec 3), PennLive, Pa.'s struggling COVID-19 vaccine rollout misses Latino community, with no targeted help or translations (link, Feb 9), Pew, In Hard-Hit Indian Country, Tribes Rapidly Roll Out Vaccines (link Feb 9), CDC, Toolkit for Community and Faith-Based Organizations (link), WebMD News, Faith Leaders Spread the Word: Get Vaccinated, (link, Jan 26)

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Countries have made different choices as to how to manage the E2E process for international arrivals (1/4)

Current as of February 15, 2021
not exhaustive

Pre-departure

Eligibility

- Arrivals open to all
- Arrivals open to all citizens, permanent residents and long term visa holders, as well as business travelers from low risk countries
- Arrivals open to all citizens, permanent residents and non-citizens from low risk countries (including tourists) or EU states
- Arrivals limited to all citizens/permanent residents (unless exemption granted e.g. for compassionate grounds; sport etc.)
- Arrivals limited to citizens from low risk countries

Testing

- No pre-departure testing required
- Traveler must return a negative PCR test no more than 72 hours before departure OR present a vaccination certificate
- Vaccination certificate required

Caps on capacity

- No caps on international arrivals (beyond eligibility)
- Volume of arrivals capped by number of planes allowed to land
- Volume of arrivals capped by quarantine capacity/international passenger arrival caps
- Volume of arrivals capped by airport shutdowns
- Volume of arrivals capped by requiring employer to agree to travel
- Volume of arrivals capped by biosecurity laws

Booking quarantine

- Quarantine upon arrival not required
- Quarantine position automatically allocated when flight booked
- Passenger must reserve place in quarantine (hotel/industry/self) before booking flight

Departure airport

Providing negative test

- No negative test must be shown
- Negative test must be proved at airport
- Negative test must be proved prior to arrival at airport

Health questionnaire

- No health questionnaire conducted
- Health questionnaire conducted by passenger prior to boarding plane
- Health questionnaire conducted by GP at airport
- Health questionnaire conducted by GP prior to arrival at airport

In flight

Social distancing

- No social distancing required
- No social distancing required but protection shields used
- Social distancing required but no protection shields used
- Social distancing required and protection shields used

Passenger PPE

- Passengers not required to wear PPE on board flight
- Passengers required to wear PPE on board flight but no stringent conditions (e.g. can wear cotton mask)
- Stringent conditions imposed on passengers use of PPE (e.g. N95 mask, face shield)

Staff PPE

- Staff not required to wear PPE on board flight
- Staff required to wear PPE on board flight but no stringent conditions (e.g. can wear cotton mask)
- Stringent conditions imposed on staff use of PPE (e.g. N95 mask, face shield)

Aircraft cleaning

- No cleaning conducted between flights
- Normal clean conducted between flights
- Deep clean conducted between flights

Ventilation

- No requirements set for ventilation standards (e.g. fine if air conditioner broken)
- High standards set for ventilation (e.g. must be hospital grade and well functioning)

On-board service

- Normal airline service (e.g. food served at seat; can use shared bathrooms)
- Limited airline service (e.g. food package given for entirety of flight; can use bathroom)

Source: Press search

Countries have made different choices as to how to manage the E2E process for international arrivals (2/4)

Current as of February 15, 2021
not exhaustive

Arrival at airport

Health questionnaire

- Health questionnaire not required
- Health questionnaire completed at airport
- Health questionnaire completed on plane

PPE for passengers

- No PPE requirements for passengers in airport
- Passengers required to wear mask in airport but no conditions set
- Passengers required to wear N95 mask in airport
- Passengers required to wear N95 mask in airport, as well as face shield and/or glasses

Separation of passengers

- Passengers all processed in same area (i.e. no separation)
- Passengers processed in separate groups based on risk profile (e.g. green, orange, red)
- Passengers processed in separate groups based on flight
- Passengers processed in separate groups based on flight, with separate ventilation for each group

Test on arrival

- Passengers not re-tested at arrivals airport
- Passengers re-tested at arrivals airport using antigen or saliva test
- Passengers re-tested at arrivals airport using PCR test

Airport staff

- Dedicated airport staff used who live in work bubble
- Staff only work 1 job but allowed to go into community
- Staff allowed to work more than 1 job and to interact with community

PPE for staff

- No PPE requirements for staff in airport
- Staff required to wear mask in airport but no conditions set (e.g. can be cloth or surgical mask)
- Staff required to wear N95 mask in airport
- Staff required to wear N95 mask in airport, as well as face shield and glasses
- Staff required to wear N95 mask, face shield, glasses and full PPE body suits

Staff testing frequency

- Airport staff not tested
- Airport staff tested bi-weekly using PCR test when working
- Airport staff tested weekly using PCR test when working
- Airport staff tested weekly using PCR test and daily using antigen test when working
- Airport staff tested at least weekly using PCR test and daily using antigen test up to a week after last shift

Transport to quarantine

- Passengers responsible for getting private transport to quarantine hotel
- People transported on buses to quarantine hotel with anyone
- People transported on buses to quarantine hotel with people from same risk profile (e.g. orange)
- People transported on buses to quarantine hotel with people from same flight
- Household transported individually to quarantine in van
- Household transported individually to quarantine in purpose built van (e.g. ambulance

Interstate travel

- Passengers can fly interstate on commercial domestic flights before hotel quarantine finished
- Passengers can fly interstate on chartered domestic flights before hotel quarantine finished
- Passengers cannot fly on domestic flights before hotel quarantine finished

Quarantine

Timing of arrivals

- Passengers arrive and depart from hotel quarantine facilities at same time
- Passengers arrive and depart from hotel quarantine facilities at different times
- Passengers arrive and depart from hotel quarantine facilities, with green departures leaving before red passengers arrive
- Hotel deep cleaned between every departure and arrival of quarantine passengers

Quarantine types

- All arrivals must self quarantine
- All arrivals must self quarantine, except for those coming from high risk countries which must do hotel quarantine
- All arrivals must do hotel quarantine (unless meet exceptions, e.g. for medical reasons)

Industry quarantine

- Industry quarantine (outside normal quarantine arrangements) not available
- Industry quarantine available for all (regardless of country profile)
- Industry quarantine available for those from low risk countries

Source: Press search

Countries have made different choices as to how to manage the E2E process for international arrivals (3/4)

Current as of February 15, 2021
not exhaustive

Quarantine

Location	Guests allowed	PPE for guests	Quarantine staff interactions	Quarantine workforce	Training	PPE for staff	Staff testing frequency	Timing for high risk passengers	Testing	Immunity exemption	Low risk exemption
Quarantine facilities all located in airports	Non-quarantine guests allowed to stay in same parts of hotel as guests in quarantine	No PPE requirements for hotel quarantine guests	Dedicated hotel quarantine staff used who live in bubble	Hotel quarantine workers staffed using private contractors	No training provided to hotel quarantine workers	No PPE requirements for hotel quarantine staff	Hotel quarantine staff not tested	Quarantine not required	Testing while in hotel quarantine not required	Exempt from quarantine if get additional number of tests; or can prove vaccination or immunity	Exempt from quarantine if from low risk country
Quarantine facilities located in CBD and regional areas	Non-quarantine guests allowed to stay in separate parts of hotel as guests in quarantine	PPE required to be worn at certain times (e.g. when opening door to get food)	Staff only work 1 job but allowed to go into community	Hotel quarantine workers combination of public and private staff	Basic training on importance of PPE provided to hotel quarantine workers	Staff required to wear mask but no conditions set (e.g. can be cloth or surgical mask)	Hotel quarantine tested bi-weekly using PCR test when working	7 day quarantine	1-2 PCR tests required while in hotel quarantine	Quarantine time reduced if get additional number of tests; or can prove vaccination or immunity	Exempt from quarantine if travel bubble in place
All quarantine facilities located in regional areas	Only quarantine guests allowed to stay in designated quarantine hotels	PPE must be worn at all times	Staff allowed to work more than 1 job and to interact with community	Hotel quarantine workers all employed by government	Staff employed in hotel quarantine follow string Standard Operating Procedures	Staff required to wear N95 mask or face shield with surgical mask	Hotel quarantine tested weekly using PCR test when working	10 day quarantine	3+ PCR tests required while in hotel quarantine	No exemptions given for people who can prove potential immunity (unless essential worker)	No exemptions given for people from low risk countries (outside travel bubbles)
All quarantine conducted in purpose built facilities				Hotel quarantine workers supplemented by police and defence force personnel		Staff required to wear N95 mask, as well as face shield and glasses	Hotel quarantine tested weekly using PCR test and daily using antigen test when working	14 day quarantine	3+ PCR tests and daily Ellume tests required while in hotel quarantine		
						Staff required to wear N95 mask, face shield, glasses and full PPE body suits	Hotel quarantine tested weekly using PCR test and daily using antigen test up to a week after last shift	21 day quarantine			

Source: Press search

Countries have made different choices as to how to manage the E2E process for international arrivals (4/4)

Current as of February 15, 2021
not exhaustive

Quarantine

Ventilation

- Standard ventilation across entire hotel
- Shared ventilation across hotel floor
- Window in guests room opened daily or individual ventilation for each room
- Window in guests room opened daily and individual ventilation for each room

Post-release testing

- Testing not required after release (unless symptoms onset)
- Testing encouraged after release (e.g. on day 16) (even if no symptoms)
- Testing required after release (e.g. on day 16) (even if no symptoms)

Freedoms post release

- Guests free to interact in community according to states COVID restrictions
- Guests must stay at home until day 21 but can see immediate household
- Testing required prior to release and guests required to get tested on day 16

Positive test

- Guest stays in same hotel and released after existing quarantine period ends
- Guest stays in same hotel and released 10 days after symptoms onset
- Guest taken to hotel hospital and released 10 days after symptoms onset
- Guest taken to hospital and released 10 days after symptoms onset

Cost

- Government pays for entirety of hotel quarantine
- Cost of hotel quarantine shared by government and guest
- Guest charged cost of hotel quarantine

Self quarantine rules

- Self quarantine not available
- Self quarantine managed on a trust based system
- Self quarantine managed using random police checks at home
- Self quarantine managed using random checks and surveillance devices (e.g. ankle bracelet)

Leaving quarantine during stay

- Guests only allowed to leave quarantine for severe medical reasons or to get tested (if in self-quarantine)
- Guests only allowed to leave quarantine for certain conditions
- Guests allowed to leave quarantine after producing negative test

Hotel quarantine freedoms

- Guests not allowed to leave rooms (unless have an exemption to leave facility)
- Guests allowed to book time to exercise
- Guests allowed to book time to see family from a distance
- Guests allowed to book time to go outside to smoke

Staff exposure

- Staff have significant interaction with guests (e.g. to administer covid tests, deliver food/packages, clean rooms, do laundry)
- Staff have limited interaction with guests (e.g. to administer Covid tests, deliver food/packages)
- Staff only interact with staff during stay to conduct tests and for medical reasons (i.e. food delivered by robots)

Airline crew quarantine

- No rules on isolation
- Self isolation rules only apply to international-based airlines
- All crew must self isolate (at own premises) until receive negative test result
- Must self isolate (at own premises) for full quarantine period
- Crew who have visited high risk countries must stay in managed hotel quarantine
- All crew must stay in managed hotel quarantine between international flights or for 14 days

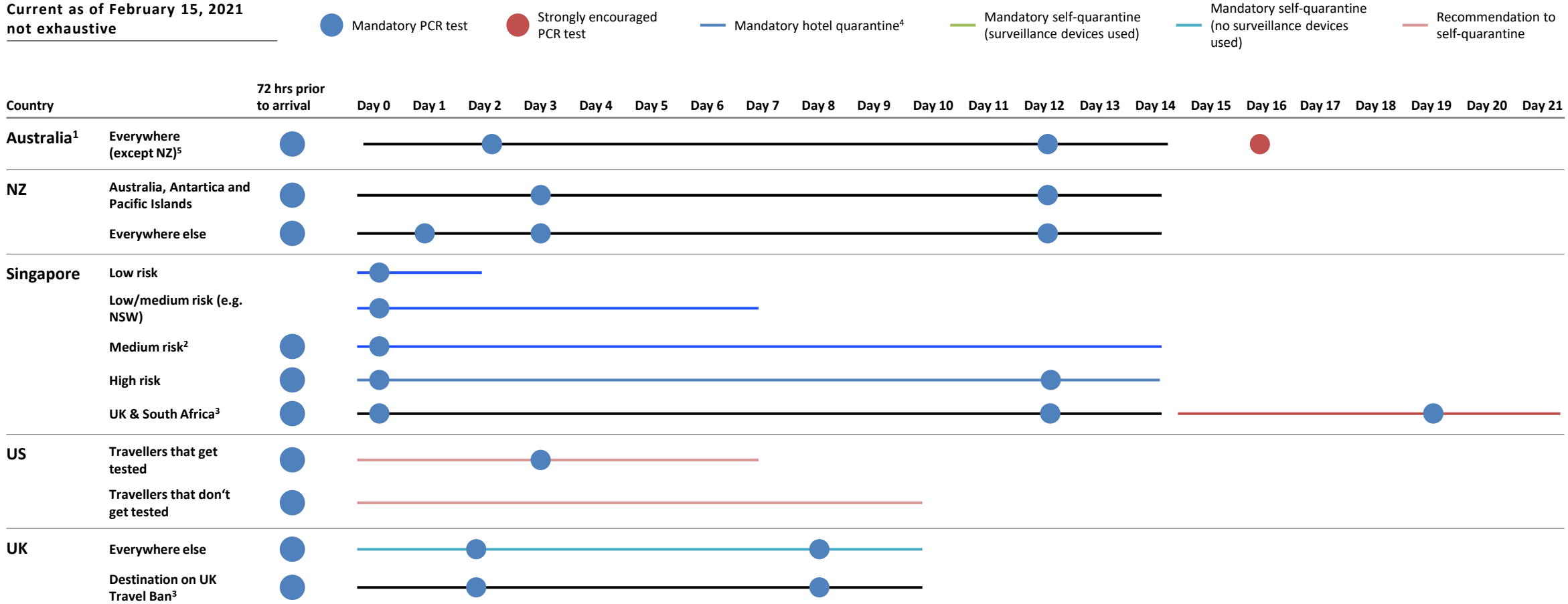
Airline crew testing

- Airline crew not tested
- Airline crew tested on arrival using PCR test
- Airline crew tested during hotel quarantine stay

Source: Press search

Quarantine requirements for international arrivals differ across countries (1/2)

Current as of February 15, 2021
not exhaustive

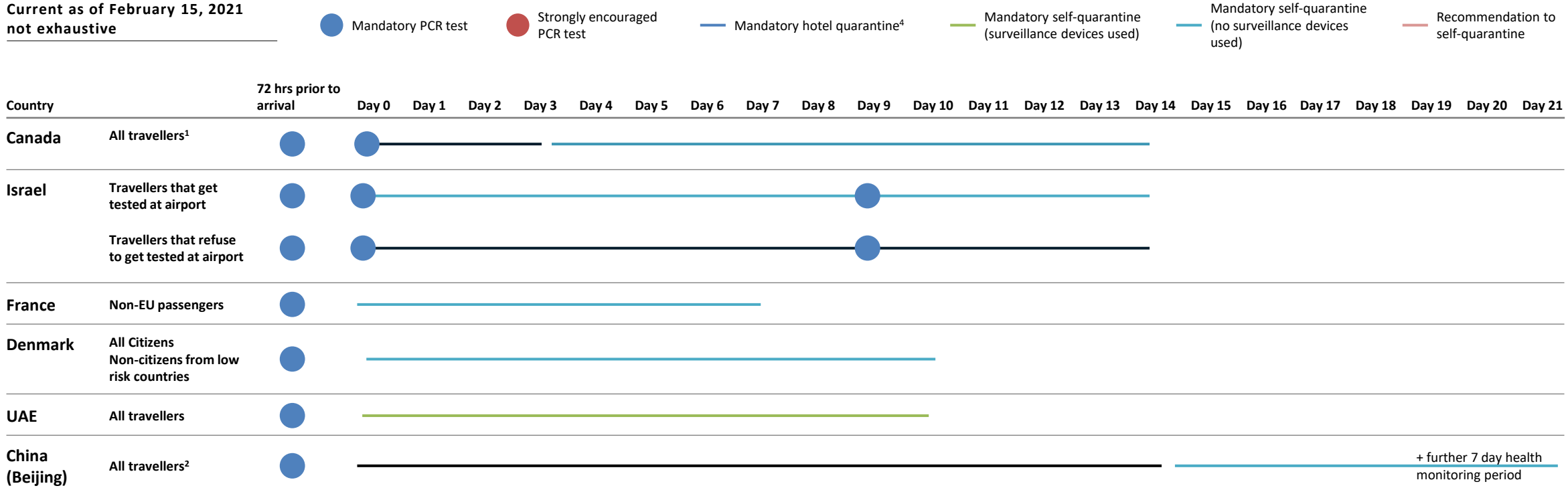


1. Based on current NSW restrictions
2. PCR test 72 hours prior only required for non-citizens and non-permanent residents
3. Only citizens and permanent residents allowed entry from these countries
4. In Singapore, SHN is completed at SHN Dedicated Facilities (SDF) for some arrivals
5. Travel bubble only available for travellers who have been in NZ for 14 days or more and not in a designated COVID19 outbreak location; and who travel to NSW, ACT, NT, QLD or VIC on a quarantine-free flight

Source: Press search

Quarantine requirements for international arrivals differ across countries (2/2)

Current as of February 15, 2021
not exhaustive



1. Restrictions expected to come into place in coming weeks
2. Timing of nucleic acid tests not published

Source: Press search

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I Snapshot of countries phasing in and out of their major economic reform measure

Countries and private sector actors are exploring different ways to demonstrate potential immunity

COVID19 vaccination and testing certificates

Vaccination certificate Negative test certificate

Current as of January 27, 2021
not exhaustive

IATA	**IATA Travel Pass:** Mobile application developed with International Airlines Group (parent company for airlines such as British Airways and Iberia), allowing travellers to store and manage certifications for COVID-19 tests or vaccines; information supplied is verified. Has been tested on flights between London and New York, launching by March 2021	✓ ✓
CommonPass	**Commonpass:** The Commons Project, The World Economic Forum and a broad coalition of public and private partners are collaborating to launch a trusted, globally-interoperable platform for people to document their COVID-19 status	✓ ✓
World Health Organization	**e-vaccination certificate:** WHO and Estonia are collaborating on developing a digitally enhanced International Certificate of Vaccination, a "smart yellow card, for eventual use in interoperable healthcare data tracking	✓
AOKpass	**AOKpass:** Developed by International SOS in partnership with the International Chamber of Commerce (ICC) and SGS. A secure way to present medical information, providing trusted recognition of COVID19 compliance status. In use between Abu Dhabi and Pakistan.	✓ ✓
W.H.A.	**VAX Passbook:** Developed by World Health Access, an International Health and Wellness subsidiary. Individuals can use VAX Passbook (vaccine verification booklet) or VAX Passcard (biometric vaccine verification card) to prove they have been inoculated with COVID-19 vaccine	✓
VCI	**Vaccination Credential Initiative:** Coalition of public and private partners (including Microsoft, Oracle and Salesforce) committed to empowering individuals with digital access to their vaccination records based on open, interoperable standards	✓
VACmobile	**Vacmobile:** Full suite of vaccination records solutions for individuals and third party requestors. VacMobile partners with State vaccination registries to safely receive, store and transmit digital vaccination records in a HIPAA compliant manner	✓
mvine iproov	**Digital passport: Technology d**eveloped by Mvine and iProov enables a person's test results or vaccination status to be registered and proved on an app using facial recognition technology (without disclosing their identity) and has started live testing in UK with NHS directors.	✓ ✓
DANISH MINISTRY HEALTH	**Vaccine passport:** Denmark is developing a 'self-print' vaccine passport for people who have received a COVID-19 vaccine. It is planned to launch in early 2021.	✓
IBM salesforce	**Ticketmaster:** IBM and Salesforce are partnering to integrate IBM's blockchain-powered smartphone app ('Digital Health Pass') with Salesforce's web-based employee management platform to help verify an employee's vaccination status and test results	✓ ✓
ticketmaster	**Ticketmaster:** The plan to require concert-goers to verify their health status includes three elements the ticketing agency will use to accomplish its goal: the Ticketmaster digital ticket app, third-party health corporations such as CLEAR Heath Pass, and testing providers such as Labcorp	✓ ✓

