COVID-19: The need for an Australian economic pandemic response plan

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ABSTRACT

Objectives: Pandemics pressure national governments to respond swiftly. Mitigation efforts created an imbalance between population health, capacity of the healthcare system and economic prosperity. Each pandemic arising from a new virus is unknown territory for policy makers, and there is considerable uncertainty of the appropriateness of responses and outcomes.

Methods: A qualitative approach was used to review mixed sources of data including Australian reports, official government publications, and COVID-19 data to discern robust future responses. Publicly available epidemiological and economic data were utilised to provide insight into the impact of the pandemic on Australia's healthcare system and economy.

Results: Policies implemented by the Australian Government to mitigate the spread of COVID-19 impacted the healthcare sector and economy. This paper incorporates lessons learned to inform optimal economic preparedness. The rationale for an economic response plan concomitant with the health pandemic plan is explored to guide Australian Government policy makers in ensuring holistic and robust solutions for future pandemics.

Conclusions: In future, an Australian Economic Pandemic Response Plan will aid in health and economic system preparedness, whilst a strong Australian economy and strategic planning will ensure resilience to future pandemics.

1. Introduction

The COVID-19 pandemic presented a dilemma for policy makers as interventions taken to ensure public safety produced short-run adverse economic impacts [1]. The Australian Government implemented border controls to prevent the further spread of SARS-CoV-2 in Australia before the World Health Organisation (WHO) declared a Public Health Emergency of International Concern on

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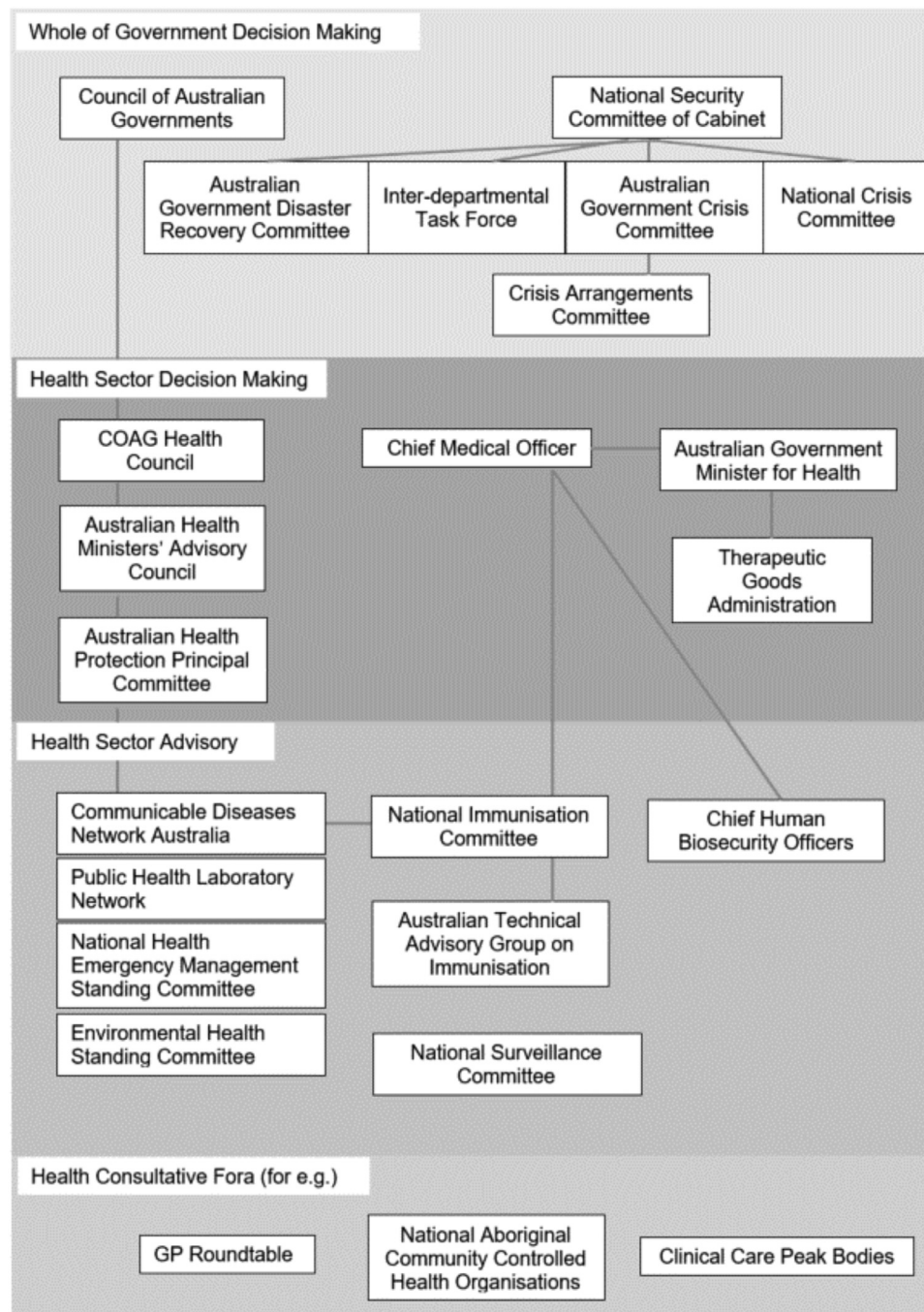
Fig. 1. Australian health sector and consultation decision-making structure in response to COVID-19 [3].