Source: Press search

Cohort specific policies are being investigated in the air travel industry, but are still uncommon in other contexts (1/2)

Current as of January 27, 2021
not exhaustive

Health policies		Singapore is considering requiring that those who do not opt to be vaccinated "have to live with more frequent tests … quarantines and … all of these other additional requirements."
		Israel's proposed 'green passports' for vaccinated persons will allow right holders to not quarantine after exposed to a diagnosed virus-carrier
		Chilean lawmakers are proposing to make COVID-19 vaccination mandatory under its Health code (as is the case for smallpox, whooping cough and other diseases)
		People vaccinated against COVID-19 in Poland will receive a vaccine passport which will enable them to use public health services without additional testing, not be included in measures for socialising and won't have to quarantine after contact with an infected person
International border policies		UK is proposing 14-day quarantine for arrivals from high risk countries be reduced to 5 days for if passenger test negatives
		Hong Kong and Singapore are proposing to use vaccine passports to enable a travel bubble between the two countries
		Anyone vaccinated can skip the requirements for a negative test upon arriving in Cyprus
		Singapore is considering relaxing its quarantine rules for vaccinated travellers if clinical trials shows evidence of lower transmission risk
		Vaccination certification will exempt people from requirements to get tested and quarantine upon arrival
		Ireland is establishing a system which would allow airline passengers to avoid restrictions if they have received a COVID-19 vaccination
		South Korea is considering proposals to include immunity passports as part of a wider travel bubble program with nearby countries such as Taiwan, Vietnam and Thailand
		Spain will create a list of all individuals refusing to receive the COVID-19 vaccine and will share this information with other members of the EU
		Prime Minister of Greece has proposed the EU roll out a vaccination certificate which he believes should be a requirement for travel
Air travel	DELTA	Delta Airlines CEO expects that vaccinations for international travel will eventually become a requirement
Private sector policies	QANTAS	Qantas has indicated they it would require passengers to be vaccinated against COVID-19, beginning in mid-to-late 2021, and that other airlines are considering similar measures
	UNITED	United Airlines is trialing mail-in Covid-19 tests between some locations to allow those who test negative to avoid quarantine
	Lufthansa	Lufthansa has started running COVID-19 tested flights which require passengers to have a negative test result to board and the CEO expects air travelers will need to provide a negative COVID test or proof of vaccination to board long-haul flights

Source: Press search

Cohort specific policies are being investigated in the air travel industry, but are still uncommon in other contexts (2/2)

Current as of January 27, 2021
not exhaustive

	National policies	Private sector policies
Workplace restrictions	United States Equal Employment Opportunity Commission issued guidelines that said employers have the right to impose a mandatory COVID-19 vaccination policy US Department Of Defence is considering the possibility of using an immunity passport to ensure the safe returns of marines and recruits	NCL NORWEGIAN CRUISE LINE Norwegian Cruise Holdings CEO has stated vaccination will be a requirement for crew and have lawyers looking into whether they have legal standing to mandate vaccination for cruisers
	An arbitrator recently upheld a Canadian nursing home's unilateral policy requiring its employees to undergo bi-weekly mandatory COVID-19 testing	
	Employers in Brazil have a right to require employees to be vaccinated or impose reasonable disciplinary measures (e.g. written admonition, suspension and termination for cause) if an employee refuses to be vaccinated without a reasonable justification	
	UAE government issued a circular on December 31 2020 mandating employees going into the office to take a nasal swab test every 14 days at their own cost (with employees who have already received COVID-19 vaccination exempt). It also mandates that contractors attending government workplaces are required to ensure their employees are vaccinated against COVID-19	
General restrictions	Israel's proposed 'green passports' for vaccinated persons will allow access to public events and restaurants. It will be issued two weeks after second dose administered	ticketmaster® Ticketmaster indicated that they are considering making proof of vaccination a condition of entry to events
	Denmark proposed "corona passport" will allow access to restaurants, movie theatres and perhaps large music festivals. Business leaders are pushing for it to cover persons vaccinated as well as those that test negative or have had a prior infection	
	Some bars, cinemas, restaurants and concert venues have already signalled plans to demand proof of vaccination from patrons once the shot becomes more widely available	
	Federal Supreme Court of Brazil recently ruled that the government can require mandatory vaccination and impose restrictions for those who refuse to be inoculated (e.g. restricting individuals entering public places)	
	Germany government has so far rejected the idea of restoring certain freedoms for vaccinated people, pointing out that it Is still uncertain whether vaccination prevents transmission	
	"Public accommodation" businesses such as hotels, theaters and restaurants could potentially be prohibited from mandating vaccination if it is deemed to constitute religious discrimination under the Civil Rights Act (1964) – however, arguments against mask wearing using this reasoning have so far been unsuccessful	

Source: Press search

Some employers have announced a role in COVID-19 vaccination

Examples of actions that employers have announced

	Guideline definer Develop guidelines that impact employee vaccination	System navigator Support employees seeking to get vaccinated	Service provider Provide opportunities for employees to get vaccinated
More neutral stance	No formal recommendation or requirement on vaccination	Provide employees with information on vaccines and how to get vaccinated (e.g., list of local providers)	Reserve time with external providers for employees to get vaccinated
	Recommend employees to get vaccinated		
	Create incentives for employees to get vaccinated (e.g., recognition or rewards)	Reduce financial barriers to getting vaccinated (e.g., reimburse employees for any costs associated with getting vaccinated)	Hold on-site immunisation clinics for employees (but do not directly procure vaccines)
	Request or require employees to show proof of COVID-19 vaccination		
More proactive stance	As appropriate, consider vaccination requirement for employees	Reduce logistical barriers to getting vaccinated (e.g., provide employees with paid time off specifically to get vaccinated)	Procure vaccines and administer on-site to employees (and potentially employees' family members)

Role of employers as guideline definers will likely change over time as regulatory guidance evolves (e.g., more proactive stance unlikely until vaccines receive full approval by regulatory authorities)

Source: Press search

The US EEOC has provided guidance that employers may request proof of vaccination from employees

Guideline definer
Develop guidelines that impact employee vaccination

More neutral stance

No formal recommendation or requirement on vaccination

Recommend employees to get vaccinated

Create incentives for employees to get vaccinated (e.g., recognition or rewards)

Request or require employees to show proof of COVID-19 vaccination

More proactive stance

As appropriate, consider vaccination requirement for employees

U.S. Equal Employment Opportunity Commission (EEOC)[1] guidance

Based on FAQs released December 16, 2020

Proof of vaccination

EEOC guidance suggests that employers may ask employees for COVID-19 vaccination status but NOT protected medical information

- Requiring an employee to show proof of receipt of a COVID-19 vaccination is not a disability-related inquiry
- However, additional questions such as asking why an employee did not receive a vaccination may illicit information about a disability and would therefore be subject to Americans with Disabilities Act (ADA) standards

Vaccination requirement

EEOC guidance suggests employers may require vaccination, but with specific accommodations

Employers may need to grant accommodations with respect to employees who cannot comply with the requirement due to disabilities or religious practices / beliefs

1. The US federal agency that enforces the Americans with Disabilities Act

Source: EEOC

Multiple employers have announced plans to develop guidelines and support vaccination of employees

Examples of employer actions to date

Guideline definer

Develop guidelines that impact employee vaccination

System navigator

Support employees seeking to get vaccinated

Service provider

Provide opportunities for employees to get vaccinated

UNITED STATES POSTAL SERVICE — Currently engaging unions in vaccine distribution discussions, likely taking place Feb

Planning to set up vaccination sites at larger postal facilities[5]

Facebook announced it will NOT require COVID vaccination but will maintain public health measures (e.g., social distancing, mask wearing) upon return-to-work[3]

Discover announced it will encourage employees who can safely get the vaccine to do so[6]

Norwegian announced it will require ship crew members to receive vaccination before returning to work[4]

Verizon COVID-19 vaccination will be fully covered by the company's health insurance plan[6]

SquareFoot Commercial real estate company SquareFoot will provide employees with paid time off to receive the vaccine[6]

Emerson Plan to reward employees who receive vaccine, e.g., contribution to retirement or gift cards[6]

Instacart Stipend for employees who have been vaccinated

Dollar General Will provide 4 hours of paid time off for employees who self-report receiving vaccine dose[7]

UVA Health / **Henry Ford Health System** Many health systems have reported setting up on-site vaccination clinics for workers[1]

Other health systems

Ford reported purchasing ultra-cold freezers to store Pfizer / BioNTech vaccine, suggesting the company may offer on-site vaccination[2]

Marriott International has reported it is considering whether to bring vaccine providers into larger hotels to administer vaccines[6]

1. UVA, Henry Ford Health, AAMC; 2. Economic Times; 3. Verge; 4. Travel Weekly; 5. Govt Executive 6. WSJ 7. WSJ

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I Snapshot of countries phasing in and out of their major economic reform measure

Many countries are starting to wind back their general economic support measures (1/4)

Current as of January 27, 2021
not exhaustive

Country	Major general economic support measure	Description	Key changes to support measure
 **Australia**	Job Keeper Payment Scheme	Federal government **wage subsidy paid to employers** who are significantly affected by COVID-19 (according to turnover test) and continue to pay the wages of 'eligible employees'	**30 March 2020:** A$1,500/fortnight for each eligible employee **21 July 2020:** scheme extended from 27 Sep 20 to **28 March 21** **28 September 2020:** reduced to A$1,200 per fortnight and lower payment rate of A$750 per fortnight introduced for those working fewer than 20 hours/week **4 January 2021:** reduced to A$1,000 per fortnight for those working more than 20 hrs/week and $650 per fortnight for others
 **Israel**	Pay for workers on unpaid leave	Program which allows **workers sent on unpaid leave** for at least 30 days by their employer to claim **up to 80% of their last salary** from the Israeli Employment Service (regardless of how much the business' turnover declines)	**March: 2020** Program announced **May 2020:** Program extended until **30 June 2021**
 **UAE**	Targeted Economic Support Scheme (TESS)	**Zero Cost Facility (ZCF)** provided by Central Bank of the UAE (CBUAE) which **benefits retail and corporate banking customers** and facilitates liquidity management for banks through collateralised funding at zero cost	**March 2020:** Scheme launched by CBUAE with zero-interest, collateralized loans worth Dhs50bn (~18bn AUD) for local banks and an additional Dhs50bn freed up from banks' capital buffers **November 2020:** CBUAE extended duration of ZCF of Dhs50bn by six months until **30 June 2021**

Source: Press search

Many countries are starting to wind back their general economic support measures (2/4)

Current as of January 27, 2021
not exhaustive

Country	Major general economic support measure	Description	Key changes to support measure
 **United Kingdom**	Coronavirus Job Retention Scheme (CJRS)	Government **grant to UK employers to cover proportion of employees wages** whom they continue to pay but would otherwise have been laid off as a result of the COVID-19 crisis	**March 2020:** payment of up to 80% of a furloughed employee's wage costs (up to £2,500 a month) including employer's NICs and pension contributions **1 July 2020:** phase 2 of scheme introduced, allowing furloughed staff to work on a part-time basis **August 2020:** employers must now bear cost of the associated employer's NICs and pension contributions **September 2020:** payment reduced to 70% of wages up to a cap of £2,187.50 per month. Employers must bear the cost of the associated employer's NICs and pension contributions as well as 10% of wages to make up the 80 per cent total (subject to the £2,500 monthly cap) **October 2020:** payment reduced to 60% of wages up to a cap of £1,875 per month. Employers must bear the cost of the associated employer's NICs and pension contributions as well as 20 per cent of wages to make up the 80 per cent total (subject to the £2,500 monthly cap) **November 1, 2020:** Program extended until 30 April 2021 and went back up to August conditions (i.e. 80%)
 **New Zealand**	Wage Subsidy Scheme	**Wage subsidy** paid directly to employers to keep their staff employed	**17 March 2020:** lump sum payment paid to employers every week for 12 weeks ($585.80 for people working 20hrs+; $350 for people working <20hrs) if business' revenue had decreased by at least 30% **14 May 2020:** wage subsidy extended until September, however now had to prove revenue decreased by at least 40% **September 2020: Scheme discontinued** (unless region goes into Stage 4 restrictions)

Source: Press search

Many countries are starting to wind back their general economic support measures (3/4)

Current as of January 27, 2021
not exhaustive

Country	Major general economic support measure	Description	Key changes to support measure
 **Singapore**	Job Support Scheme (JSS)	**Wage support to employers** to help them **retain local employees** (Singapore Citizens and Permanent Residents) by offsetting their wages	**18 February 2020:** JSS announced, with the government co-funding between 25-75% of the first S$4,600 of gross monthly wages paid to each local employee in a 10-month period **21 April 2020:** program extended until August. **17 August 2020:** JSS extended until **March 2021**, however, the government will only pay between 10-50% of the gross monthly wages in the subsequent 7-month period
 **US**	Paycheck Protection Program	**100% forgivable loan** provided by SBA to businesses to help them **keep their workforce employed** during COVID-19 crisis	**27 March 2020:** The CARES Act is signed, with the PPP providing loans of up to $12 million to SMBs, with the goal to help them retain their employees **4 July 2020:** program extended until August 8 2020 **27 December 2020: final extension** of the PPP approved
 **France**	Chômage Partiel (Partial Unemployment)	Scheme which enables employers to receive a **monthly government allowance** corresponding to their employees' non-working days up to a maximum of 1,607hrs per year per person	**1 March 2020:** partial unemployment plan scheme announced, covering 100% of the salaries for companies most-affected by the virus **1 May 2020:** people on short-term contracts (CDD) and intermittent workers no longer qualified **1 August 2020:** payment reduced to 80%. **26 August 2020: 2 year extension to scheme** for companies covered by agreement and extension till November 1 2020 for companies not covered but especially impacted by COVID-19 crisis (e.g. sport, tourism and events businesses) **11 December 2020:** November deadline extended to **2021**

Source: Press search

Many countries are starting to wind back their general economic support measures (4/4)

Current as of January 27, 2021
not exhaustive

Country	Major general economic support measure	Description	Key changes to support measure
 **Canada**	Canada Emergency Wage Subsidy (CEWS)	**Subsidy paid to employers** that have experienced at least a 30% drop in revenue, to cover part of employees wages	**27 March 2020:** Temporary Wage Subsidy introduced, providing a 10% wage subsidy for eligible businesses for a maximum of C$1,375 per employee per month and C$25,000 per employer. Originally covered period from 15 March to 6 June 2020 **27 April 2020:** CEWS introduced, bringing the wage subsidy up to 75% (up to $847/week). Originally covered period from March 15 to June 6 2020. Revenue decline required for eligibility was 15% for March, and 30% for April, May and June 2020 **15 May 2020:** program extended to 29 August 2020 and eligibility extended **17 July 2020:** program extended until 19 December 2020 and a base subsidy is made available for those that do not meet the 30% decline of sales test **23 September 2020:** CEWS extended to summer 2021 **19 November 2020:** program extended to **June 2021** (although details only available till March 13 2021)
 **Denmark**	Wage Compensation Scheme	Government **relief for employees** subject to the ban on staying open and which have sent home a minimum of 30% of the total staff or more than 50 employees	**9 March 2020:** Scheme introduced, providing 75- 90% wage subsidy to companies that have had to let go more than 30% of their employees for a maximum of DKK30,000 (~$6,000) per month **June 2020:** scheme deadline extended from 8th June to 29th August **31 August 2020:** New distribution of work scheme introduced which allows for companies to share their available labour between employees instead of making staff redundant **27 November 2020:** new scheme extended from 31 December to unspecified date **10 December 2020:** reintroduced wage compensation scheme (currently applicable to **17 Jan 2021)**

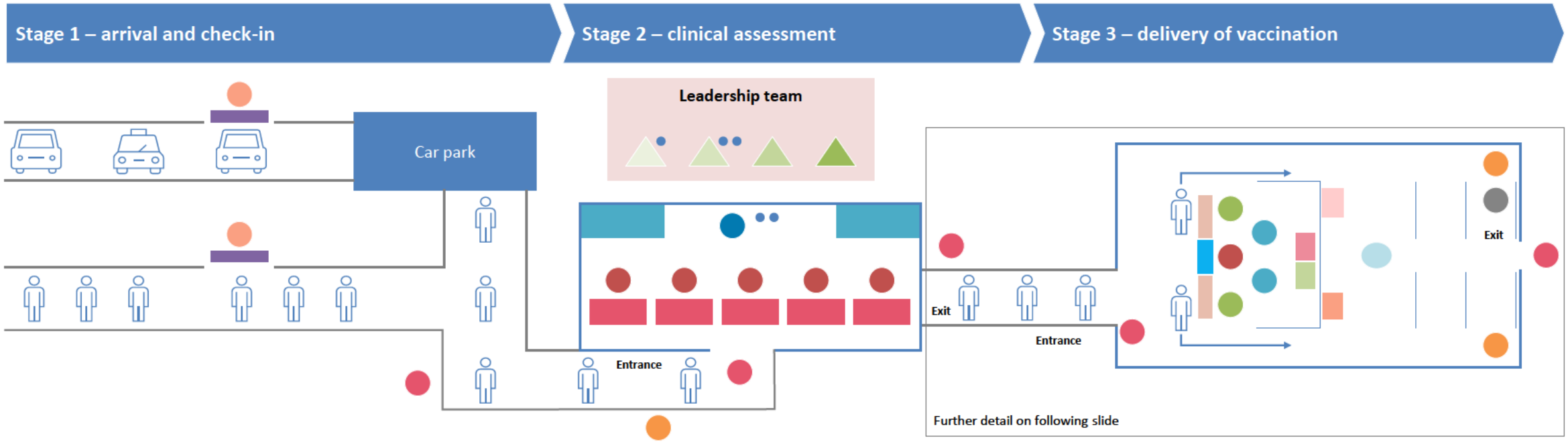
Source: Press search

Appendix

- **A) Example vaccination site flows**
- B) Sample customer journeys at vaccination sites
- C) Other resources

Site layout (1/2)

Sanitised Example: to be tested with medical experts



Key

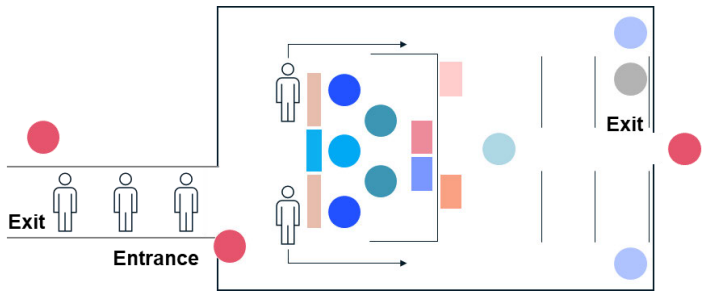
- User
- Front of house (paid)
- Marshall (volunteer)
- Check-in station
- Registered HCP Grade X
- Registered HCP Grade Y
- Immuniser
- Admin Support
- Health Care Assistant
- Volunteer First Aid Group (post vaccination observation & patient advocate)
- Assessment Station
- Private office for clinical assessment
- Dirty area
- Clean area
- Vaccine station
- Vaccine preparation bench
- Trolley
- Resus equipment
- Senior Manager
- Nursing Manager
- Medical Director
- Operations Director

Only required for single lane site*

Only required for multiple lane site**

Site layout: Key activities (2/2)

Sanitised Example: to be tested with medical experts



A single queue feeds in to each lane. A marshal will direct users to a vaccination station. Each vaccination station is staffed by an immuniser and an administrator. Key steps include:

1. Vaccination

- **Final checks –** the administrator will
  - Enter the booking reference into the clinical system to bring up a user's record
  - Confirm the user's name, address and date of birth
  - Confirm the user has completed their clinical assessment.
- **Vaccine delivery –** vaccine is delivered by the immuniser to the user's deltoid by IM injection
- **Updating the user's record –** the vaccination event needs to be captured in the user's record. The administrator will input the following information in to the clinical system:
  - Name of the individual who drew up the vaccine
  - Name of the immuniser
  - Vaccine particulars (brand, batch, expiry)
  - Where the vaccine was administered
  - Date and time of vaccine event
- **Vaccination station wipe down –** administrator wipes down the vaccination station before the next users attends

2. Post-vaccination observation

- Users make their way to a socially distanced seat in the post-vaccination observation area
- Users will time their 15 minute vaccination period themselves

3. Check out

A member of the Volunteer First Aid Group team will be responsible for managing the check-out of users following their vaccination. Using their handheld mobile device they will:

- Enter the booking reference into the clinical system to bring up a user's record upon exit
- Advise users to wait the recommended time period post vaccination — the clinical system will provide visibility on users that have driven to site and the timestamp of the vaccine event
- Check users out on the clinical system and capture users that have not observed the advised 15 minutes post vaccination period

Section

- A) Example vaccination site flows
- **B) Sample customer journeys at vaccination sites**
- C) Other resources

Average patient journey at a COVID-19 vaccination site ranges from 25 – 40 minutes

Based on anecdotal evidence collected from 10+ jurisdictions, note that specific timings can vary significantly depending on site type and consumer[1]

Illustrative

	Pre-registration and pre-arrival	Registration and consent	Administer	Observation and Follow-up
Example activities (not exhaustive)	 Schedule appointment Provide factsheets Conduct eligibility / medical screening, as required	 Register consumer and input consumer related data Consent for vaccine administration	 Prepare and administer vaccine doses Input vaccine related data	 Observe for 15 minutes post administration  Hand consumer vaccination card Provide safety information, details for adverse event reporting and second dose reminder
Indicative timing	**N/A**	**5 – 15 minutes:** Highly variable based on walk-in vs pre-booked; if pre-booked, dependant on extent to which identity / eligibility check is done prior	**~5 – 6 minutes:** Highly variable depending on patient and clinic type	**~15 minutes**

Range of indicative timings:

3 – 4 minutes	5 – 6 minutes	~8 minutes	15+ minutes
Megasite in a US Stadium	Typical dedicated site (2+ lanes) in the UK / US	Private sector estimate in response to US RFQ	Aged care settings (more if consent not done prior)

1. Based on UK, Israel, France, Canada and multiple US states

Source: Expert interviews

Example: Illustrative drive through COVID-19 vaccination site

Pre-registration

Registration – through car by site staff

Vaccination – patient/s remain in car
(2 vaccinators)

Observation – larger parking area where patients park for observation
(stay in vehicle)

Follow-up

Types of sites by potential throughput

Highly Preliminary

Micro site

30 Doses per day

5-6 Days a week

Medium site

50 Doses per day

5-6 Days a week

Large site

300 Doses per day

5-6 Days a week

Mega site

1,200 - 2,400 Doses per day

7 Days a week

Example site staffing and throughput for standard mega site COVID-19 vaccination site with 10-20 lanes, operating for 8 to 16 hours daily

Highly Preliminary: to be tested with medical experts

Patient Journey

Pre registration and education	Registration and consent	Vaccination	Observation and Follow-up

Illustrative vaccination lane

Dedicated per lane

Registration and consent	Vaccination	Observation and Follow-up
Greeter/ patient navigator – ***1*** *per lane*	Vaccinator (will also prepare vaccine) – ***2*** *per lane*	Observation staff – ***1*** *per lane*
Registration staff[1] – ***1*** *per lane*	Data entry staff – ***1*** *per lane*	
	Runner – ***1*** *per lane*	
		7 dedicated FTEs per lane

Sitewide staffing

- Security guard – ***5*** *per site*
- Medical screener – ***1*** *per site*
- Quality and patient experience officer – ***1*** *per site*
- EVS staff – ***2*** *per site*
- Community volunteers
- Clinic manager – ***1*** *per site*
- Vaccine coordinator[2] – ***2*** *per site*
- Safety coordinator – ***1*** *per site*
- EMT (for large non-hospital sites) – ***1*** *per site*
- Float/ relief staff – *15% buffer*

On call / offsite staff

- Outreach staff - ***1*** *per site*
- IT and data management staff[3] - ***1 per 10*** *sites*
- Appointment clerk[3] - ***1*** *per site*
- Translator services[4] – *on call services*
- Maintenance staff - ***1 per 10*** *sites*

~16 total FTEs

1,200 (10 lanes) to 2,400 (20 lanes) vaccinations could be completed daily at each mega site
Each site could require ~155 FTEs; ~65 clinical and ~90 non clinical

1. Registration lanes may be divided into lane for walk-ins and lane for prescheduled appointments; 2. CDC recommends that each PODS has a vaccine coordinator and backup (serve as POC for receiving vaccine shipments, monitoring storage unit temperatures, managing vaccine inventory); 3. Multi lingual; 4. Budgeted per use, assumed 160 minutes use per day for mega site

Example: Site staffing for standard large COVID-19 vaccination site

Highly Preliminary: to be tested with medical experts

Patient Journey

Pre registration and education	Registration and consent	Vaccination	Observation and Follow-up

Dedicated per lane

	Greeter / Patient navigator – ***1*** *per lane* Registration staff – ***1*** *per lane*	Vaccinator (will also prepare vaccine) – ***2*** *per lane* Data entry staff – ***1*** *per lane* Runner – ***1 per 2*** *lanes*	Observation staff - 1 per 2 lanes

6 dedicated FTEs per lane

Sitewide staffing

- Security guard – ***1*** *per site*[1]
- Safety and quality and patient experience officer – ***1*** *per site*
- EVS staff – ***1*** *per site*
- Community volunteers
- Clinic manager and Vaccine coordinator[2] – ***1*** *per site*
- Float/ relief staff – *10% buffer*

26 total staff: 9.5 clinical and 17.5 non-clinical

On call / offsite staff

- Outreach staff - ***1*** *per site*
- IT and data management staff - ***1 per 10*** *sites*
- Appointment clerk[3] - ***1*** *per site*
- Translator services[4] – *on call services*
- Maintenance staff - ***1 per 10*** *sites*
- Regional medical screener[5] – ***1*** *per region*

~8 total FTEs

Assuming minimum weekly capacity of 1,200 – 1,800 doses per site, with throughput of 100 doses per day per lane with 3 lanes per site

1. Not included for hospital sites; 2. CDC recommends that each PODS has a vaccine coordinator and backup (serve as POC for receiving vaccine shipments, monitoring storage unit temperatures, managing vaccine inventory); 3. Multilingual; 4. Budgeted per use, assumed 120 minutes use per day for large site; 5 One per region, Medical screening support for eligibility, with possible central physician support

Example: Site staffing for standard medium COVID-19 vaccination site

Highly Preliminary: to be tested with medical experts

Patient Journey

Pre registration and education	Registration and consent	Vaccination	Observation and Follow-up

Dedicated per lane

	Greeter / Patient navigator – ***1*** *per lane* Registration staff – ***1*** *per lane*	Vaccinator (will also prepare vaccine) – ***1*** *per lane* Data entry staff – ***1*** *per lane*	

4 dedicated FTEs per lane

Sitewide staffing

- Runner – ***1*** *per site*
- Observation staff – ***1*** *per site*
- Security guard – ***1*** *per site*[1]
- Safety and quality and patient experience officer – ***1*** *per site*
- Clinic manager and Vaccine coordinator[2] – ***1*** *per site*
- EVS staff – ***1*** *per site*
- Float/ relief staff – *10% buffer*
- Community volunteers

11 total staff: 3 clinical and 8 non-clinical

On call / offsite staff

- IT and data management staff - ***1 per 10*** *sites*
- Translator services[3] – *on call services*
- Maintenance staff - ***1 per 10*** *sites*
- Regional medical screener[4] – ***1*** *per region*

~7 total FTEs

Assuming minimum weekly capacity of 300 - 600 doses per site, with throughput of 50 doses per day per lane, with 1 lane per site

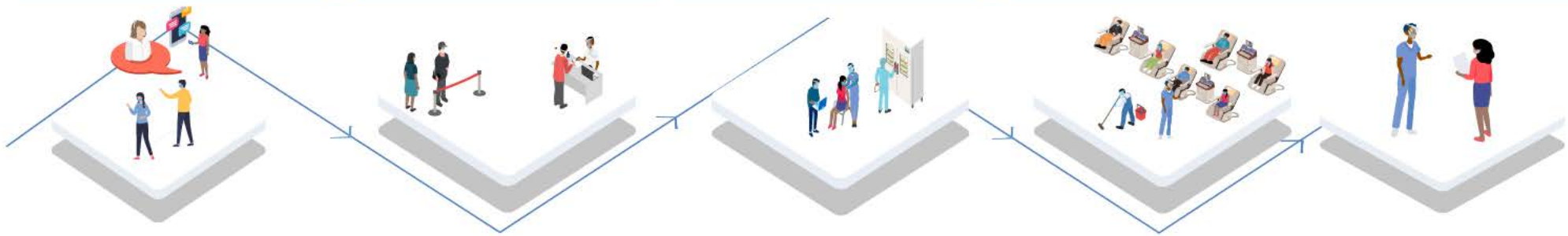
1. Not included for hospital sites; 2. CDC recommends that each PODS has a vaccine coordinator and backup (serve as POC for receiving vaccine shipments, monitoring storage unit temperatures, managing vaccine inventory); 3. Budgeted per use, assumed 80 minutes use per day for medium sites; 4. One per region, Medical screening support for eligibility, with possible central physician support;

Example: Site staffing for standard micro COVID-19 vaccination site

Highly Preliminary: to be tested with medical experts

Patient Journey

Pre registration and education	Registration and consent	Vaccination	Observation and Follow-up



Dedicated per lane

Registration staff – ***1*** *per lane*

Vaccinator (will also prepare vaccine) - ***1*** *per lane*

Data entry staff - ***1*** *per lane*

3 dedicated FTEs per lane

Sitewide staffing

Observation staff – ***1*** *per site*

Clinic manager and Vaccine coordinator[1] – ***1*** *per site*

EVS staff – **0.5** *per site*[2]

Community volunteers

4 total staff: 3 clinical and 3 non-clinical

On call / offsite staff

IT and data management staff - ***1 per 10*** *sites*

Maintenance staff - ***1 per 10*** *sites*

Regional medical screener[3] – ***1*** *per region*

Translator services[4] – *on call services*

~4 total FTEs

Assuming minimum weekly capacity of 180 doses per site, with throughput of 30 doses per day per lane, with 1 lane per site

1. CDC recommends that each PODS has a vaccine coordinator and backup (serve as POC for receiving vaccine shipments, monitoring storage unit temperatures, managing vaccine inventory); 2. Assume half shift for micro site ; 3. One per region, Medical screening support for eligibility, with possible central physician support; 4. Budgeted per use, assumed 60 minutes use per day for medium sites

Section

- A) Example vaccination site flows
- B) Sample customer journeys at vaccination sites
- **C) Other resources**

Additional Resources

UK COVID-19 Vaccines Delivery Plan

NHS COVID-19 Vaccination Centres: Operating Framework

COVID-19: the green book, chapter 14a

Joint Committee on Vaccination and Immunisation: advice on priority groups for COVID-19 vaccination

COVID-19 Dashboard
Translation into English available via Google Translate

Canada's COVID-19 Immunisation Plan: Saving Lives and Livelihoods

Coronavirus disease (COVID-19): Guidance documents, in particular:

- Planning guidance for immunisation clinics for COVID-19 vaccines
- Planning guidance for administration of COVID-19 vaccine

COVID-19 Vaccination Tracker

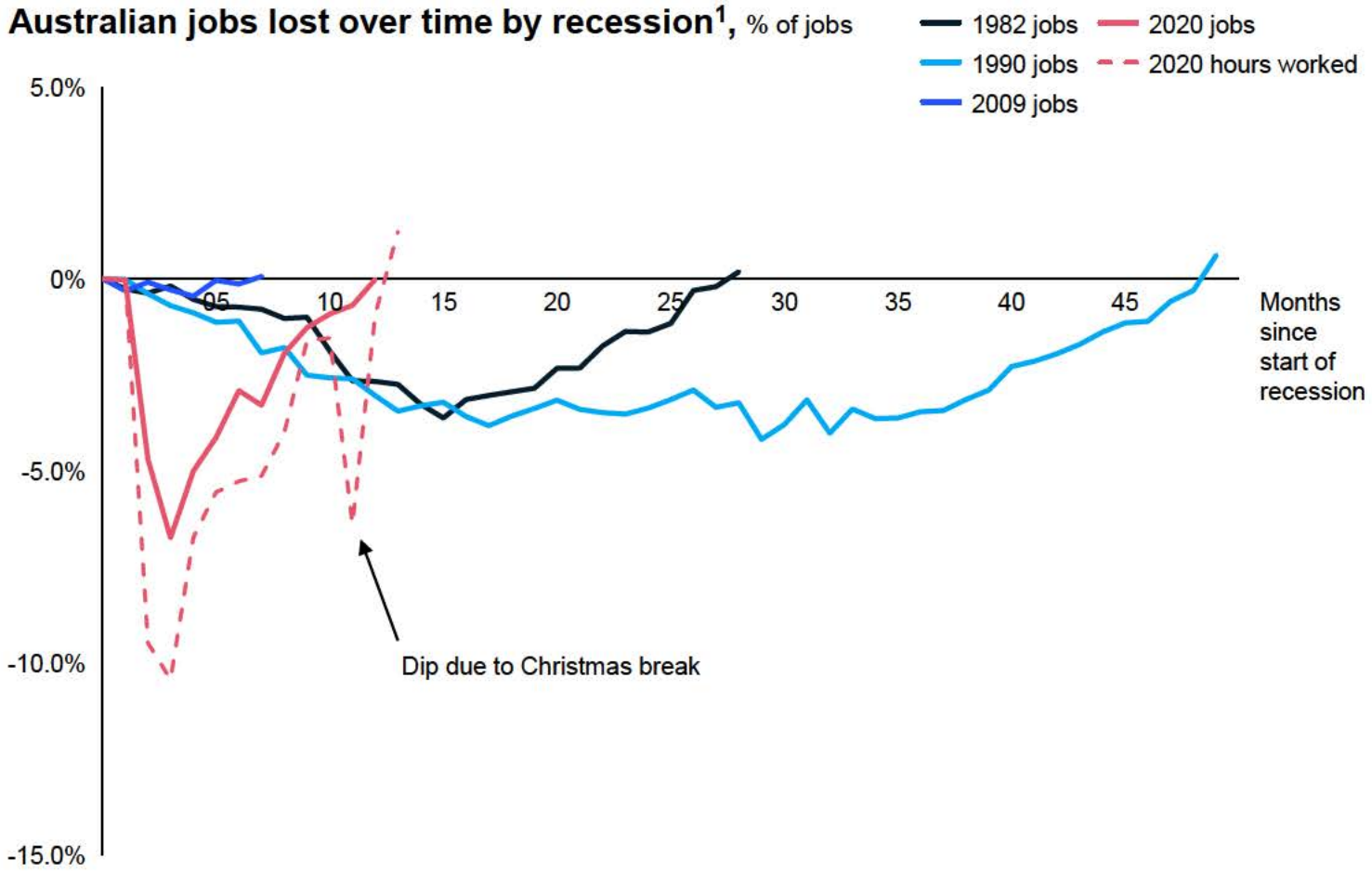
Economic opportunities

Draft discussion document

19 April 2021

The COVID19 shock was rapid and brief…

Australian jobs lost over time by recession[1], % of jobs



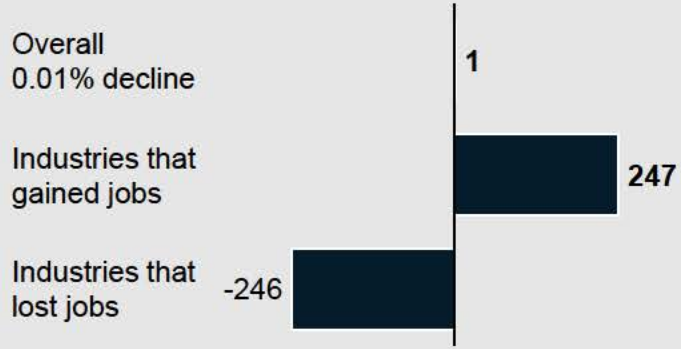
1. 2009 is included for illustrative purposes; it was not a technical recession

Source: ABS; McKinsey analysis

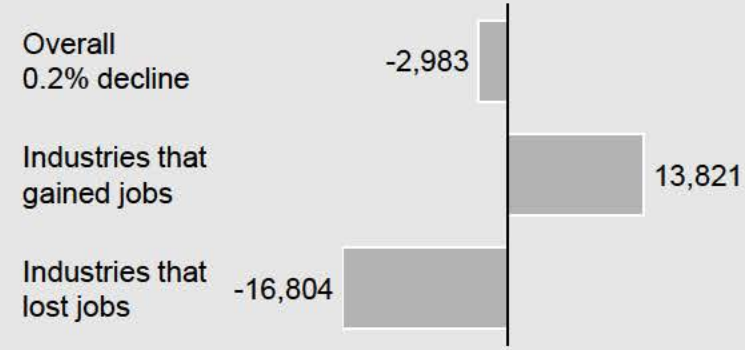
… recovery is not complete

Net change in Jobs and GVA

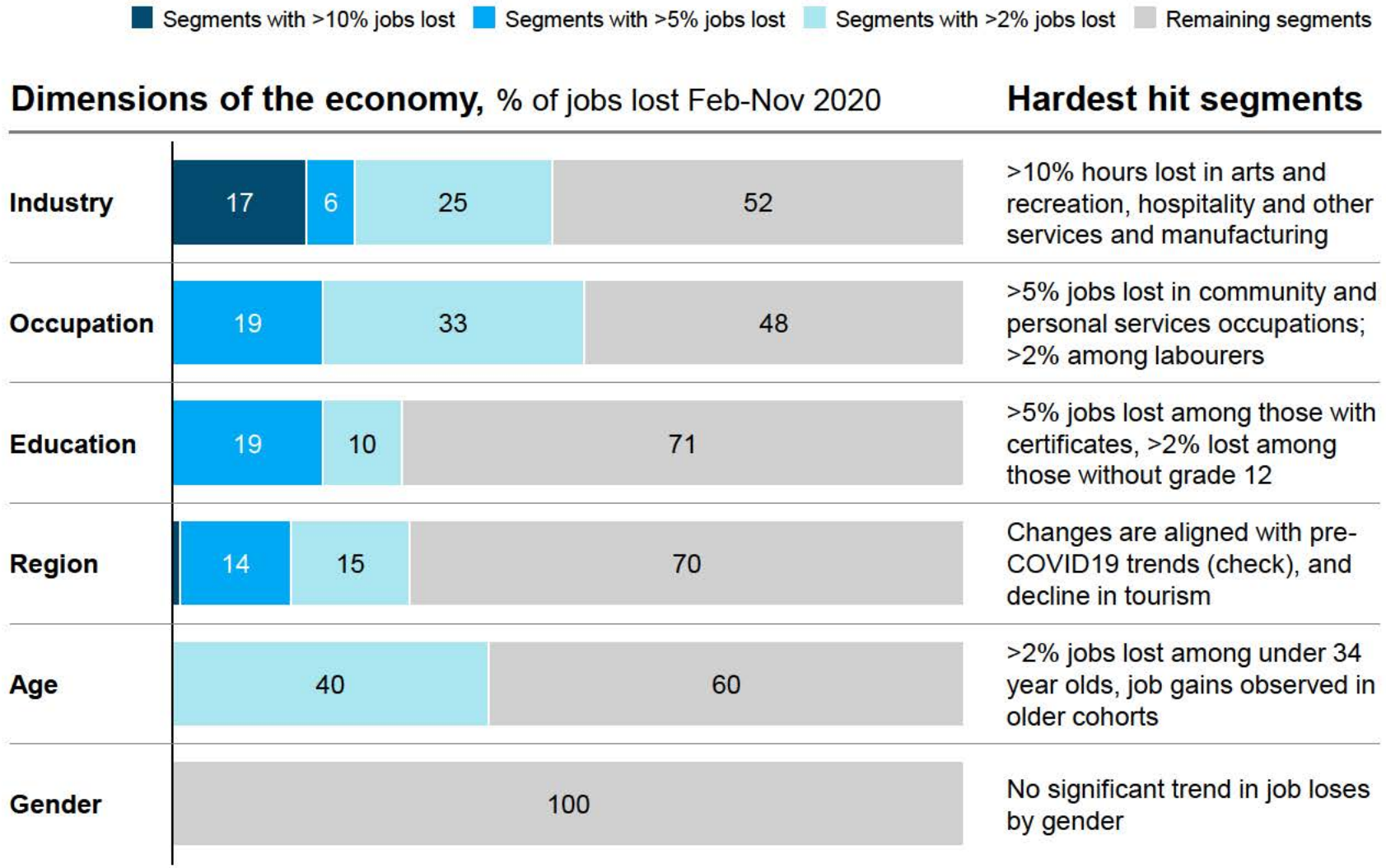
Jobs, Feb 2020 – Feb 2021, '000s



GVA, June 2019 – June 2020, $Millions



COVID19 shock hit primarily down industry lines



Source: ABS; McKinsey analysis

Policy implications

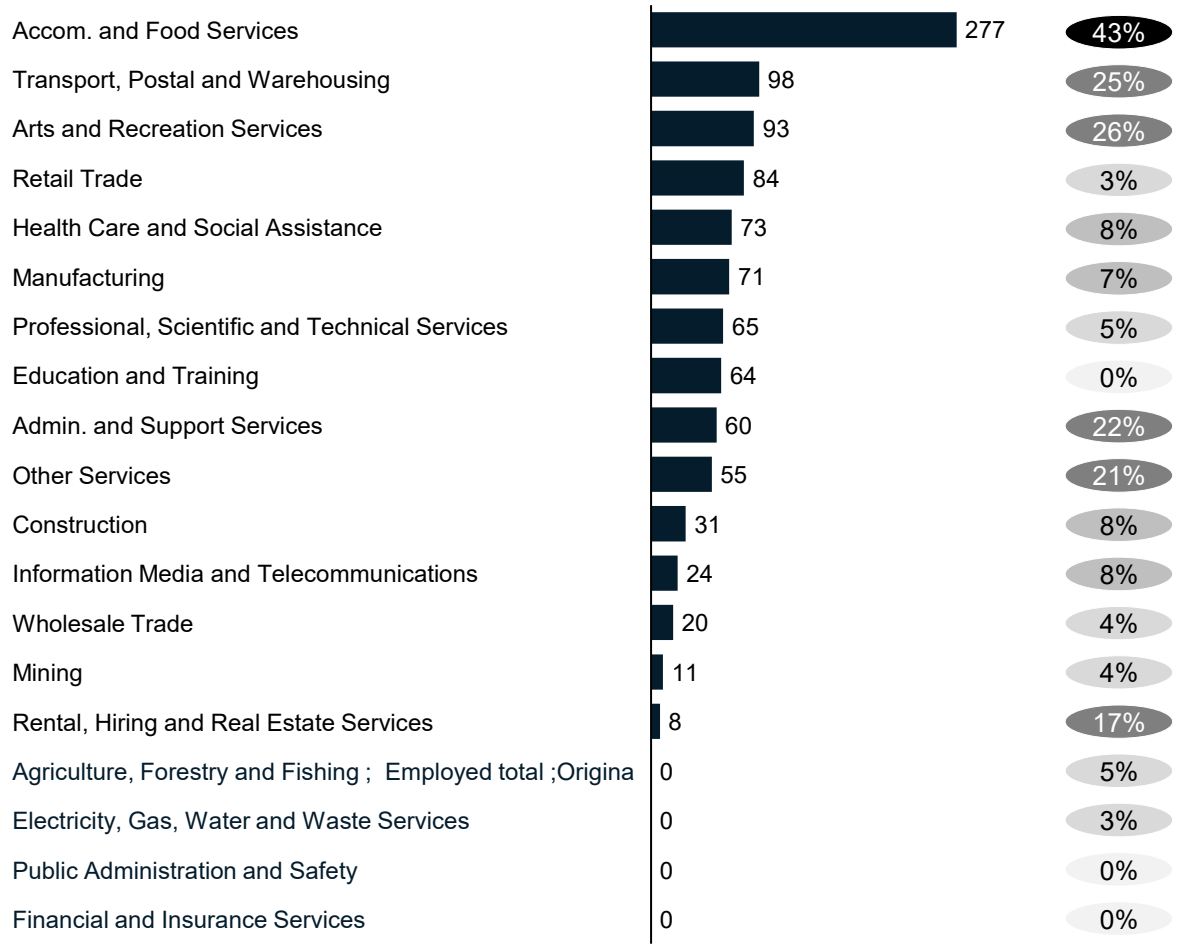
- **17% of jobs** were located in **industries that lost 10% or more of their jobs**
- The only other dimension where more than 10% of jobs were lost in a single category was regions
- This implies that **recovery policy will be most effective if it is targeted at key industries,** as opposed to other economic dimensions

Job losses were greatest in industries exposed to restrictions, but spread right across the economy

Draft

Peak job losses over Feb 2020 – Feb 2021 by industry and occupation, 000s

Peak job losses by industry



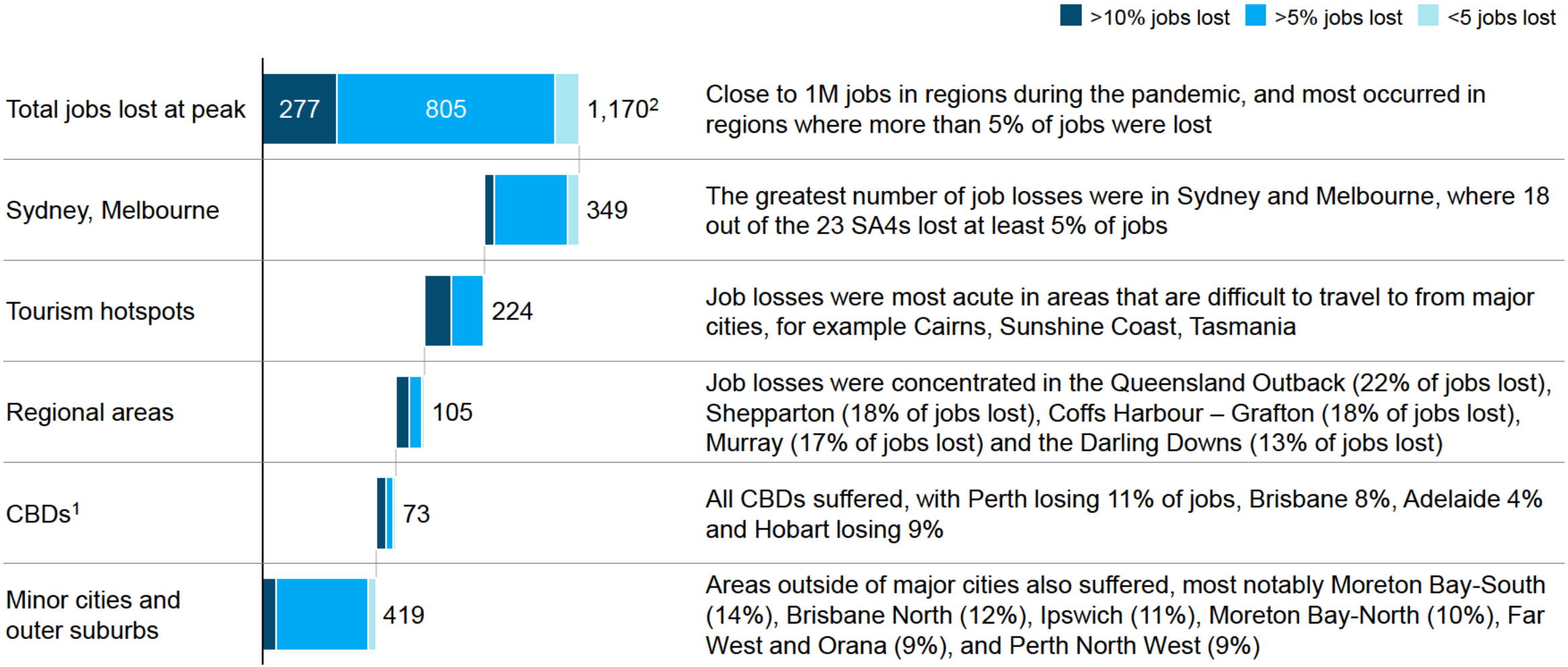
Job losses by occupation

Source: ABS; McKinsey analysis

Tourism regions experienced the most acute job losses, but the greatest number of job losses were in Melbourne and Sydney

Draft

Peak job losses by region and concentration, 000s

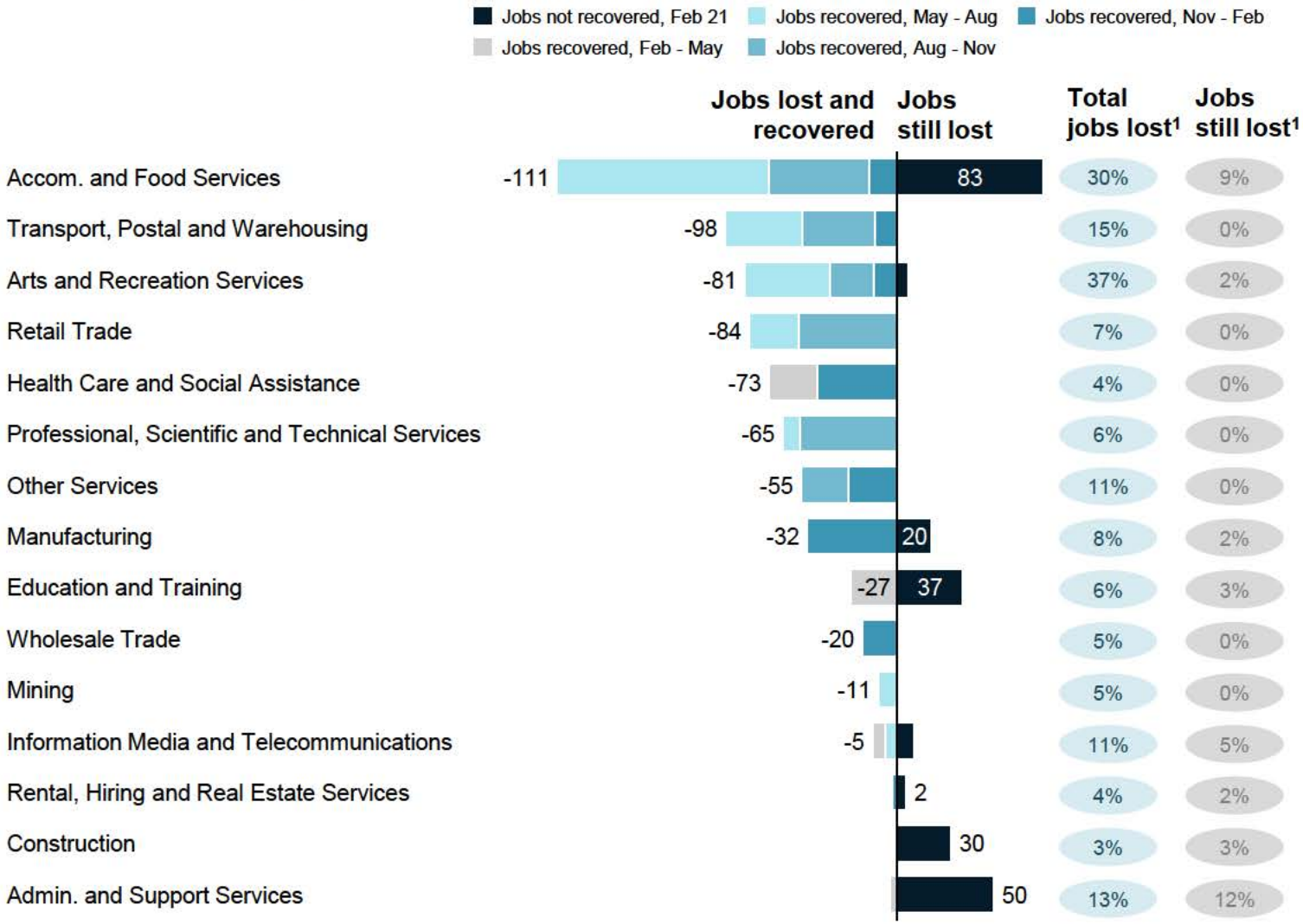


1. Excluding Sydney and Me bourne CBDs
2. Peak jobs lost across regions (1,135k) does not correspond directly to peak jobs lost across industries (1,035k) as these figures are the sum of net job losses within different segments of the economy.

Source: ABS Detailed Labour Force

As restrictions lifted, cohorts hardest hit by restrictions also recovered the fastest

Peak and current jobs lost relative to Feb 2020, '000s

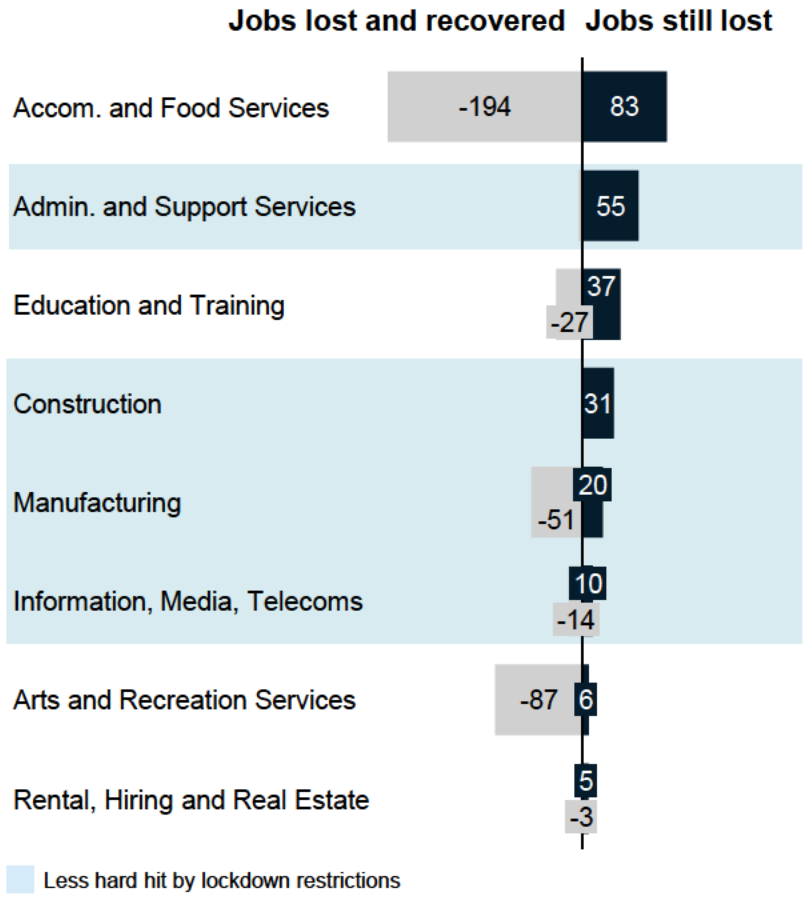


1 Percent of pre-Covid jobs

Source: ABS Detailed Labour Force

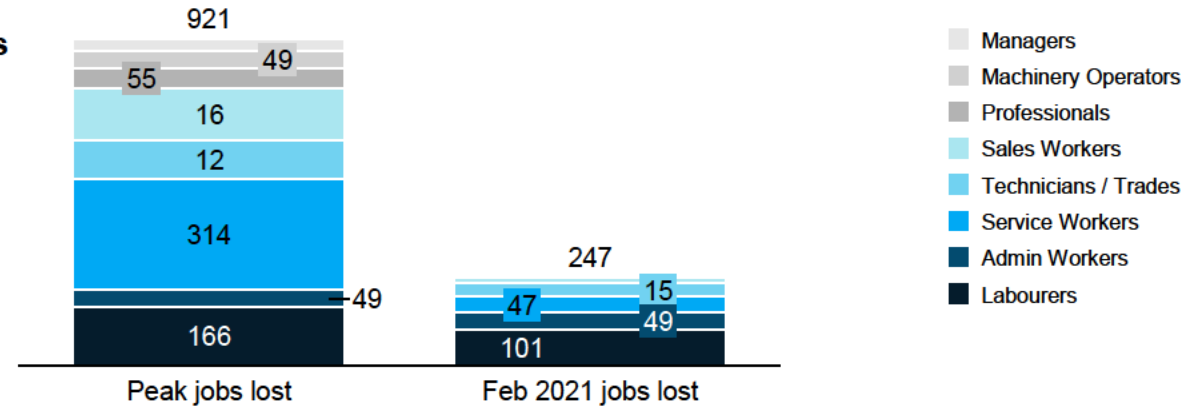
One year in, the soft spots in the economy already look different

Half the remaining job losses are in industries that were less hard hit by initial restrictions

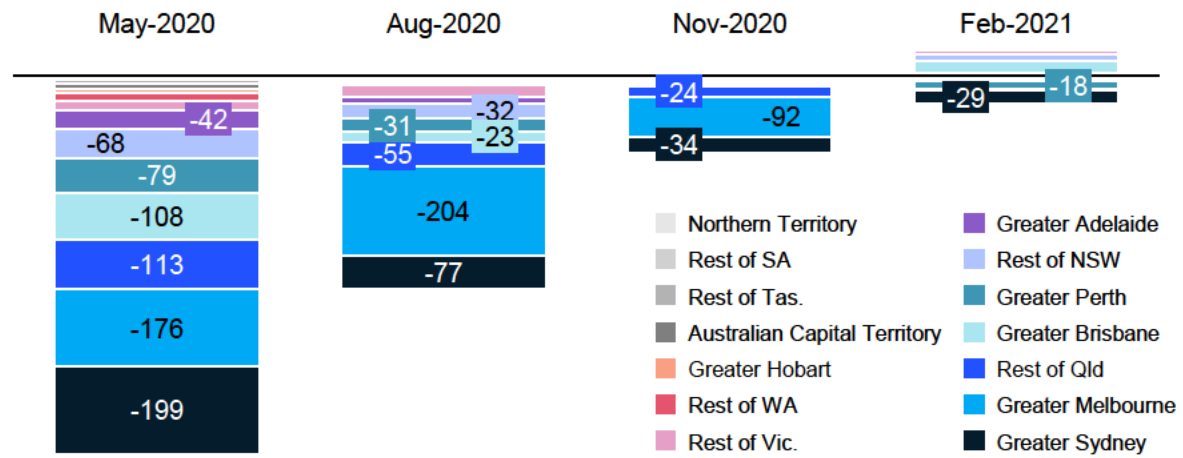


Occupation and region cohorts most affected are in segments with soft long term growth, rather than cohorts hard hit by initial restrictions, Jobs lost relative to Feb 2020, '000s

Manual workers are the most affected by the remaining job losses



Remaining job losses are concentrated in Greater Sydney and Perth



Industries that recovered all jobs lost in 2020 not listed here

Source: ABS; McKinsey analysis

The long term impact of COVID19 has been to accelerate structural shifts

Disruptive trend | Acceleration of trend

Key trends		Impact of COVID19
Consumption	**Rise of services**	Services consumption was rising rapidly. Demand was disrupted by lockdown, but is recovering strongly, driven by ageing populations and government expenditure
	Increasing inequality	COVID19 contraction in unemployment and a disproportionate impact on youth unemployment
	Aging population	Australia has an aging population, which underpins growth in health care demand. This trend has been accelerated by the extended pause in migration
	Potential to WFH	Work-from-home shifted real estate and consumption preferences, as spending more time at home increased the attractiveness of home improvement
Labour	**Digitisation**	Surge in e-commerce, digital entertainment, online grocery shopping and click n collect
	Automation	Automation and other cutting-edge technologies appears to have accelerated during the pandemic, and could raise productivity
	Rising education levels	Enrolments in post-graduate education and training increase as graduates struggle to find jobs
Other macro-economic factors	**Low interest rates**	Secular stagnation and low interest rates prior to COVID19 has been compounded by global recession and declining consumption rate preferences
	Supply vulnerabilities	Although Australia remains one of the most open economies, globalisation peaked in 2010 and COVID19 supply chain disruptions increased onshoring
	Attractiveness of Australia	Low levels of COVID19 transmission and disruption to everyday life has increased the attractiveness of Australia as a place to live

Source: McKinsey analysis

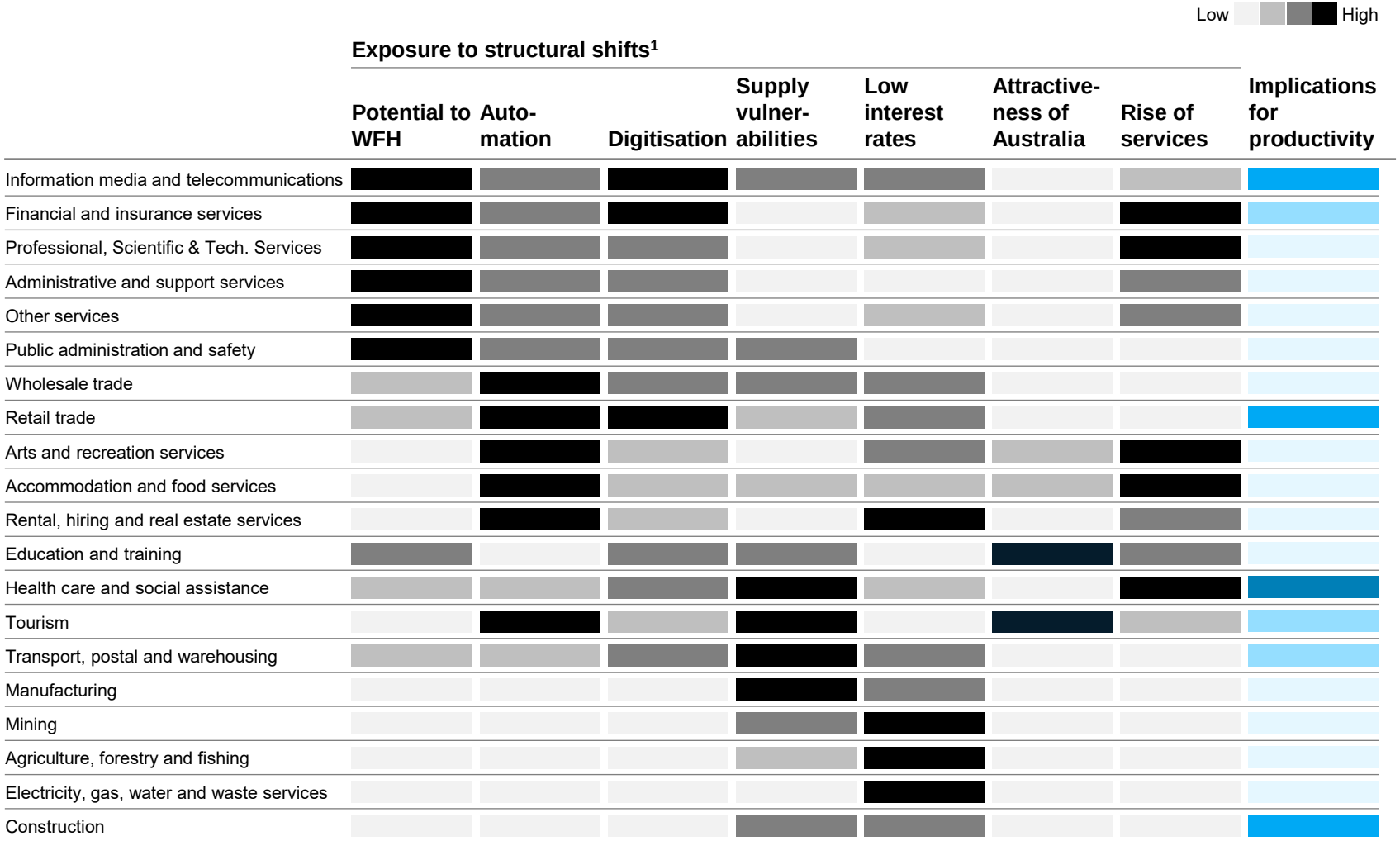
COVID19 has accelerated changes that were already underway, rather than changing the direction of growth

Shifts in consumption patterns, together with low interest rates and disrupted global trade patterns, create opportunity for disruption and renewal

Digitisation, automation and rising education levels can fuel productivity growth, but put demand for some segments of the labour market at risk

The significance of this shift can be seen in the growth of ‘Mega 25’ tech stocks (see appendix)

These shifts will have a bigger impact on some industries than others



1. Note that 3 trends (increasing inequality; ageing population; rising education levels) have not been called out separately as their impact either does not vary significantly by industry, or is proxied by other shifts

Source: ABS; RBA, McKinsey analysis

There is significant variation in the exposure of industries to structural shifts

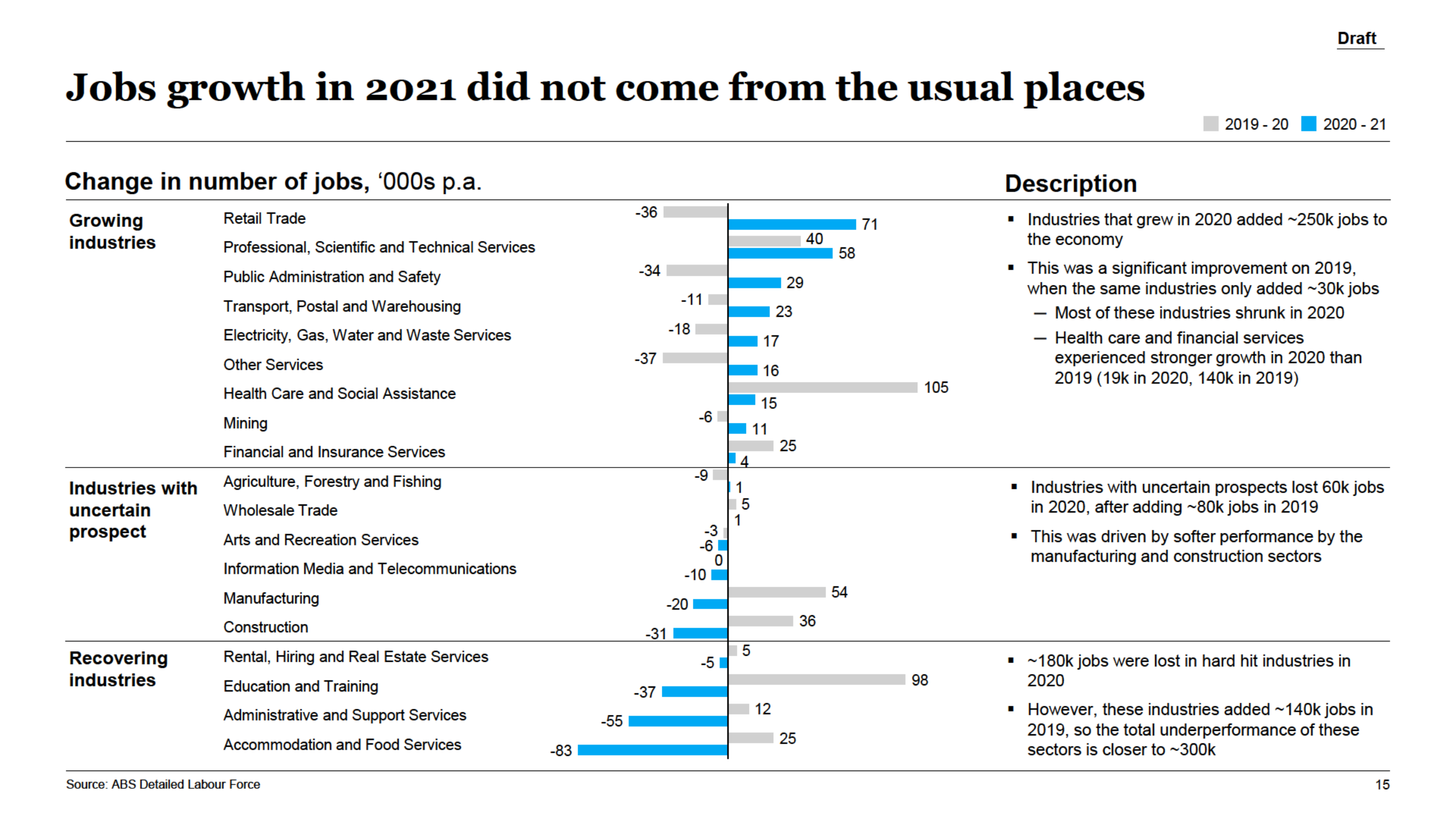
For example, some industries are highly exposed to digitisation (e.g., Financial and insurance services), while others are exposed low interest rates (e.g., Mining)

The acceleration of these structural trends has the potential to drive significant productivity improvement, and in turn, economic growth

The key challenge is ensuring this growth is inclusive of vulnerable cohorts and regions

These trends are expected significantly boost productivity in some industries – see appendix for details

Jobs growth in 2021 did not come from the usual places



Description

Growing industries

- Industries that grew in 2020 added ~250k jobs to the economy
- This was a significant improvement on 2019, when the same industries only added ~30k jobs
  - Most of these industries shrunk in 2020
  - Health care and financial services experienced stronger growth in 2020 than 2019 (19k in 2020, 140k in 2019)

Industries with uncertain prospect

- Industries with uncertain prospects lost 60k jobs in 2020, after adding ~80k jobs in 2019
- This was driven by softer performance by the manufacturing and construction sectors

Recovering industries

- ~180k jobs were lost in hard hit industries in 2020
- However, these industries added ~140k jobs in 2019, so the total underperformance of these sectors is closer to ~300k

Source: ABS Detailed Labour Force

The longer term impact of COVID-19 has been to accelerate structural shifts underway

Disruptive trend | Acceleration of trend

Key trends		Description
Consumption	**Rise of services**	Services consumption was rising rapidly. Demand was disrupted by lockdown, but is recovering strongly, driven by ageing populations and government expenditure
	Increasing inequality	COVID19 contraction in unemployment and a disproportionate impact on youth unemployment
	Aging population	Australia has an aging population, which underpins growth in health care demand. This trend has been accelerated by the extended pause in migration
	WFH and home-based preferences	Work-from-home shifted real estate and consumption preferences, as spending more time at home increased the attractiveness of home improvement
Labour	**Flight to digital**	Surge in e-commerce, digital entertainment, online grocery shopping and click n collect
	Automation	Automation and other cutting-edge technologies appears to have accelerated during the pandemic, and could raise productivity
	Rising education levels	Enrolments in post-graduate education and training increase as graduates struggle to find jobs
Other macro-economic factors	**Low growth & interest rates**	Secular stagnation and low interest rates prior to COVID19 has been compounded by global recession and declining consumption rate preferences
	Reduced globalisation	Although Australia remains one of the most open economies, globalisation peaked in 2010 and COVID19 supply chain disruptions increased onshoring
	Attractiveness of Australia	Low levels of COVID19 transmission and disruption to everyday life has increased the attractiveness of Australia as a place to live

Source: McKinsey analysis

These shifts mean the economy could look different:

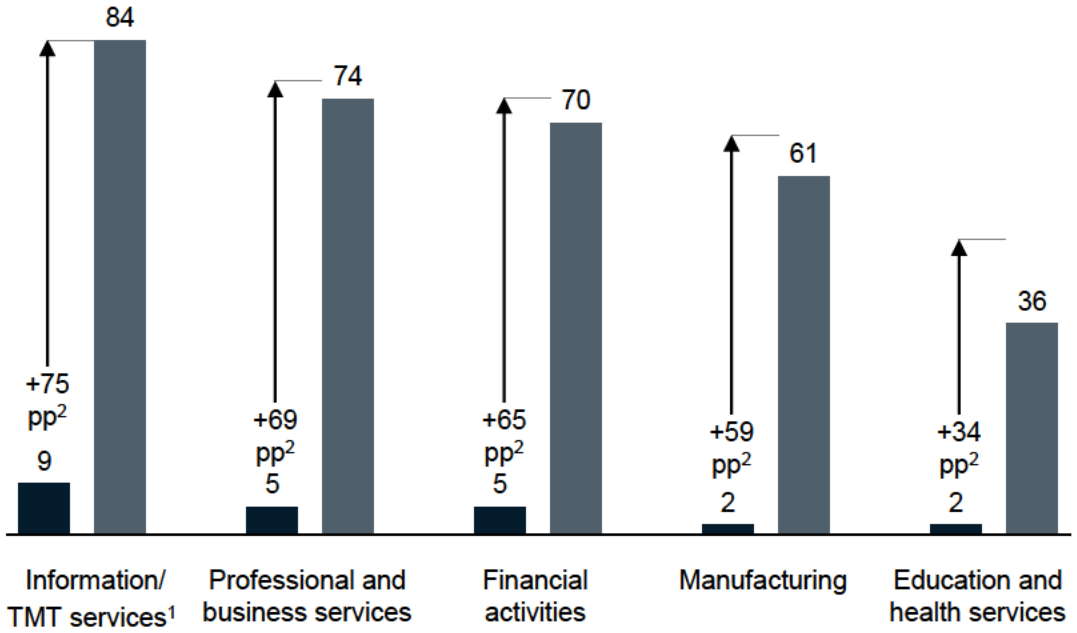
Shifts in consumption patterns, together with low interest rates and disrupted global trade patterns, create opportunity for disruption and renewal

Digitisation, automation and rising education levels can fuel productivity growth, but put demand for some segments of the labour market at risk

WFH: COVID-19 has shifted the way the workforce operates

The levels of remote working have skyrocketed during lockdowns and are likely to remain higher than pre-crisis level

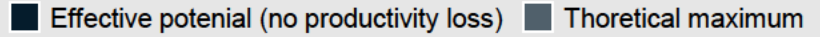
Share of employees working remotely full time, percent



1. TMT = technology, media, and telecom. Pre-COVID-19 figures for remote-work frequency in sector sourced from internal survey (unavailable in American Time Use Survey)
2. Percentage points

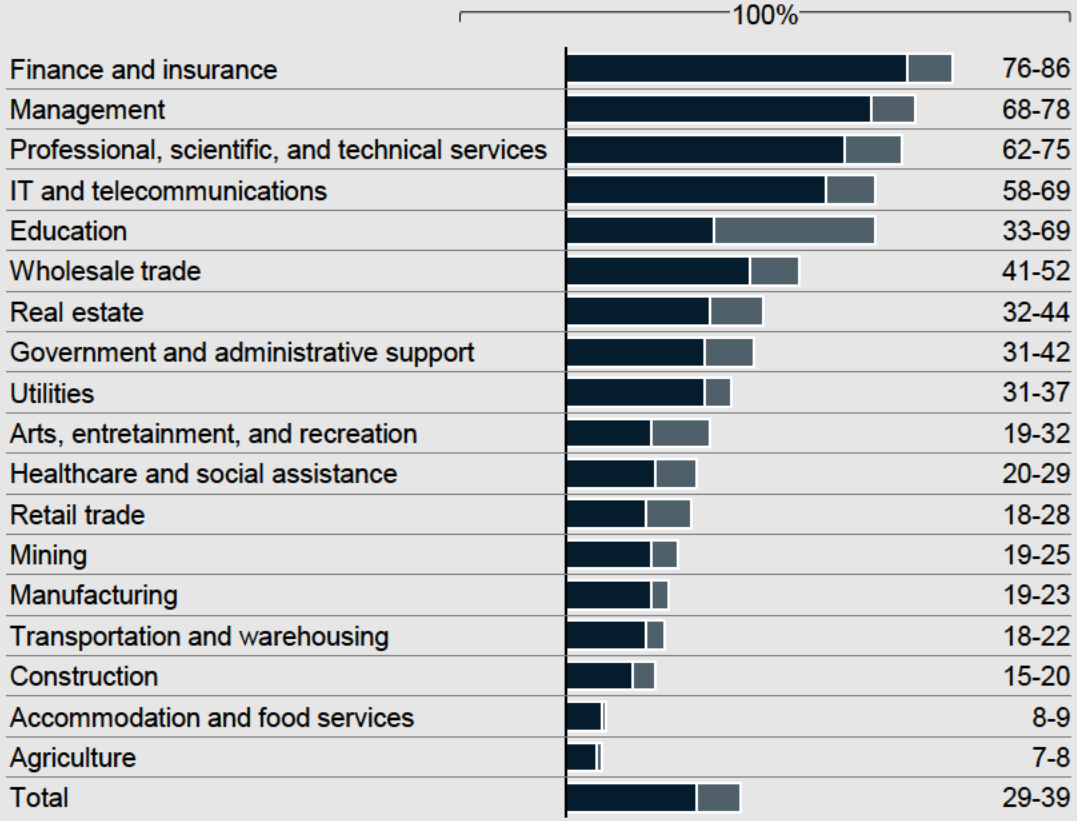
Note: Note: The theoretical maximum includes all activities not requiring physical presence on-site; the effective potential includes only those activities that can be done remotely without losing effectiveness. Model based on more than 2,000 activities across more than 800 occupations

Source: American Time Use Survey, US Bureau of Labour Statistics, n=134; expert interviews; press search; McKinsey analysis



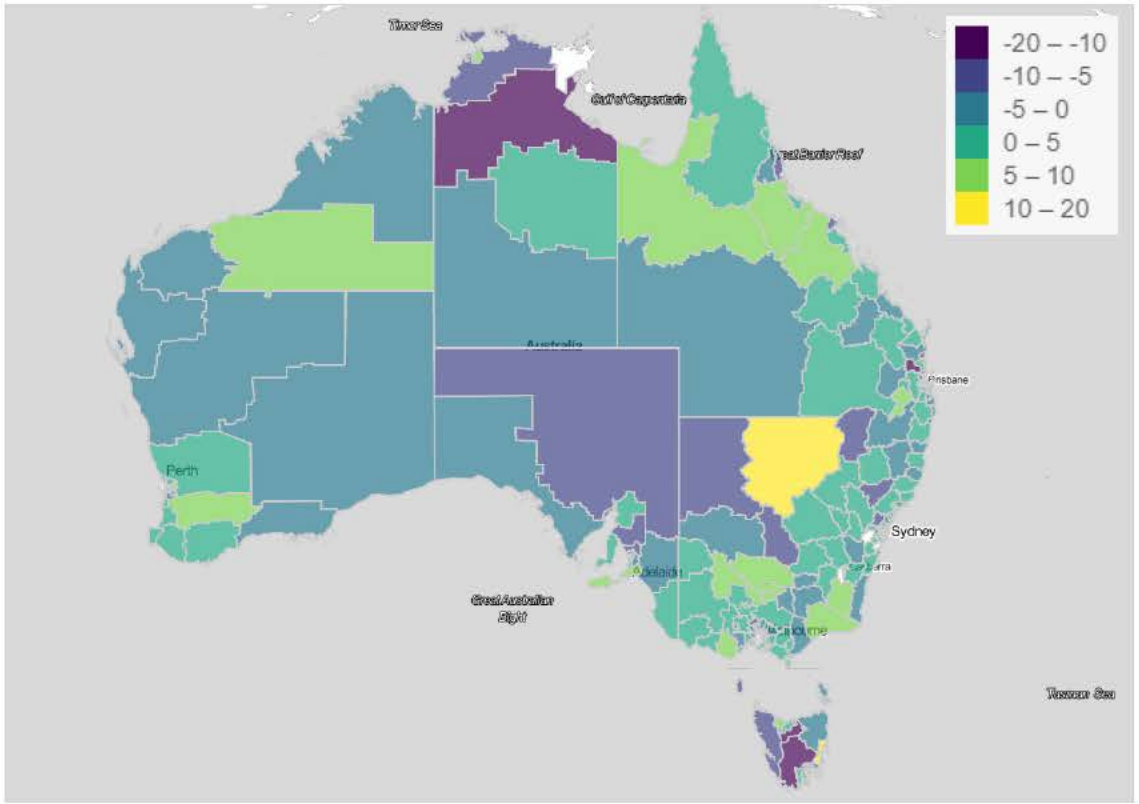
The finance, management, professional services, and information sector have the highest potential for remote work

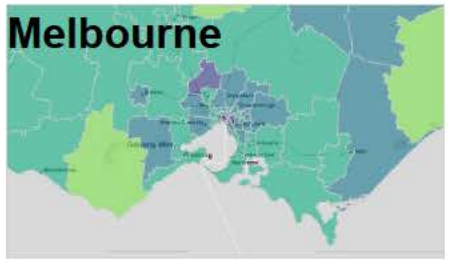
Potential share of time spent working remotely by sector in the United states, %

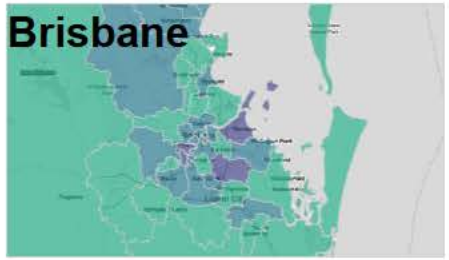


WFH: Improved remote work options has encouraged increased migration to regions

Growth in median dwelling rent by location, March to June 2020, %







This reversal in rent trends may create a new growth opportunity for regional and remote areas, and pose a dampener on recovery in metropolitan areas

Trends in rents reversed between March and June 2020, with CBD rents falling, and regional and remote areas booming

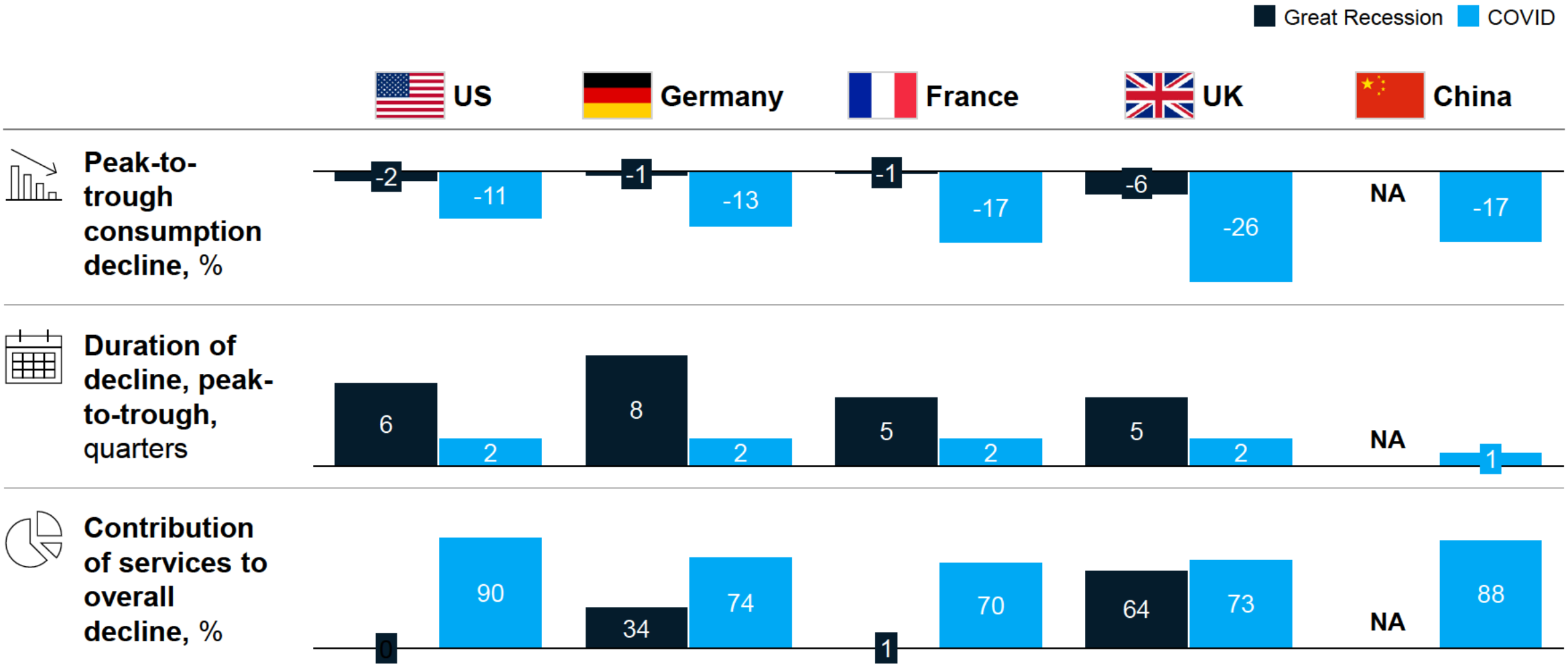
The reversal in rents, and corresponding flight of individuals to regional and remote areas, may have exacerbated the short-term impact of COVID19

It is unclear the extent to which this reversal will persist, but may present a new opportunity for growth in regional and remote areas

Source: RBA

Rise of services: Services will be a key component of equitable growth, but unlike in past recessions, COVID hit services

Draft



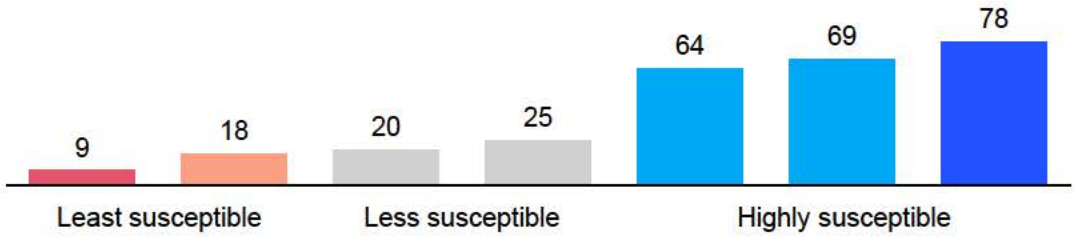
Note: Peak-to-trough based on quarterly data, dates may vary across countries. For COVID, assumed peak in Q42019 and trough in Q2 2020 (Q1 2020 in China)

Source: OE, BEA, Eurostat, NBS

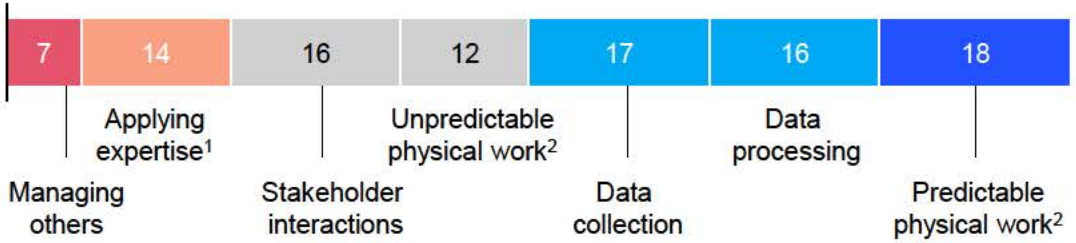
Automation: ~50% of work time spent is susceptible to automation

Analysing work activities shows ~50% of time spent is on activities which are highly susceptible to automation

Technical feasibility, % of time spent on activities that can be automated by adapting currently demonstrated technology



Time spent in all US occupations, %



1. Applying expertise to decision making, planning and creative tasks
2. Unpredictable physical work (physical activities and the operation of machinery) is performed in unpredictable environments, while in predictable physical work, the environments are predictable

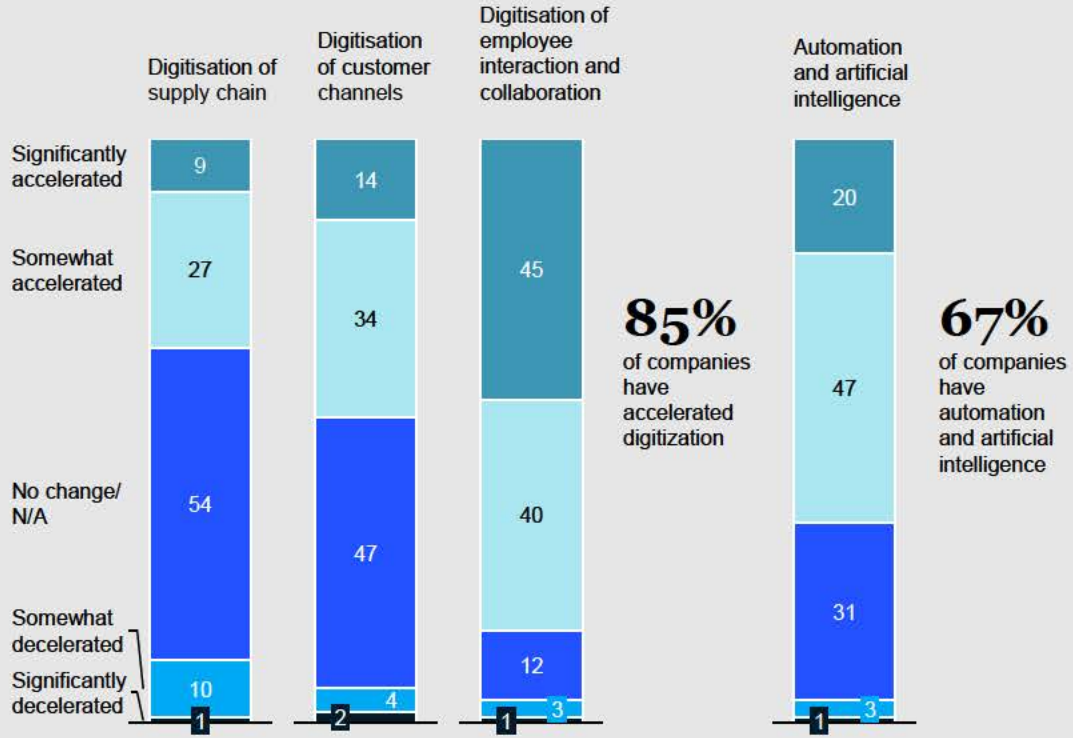
Note: Note: in practice, automation will depend on more than technical feasibility. Five factors involved: technical feasibility; cost to automate; the relative scarcity, skills, and cost of workers who might otherwise do the activity; benefits (e.g., superior performance) of automation beyond labor-cost substitution; and regulatory and social acceptance considerations

Source: McKinsey analysis

… and private businesses are responding to the opportunity

Executives say they have accelerated the deployment of digitisation and automation during COVID-19 pandemic

Since the start of COVID-19 outbreak, how has your company's or business area's adoption of the following technology trends changed? % of respondents (n=800)



Note: figures may not sum to 100% because of rounding

Source: McKinsey Global Business Executives Survey, July 2020

Automation: The mix of occupations may shift by 2030 in the post-COVID-19 scenario

Estimated change in share of total employment, post-Covid-19 scenario, 2018 to 2030[1], percentage points

Occupational category	United states	Spain	United Kingdom	France	Germany	Japan	China	India
Health aides, techs, care workers								
STEM professionals								
Health professionals								
Managers								
Business/legal professionals								
Creatives and arts management								
Transportation services								
Educator and workforce training								
Property maintenance								
Community services								
Builders								
Mechanical installation and repair								
Customer service and sales								
Food services								
Agriculture								
Production and warehousing								
Office support								

Australia's experience is most similar to developed countries with below average rates of COVID19

1. Average of 7.7% workforce would need to transition in pre-COVID scenario, increasing to 8.9% in post-COVID scenario. Average taken of United States, United Kingdom, France, Germany, Spain.
2. The pre-COVID-19 scenario includes the effects of eight trends: automation, rising incomes, aging populations, increased technology use, climate change, infrastructure investment, rising education levels, and marketization of unpaid work. The post-COVID-19 scenario includes all pre-COVID-19 trends as well as accelerated automation, accelerated e-commerce, increased remote work, and reduced business travel

Source: McKinsey Global institute analysis

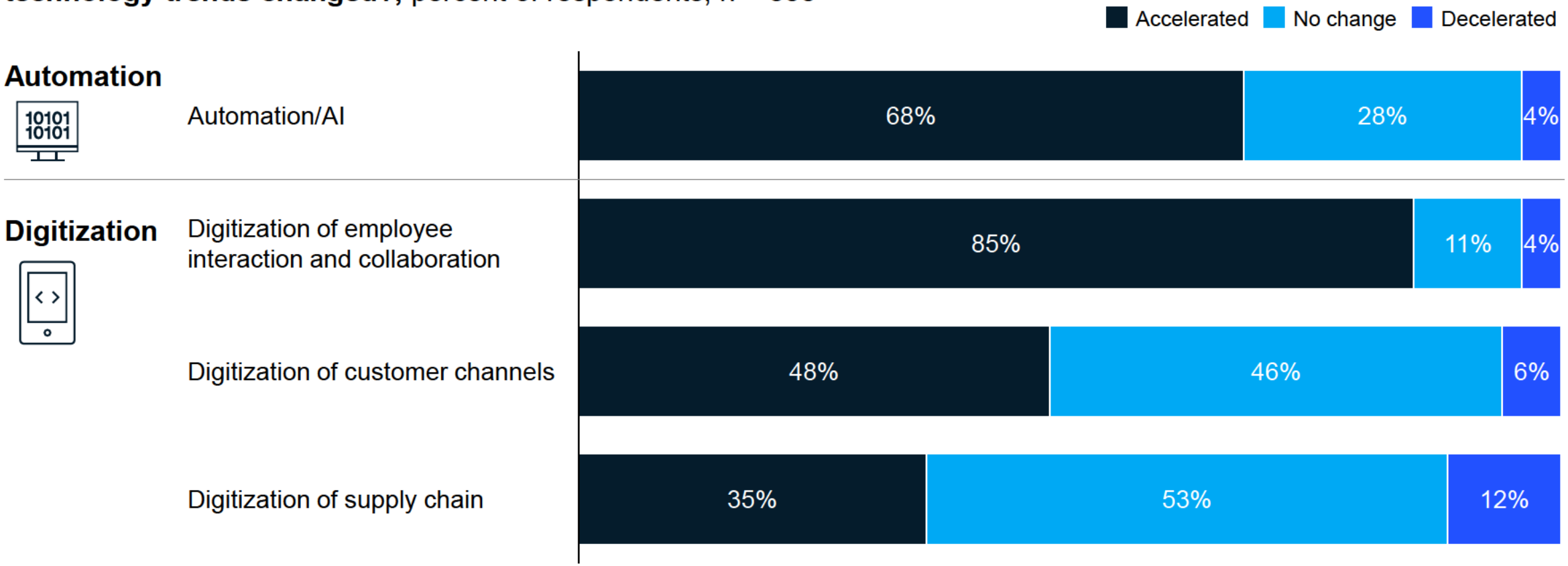
+16%

average increase in the share of workforce that will need to transition to jobs in a new occupation by 2030 due to automation and COVID-19[1]

Automation: There has been an acceleration in adoption of automation during COVID-19

Draft

Since the start of the COVID-19 outbreak, how has your company's or business area's adoption of the following technology trends changed?, percent of respondents, n = 800[1]



1. Excludes 6 respondents who selected the option "Not applicable; we have not yet adopted this trend"

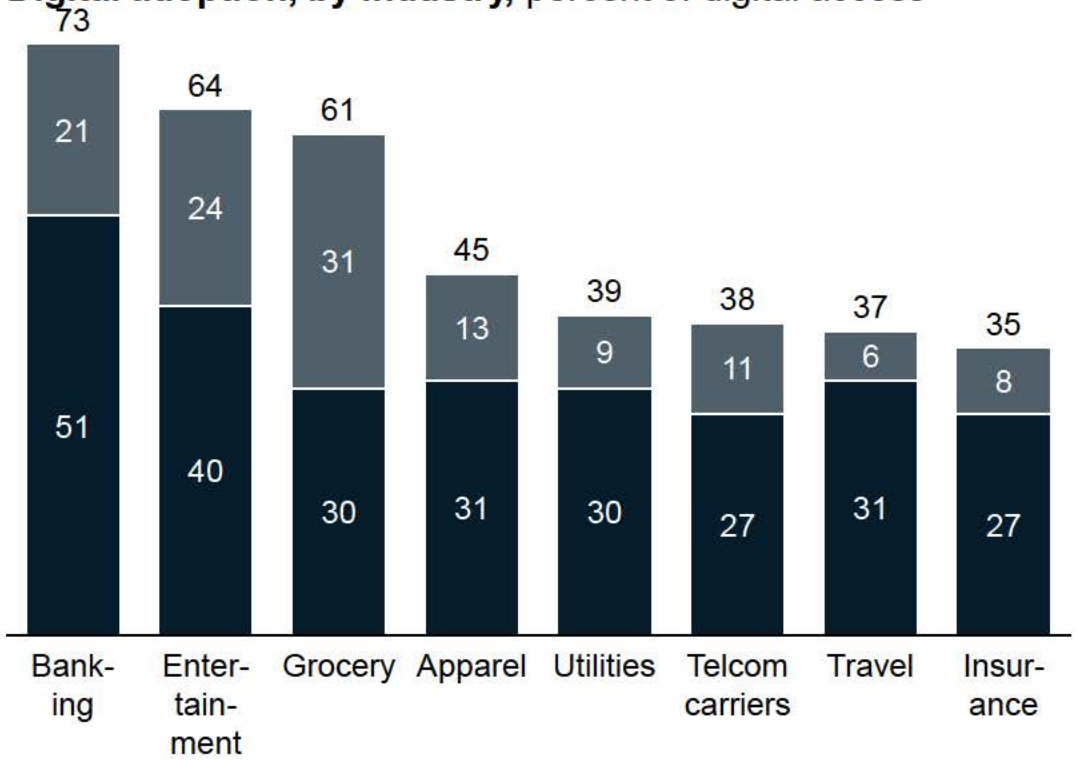
Source: McKinsey Global Business Executive Survey, July 2020, McKinsey Global Institute analysis

Flight to digital: Adoption of digital has skyrocketed

First-time users Regular users

US consumers are accelerating adoption of digital channels, a trend seen across global regions

Digital adoption, by industry, percent of digital access



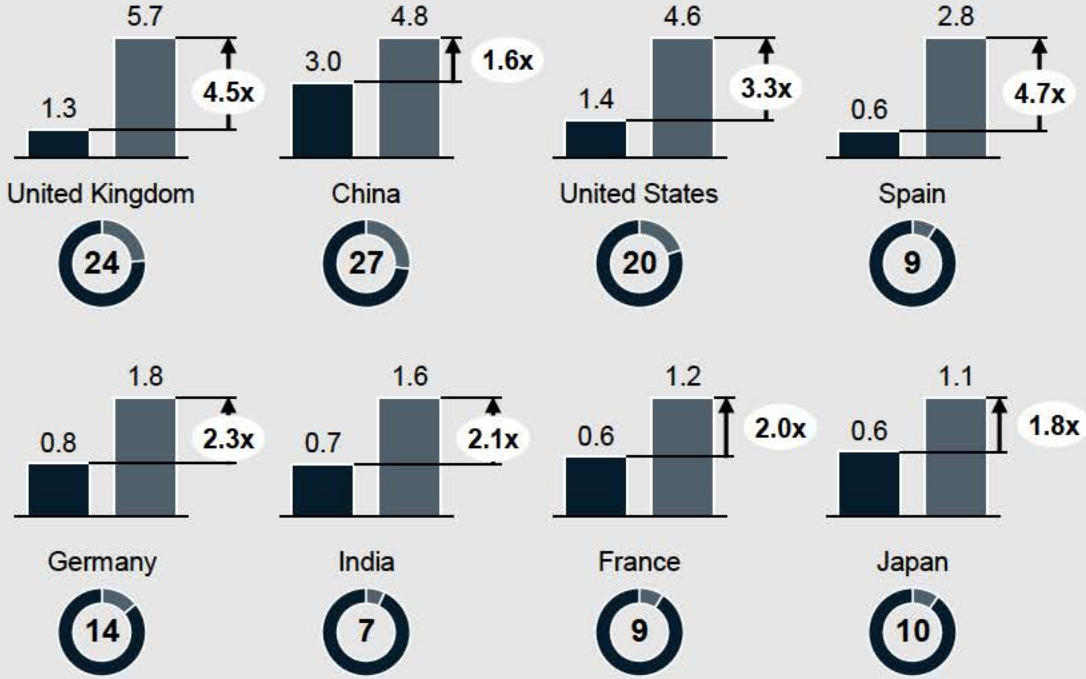
Note: Figures may not sum to listed totals, because of rounding

Source: McKinsey COVID-19 US Digital Sentiment Survey, Apr 25-28, 2020

XX E-commerce sales as % of total retail sales, 2020 2015-19 average 2020

E-commerce has grown 2 to 5 times faster than before the pandemic

Year-over-year growth of e-commerce as share of total retail sales, percentage points



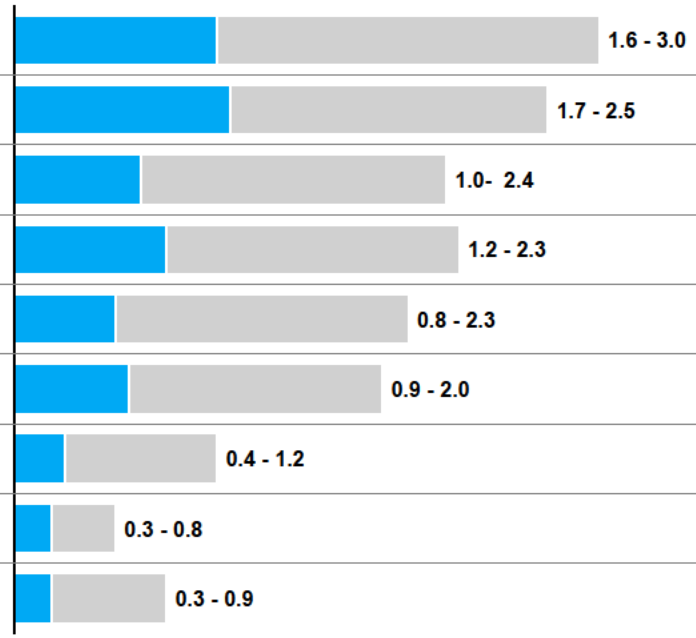
Source: retailing by Euromonitor International, 2021; McKinsey Global Institute analysis

Significant productivity improvements are expected to be linked to digital step-changes

Draft

The potential for incremental productivity growth from COVID19 is estimated to be ~one percentage point per year through 2024.

Sector	Share of economy, 2017[1,2], %	Pandemic-related productivity acceleration potential, CAGR, 2019-24, %	Main contributors to potential productivity growth acceleration driven by COVID-19, 2019-24
Healthcare	10	1.6 - 3.0	Telemedicine, Operational
Construction	5	1.7 - 2.5	Operational efficiency, Industrialisation, Digital construction
Retail	7	1.0- 2.4	E-commerce, Warehouse automation, Advanced analytics
ICT[2]	10	1.2 - 2.3	Online channels, Online advertising, Demand for online services
Pharmaceutical	2	0.8 - 2.3	Digitalization of sales channels, Automation of manufacturing, AI for vaccine discovery
Banking	8	0.9 - 2.0	Hybrid working, Online channels, Shift to digital payments
Automotive	3	0.4 - 1.2	Electric vehicles, Connected car, Online sales
Travel and logistics	13	0.3 - 0.8	Digital interaction (eg, apps), Agile working, Automation of tasks
Others	42	0.3 - 0.9	Automation of tasks, Digital channels, Lower real-estate costs
		Overall: 1.1	



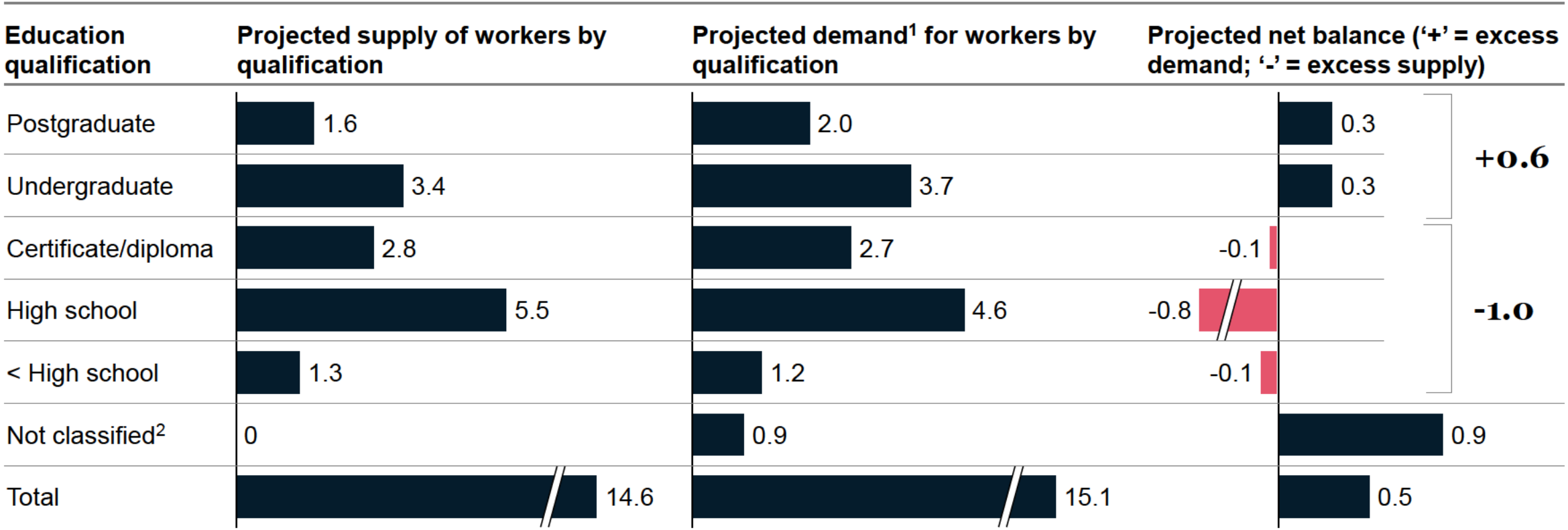
1. 'Weighted by total nominal GDP contribution of US (62%) and 6 European economies (38%) in our focus countries. Pharma includes chemicals and recreation manufacturing due to lack of breakdown for US and Sweden; automotive includes tramsaport machinery; travel and logistics includes arts and recreation, accomodation and food services , transportaion and storage, other services activities, and activities of househollds and extraterritorial units; other nonfar, business sectors include professional services, wholesales, mining and quarrying, maufactiring {excluding chemicals, pharmaceuticals, and automotives}. and utilities; excludes public administration and defense, real-estate activities, education, and agriculture. Sectors included amount to 74% of total economy in US and 75% in 6 European focus countries.
2. Information and communication technology.

Source: EU KLMES; Mckinsey Global Institute analysis: https://www.mckinsey.com/industries/public-and-social-sector/our-insights/will-productivity-and-growth-return-after-the-covid-19-crisis

Time for (more) school

Projected change (mid-point adoption scenario[1]) in employment supply and demand, by education qualification

Millions of jobs, 2030



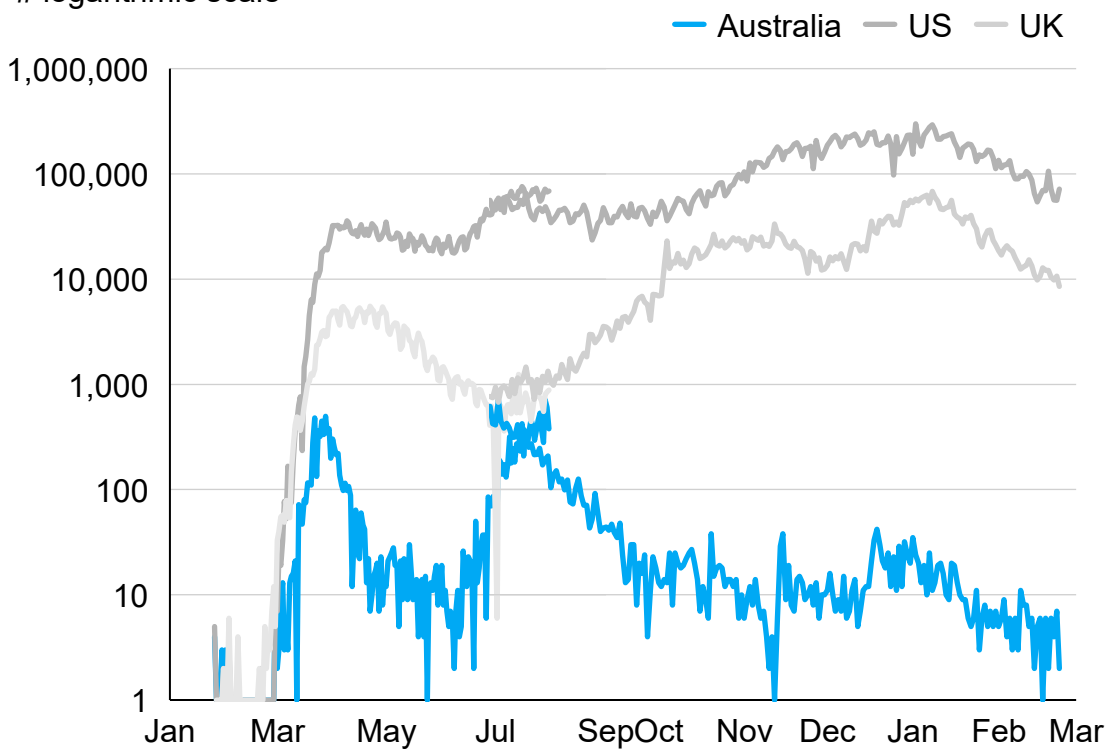
1. Mid-point automation scenario, step-up labour demand scenario
2. New occupations created by automation and technological change

Note: Mid-point of earliest and latest automation adoption in the 'step-up' scenario. Numbers may not add up due to rounding

Source: MGI Automation Model March 2018, Jobs Lost Jobs Gained December 2017; McKinsey Global Institute analysis

Attractiveness of Australia has grown with low infection rates

Number of confirmed COVID-19 cases per day
logarithmic scale



Source: COVID-19 Data Repository by CSSE at Johns Hopkins University; news reports

Rising education levels have reflected job market conditions

Draft

Increase in post-graduate education:

- **~30% increase** in domestic postgraduate enrolments expected at UNSW
- **~12% increase** in first preferences from non-school leavers at UQ
- **~60% increase** in postgraduate applications at CDU

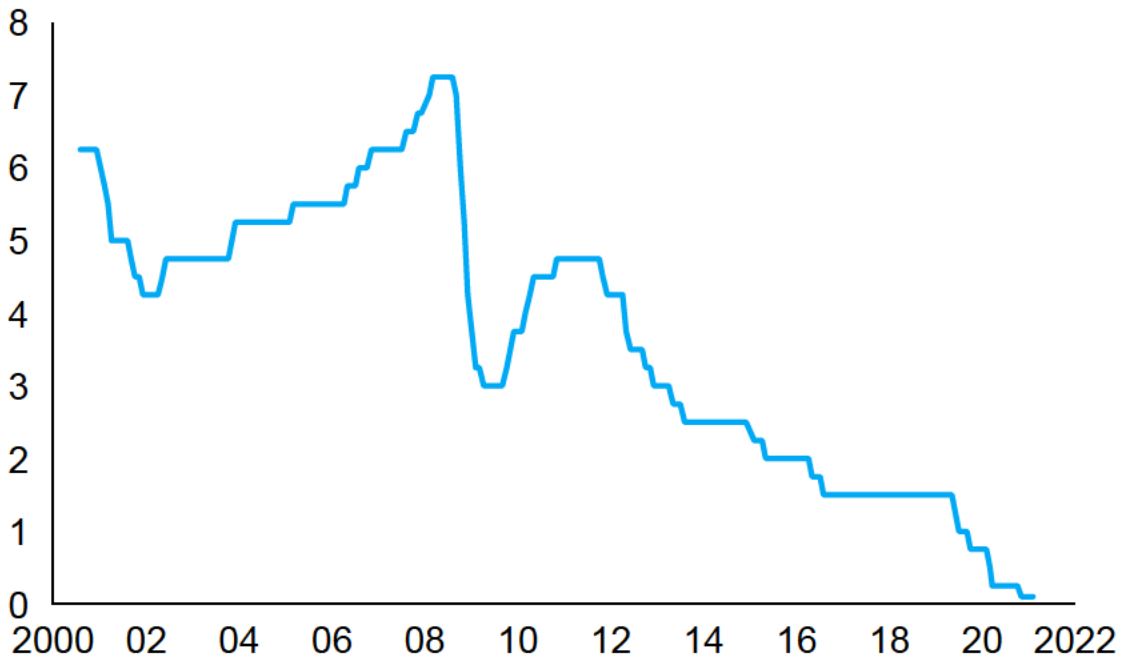
Overall increase in domestic enrolments:

- **~11% increase** in fee-help loan amounts across 36 public universities

Low growth & interest rates: Australia saw recession conditions

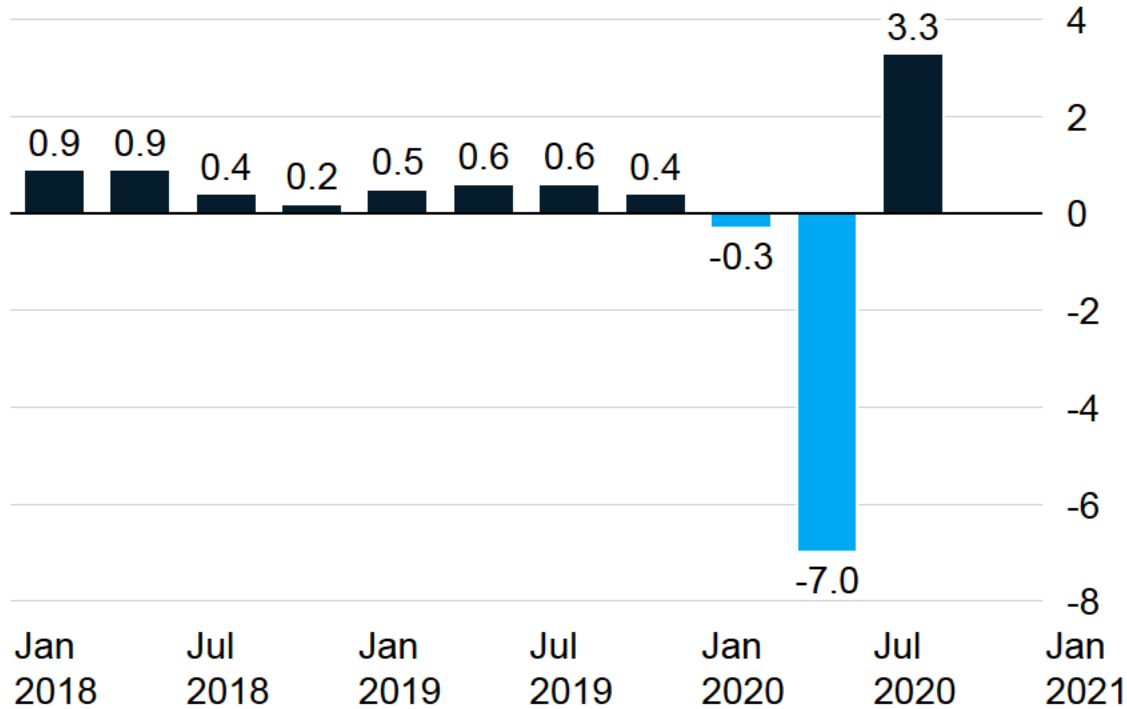
The RBA lowered the cash rate to 0.1%, it's lowest on record

Cash rate target, percent



And Australia saw two consecutive quarters of negative GDP growth

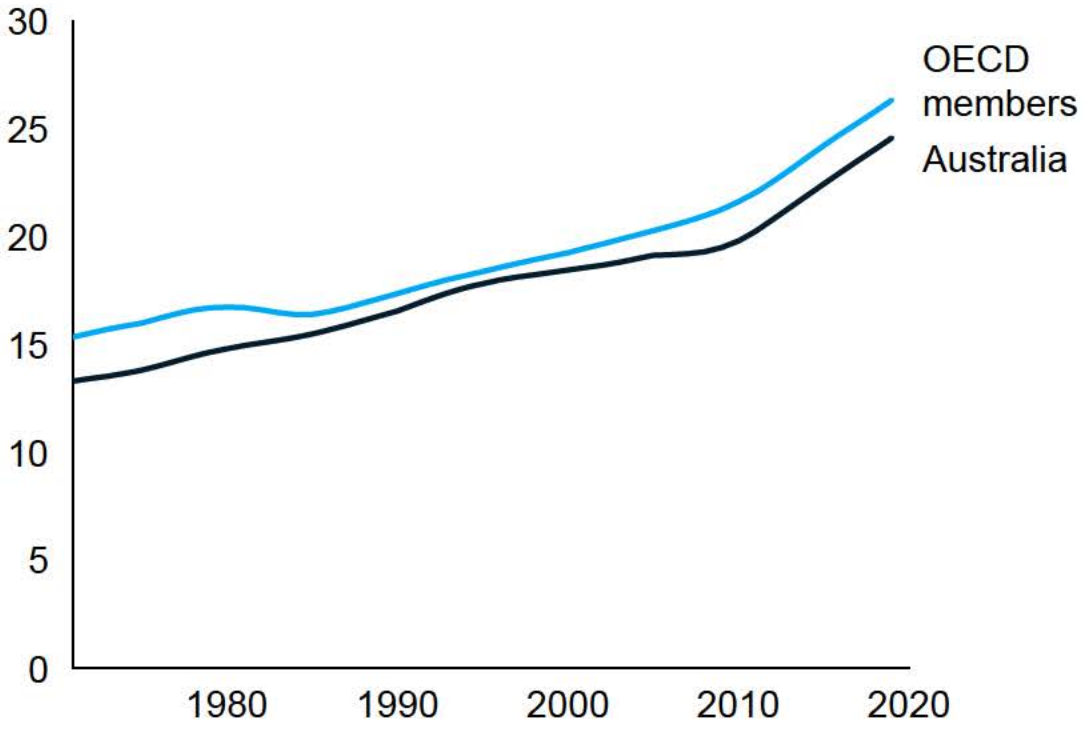
GDP growth rate, percent



Source: ABS, RBA

Dependency ratio is highest on record as our population ages

Age dependency ratio, old
Percent of working-age population



Source: World Bank, ABS

Increasing inequality: young, blue collar workers are more impacted

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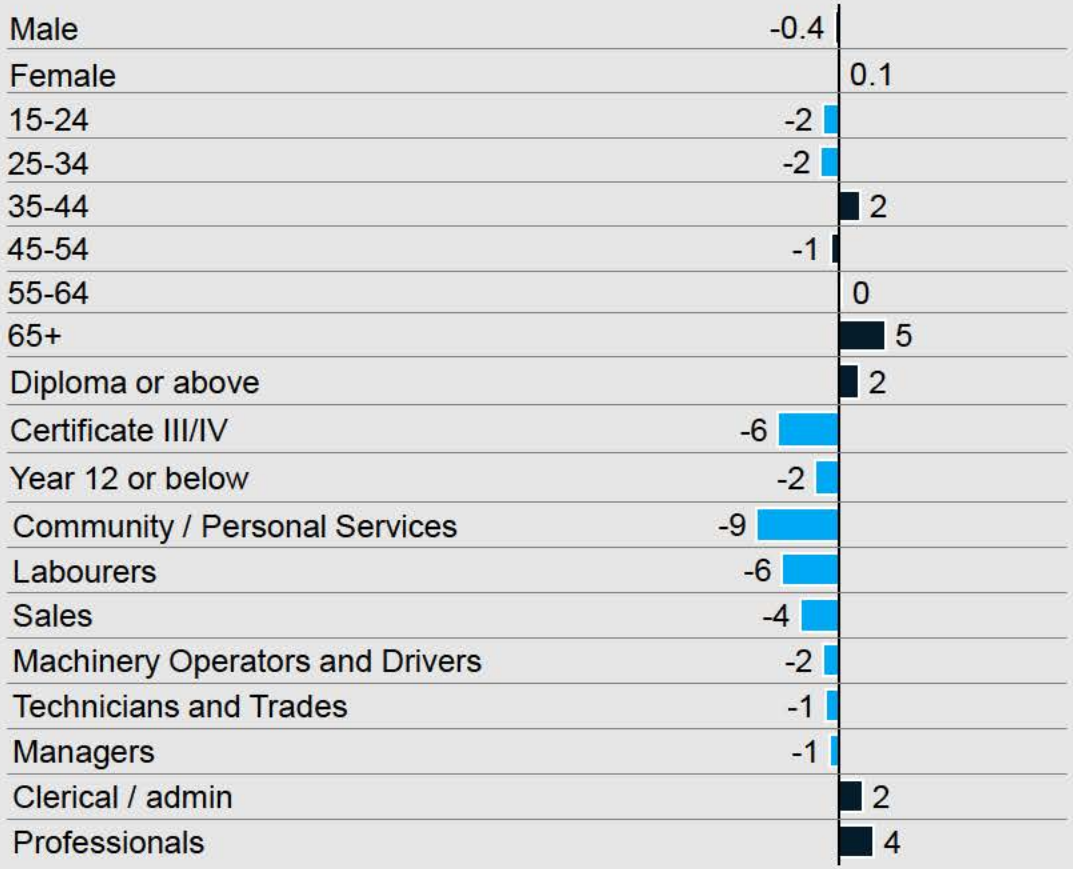
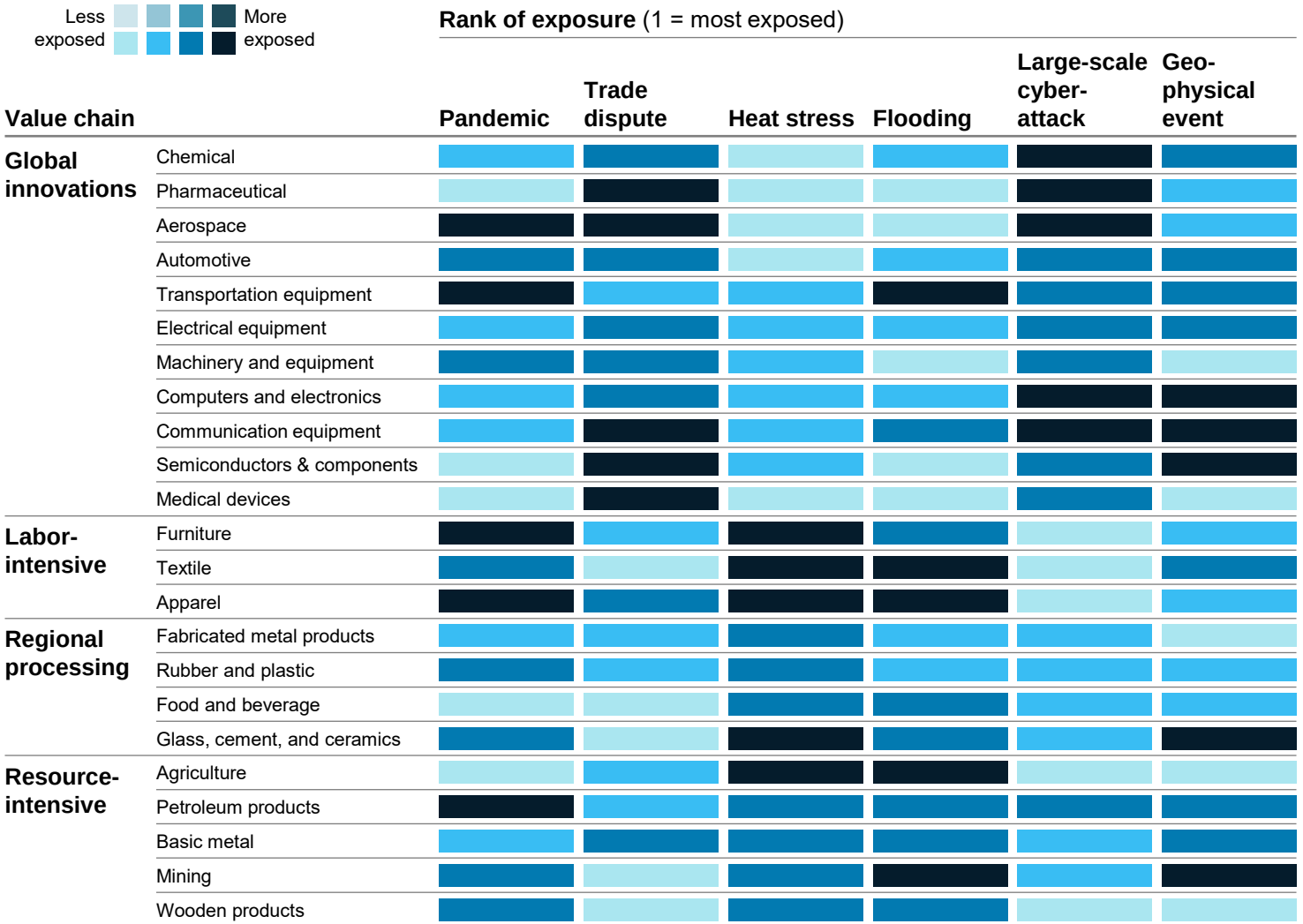
Job losses are concentrated among service workers with low education levels
Percentage gap to pre-COVID19 jobs



Some industries are more exposed to supply chain shocks



Source: McKinsey Global Institute

Key insights

- **Pandemics** are likely to predominantly impact **labour-intensive industries**, and industries linked to **travel and movement** (e.g., aerospace, transportation, petroleum products)
- **Trade disputes**, on the other hand, predominantly impact industries with a **high degree of knowledge intensity** and **high-value industries** (e.g., pharmaceutical, communication equipment, semiconductors and components)
- From an industry perspective, **labour intensive industries** are **particularly vulnerable** across multiple dimensions, as are those linked to **rare earth metals** (e.g., computer and electronics, communication equipment, and semiconductors and components)

Onshoring is not a viable option for all industries

Low High

Low High

Value chain		Share of value chain exports, %	Feasibility of geographic shift: Economic factors	Feasibility of geographic shift: Non-economic factors
Global innovations	Chemical	5-11		
	Pharmaceutical	38-60		
	Aerospace	25-33		
	Automotive	15-20		
	Transportation equipment	29-43		
	Electrical equipment	23-34		
	Machinery and equipment	19-25		
	Computers and electronics	23-35		
	Communication equipment	34-54		
	Semiconductors & components	9-19		
	Medical devices	37-45		
Labor-intensive	Furniture	22-45		
	Textile	23-45		
	Apparel	36-57		
Regional processing	Fabricated metal products	21-32		
	Rubber and plastic	20-30		
	Food and beverage	5-11		
	Glass, cement, and ceramics	11-21		
Resource-intensive	Agriculture	20-26		
	Wooden products	5-11		
	Basic metal	6-12		
	Petroleum products	9-18		
	Mining	6-13		
		16 **26**	**Total**	Low High

Key insights:

- **Economic feasibility** is determined by factors including:
  - Is there movement in the global distribution of the supply chain already?
  - Are the exports capital-intensive? Such industries have strong economies of scale, making them more costly to shift
  - Are the exports knowledge-intensive? Often these industries have specialised ecosystems in specific locations, with unique suppliers and talent
  - Is the production tied to geology or natural resources?
  - Is the production highly globalised, or already regionalised?
- **Non-economic feasibility** is determine by factors such as:
  - National security considerations
  - National competitiveness considerations
  - Self-sufficiency goals
- Value chains with the largest share of total exports potentially in play are **pharmaceuticals, apparel, and communication equipment**
- In most cases, **economic and non-economic considerations do not overlap**, meaning countries may have to expend considerable sums to induce shifts from what otherwise are economically optimal production footprints

These shifts will have a bigger impact on some industries than others

1. Note that 3 trends (increasing inequality; ageing population; rising education levels) have not been called out separately as their impact either does not vary significantly by industry, or is proxied by other shifts

Source: ABS; RBA, McKinsey analysis

There is significant variation in the exposure of industries to structural shifts

For example, some industries are highly exposed to digitisation (e.g., Financial and insurance services), while others are exposed low interest rates (e.g., Mining)

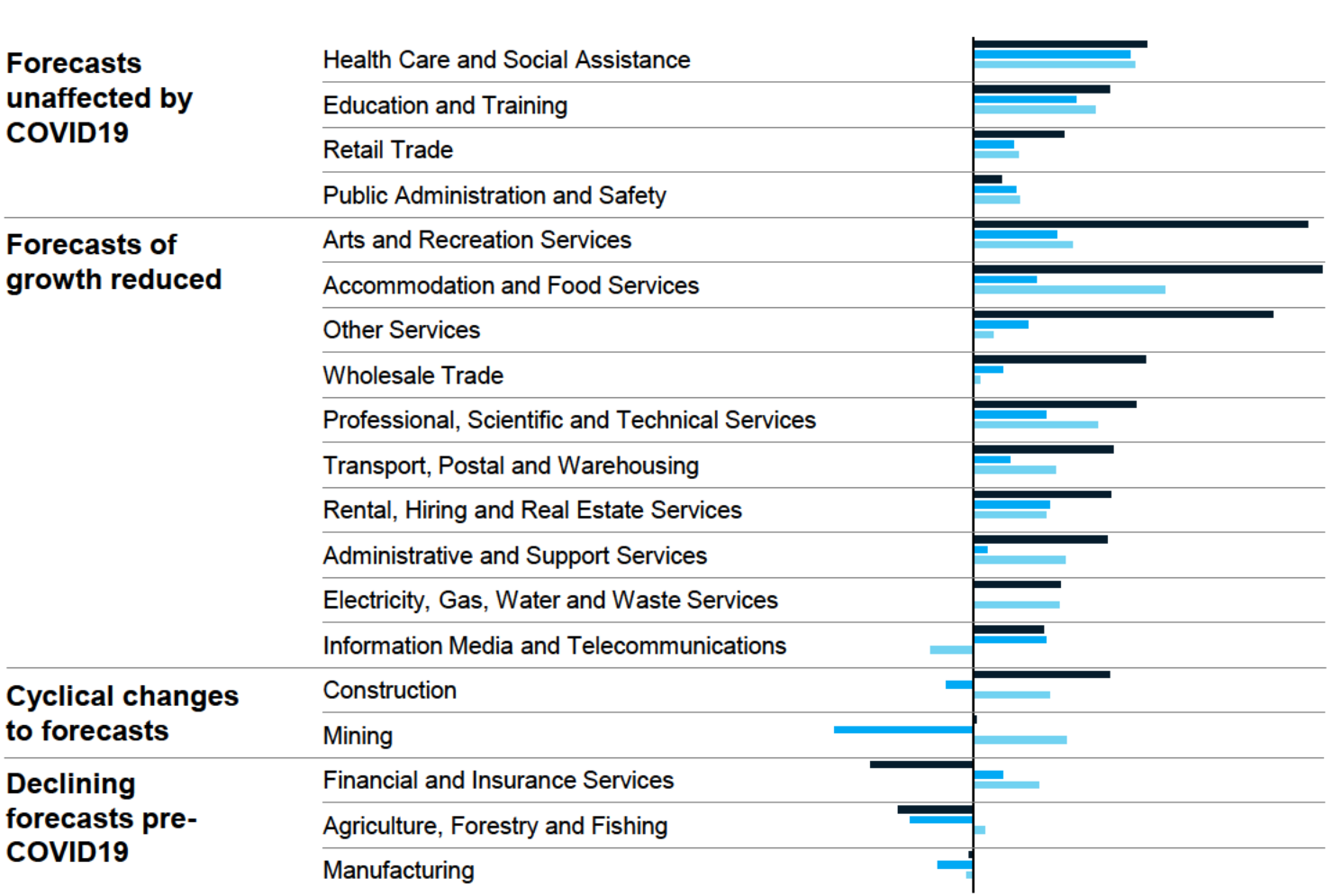
The acceleration of these structural trends has the potential to drive significant productivity improvement, and in turn, economic growth

The key challenge is ensuring this growth is inclusive of vulnerable cohorts and regions

These trends are expected significantly boost productivity in some industries – see appendix for details

Industry growth is generally expected to continue in line with pre-COVID19 trends

Job growth forecasts, 2020-2025, average annual % increase



Source: National Skills Commission, Shape of Australia's Post COVID-19 workforce; National Skills Commission 2019 Employment Projections; National Skills Commission 2020 Employment Projections, McKinsey Analysis

COVID19 accelerated existing trends, so has changed the pace of growth but not the direction

However, short term jobs forecasts remain extremely uncertain

- Recent jobs forecasts released by National Skills Commissions since Nov 2020 differ by ~150% on average
- Forecasts for some industries have been volatile across releases, for example Financial Services and Agriculture, Forestry and Fishing
- Part of this uncertainty is because structural shifts like automation improve productivity but have mixed impacts on jobs

The acceleration of structural shifts will benefit some occupations, but depress demand for others

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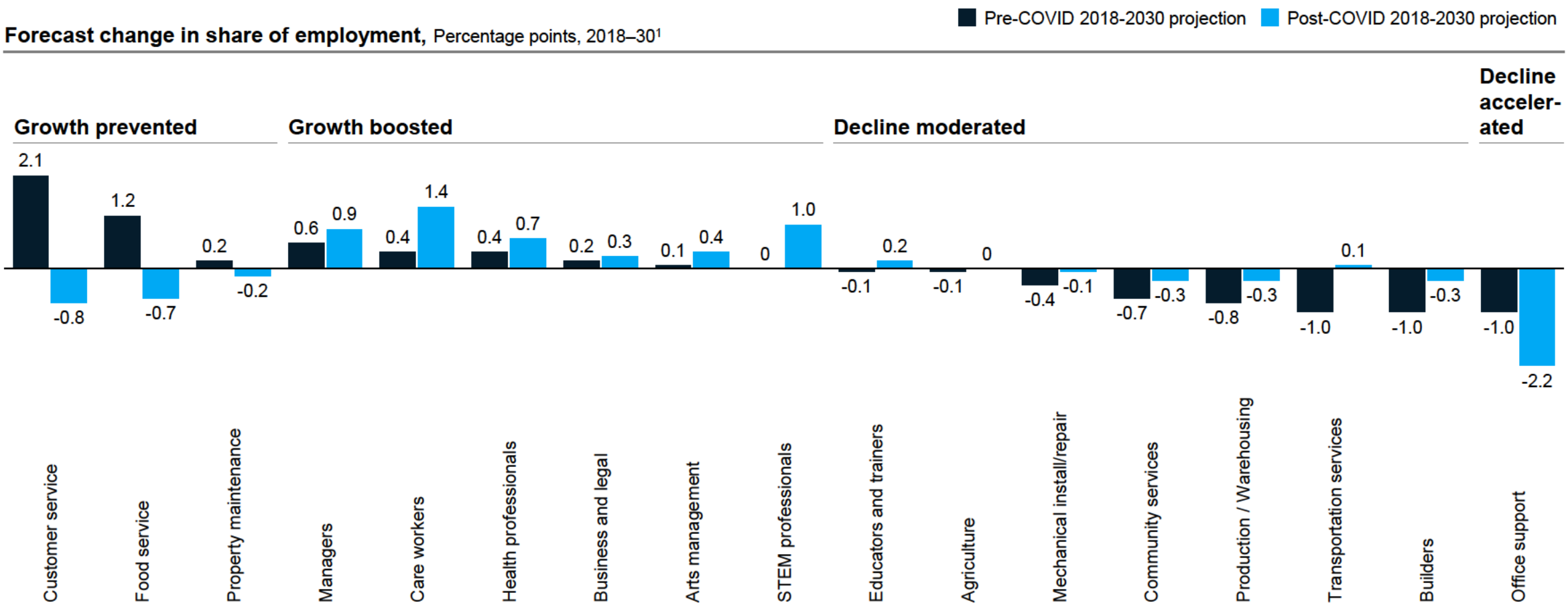
Forecast change in share of employment, Percentage points, 2018–30[1]

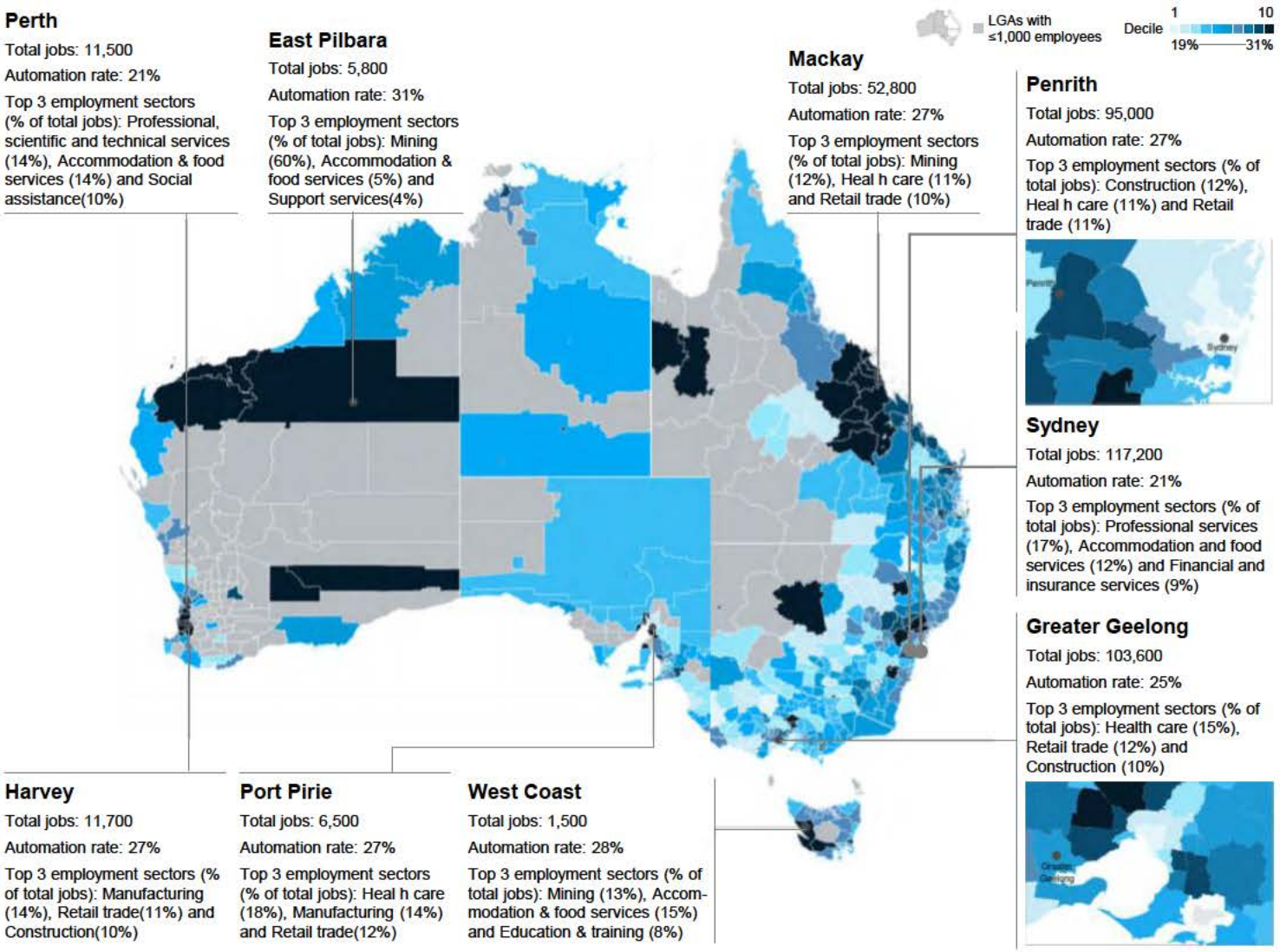


1. Estimates are for UK economy, which is structurally similar to Australia. Pre-COVID-19 scenario includes effects of eight trends: automation, rising incomes, aging populations, increased technology use, climate change, infrastructure investment, rising education levels, and marketization of unpaid work. Post-COVID-19 scenario includes all pre-pandemic trends as well as accelerated automation, accelerated e-commerce, increased remote work, and reduced business travel.

Source: McKinsey Global Institute, The Future of Work after COVID-19; ABS, Online sales data, Jan 2021

Job losses due to automation are likely to be concentrated in outer suburbs and regions

Impact of automation by 2030



Source: McKinsey and Company, 'Australia's Automation Opportunity', 2016.

High exposure to disrupted industries makes regions vulnerable to automation

Forecast share of jobs automatable by industry, %

Regions vulnerable to concentrated job losses due to automation are highly exposed to one or more of these industries