30 January [2]. This decision, and those following, were informed by the Australian Health Management Plan for Pandemic Influenza (AHMPPI) [3]. The AHMPPI was recommended by the WHO [4] and outlines best practice in pandemic planning and infection control [3]. It has been constantly updated since 1999 (most recently revised in August 2019), and was the core document used to develop the Australian Health Sector Emergency Response Plan for Novel Coronavirus (COVID-19) [3]. This plan outlined the government decision-making and consultation processes during the COVID-19 outbreak, provided in Fig. 1. The response involved the establishment of a National Cabinet, comprising the Prime Minister, State and Territory Premiers and Chief Ministers to coordinate healthcare decisions during the pandemic. Despite this initiative, incon-

sistencies between state and national policies occurred; a lack of executive powers prevented the National Cabinet from enforcing federally endorsed guidelines.

The Australian Health Sector Emergency Response Plan for COVID-19 engaged only with the health sector and health authorities (Fig. 1), with no evident plans for economic policies during a pandemic. Therefore the aim of this paper is to consider the impact of policy changes on healthcare and the economy, and the development of pre-emptive economic policy. In Australia, the economic responses were swift and sizeable given the unprecedented shock, however assessing policy impacts on health and economic systems can provide valuable insight for future preparedness. Consequences of decisions made by governments to mitigate and con-

tain the spread of the virus through stringent policies were examined within this paper to inform future policy developments, and a rationale to embed economic planning in government decision-making.

This paper highlights the need for a formalised economic response. Australia's national COVID-19 policies are described and the impacts on the economy and healthcare sector are explored, highlighting resource allocation of Intensive Care Units (ICU), Personal Protective Equipment (PPE), ventilators, staffing and elective surgeries. This is followed by recommendations designed to strengthen the national pandemic response plan to ensure holistic preparedness for future pandemics. The scope of the discussion is limited to Australia, however the conclusions and recommendations are relevant to a much broader audience.

2. Methods

A mixed methods research approach was used to evaluate the impact of policy decisions on the healthcare sector and economy. Qualitative content analysis was conducted using a manifest analysis methodology as described by Bengtsson (2016) [5], in conjunction with the Categorising Policy and Technology Interventions (CPTI) framework [6]. This framework was chosen for its detailed approach to policy categorisation and the severity gradient. Sources included official media statements and releases from national and state government websites [7], and leading health sources such as the Medical Journal of Australia, the WHO, and the Doherty Institute [8]. Documents were included for analysis using triangulation methodology whereby at least two investigators decided upon inclusion. Results were then coded and categorised by policy severity in line with the CPTI framework. Data sources that allowed for the quantification of the impact of COVID-19 included epidemiological data collected from covid19data.com.au, a database which collated detailed data from official state and national COVID-19 websites [9], the Oxford Response Stringency Index [10], the CPTI framework, and the Australian Bureau of Statistics (ABS) labour market index [1]. These data were used to chart trends to identify policy impacts. We accessed proprietary data; FactSet Research Systems was used to chart economic impacts, and BIS Oxford Economics for economic forecasts. Basic descriptive statistics were applied to observe policy impacts on health and economic outcomes. All dollar amounts are in AUD. Detailed methods are provided in supplementary material 1.

3. Policy responses and impacts

3.1. The development of Australia's pandemic policies

Australia's pandemic response began on 21 January 2020 with the listing of SARS-CoV-2 as a human disease under the Biosecurity Act 2015. Consequently, the Governor-General granted additional powers for authorities to impose stringent biosecurity measures to restrict the movement of goods and persons. These powers were exercised on 1 February with a range of border restrictions, limiting travel from mainland China when there were only 9 confirmed cases in Australia [7,9]. The restrictions denied entry to arrivals but exempted airline crews, Australian citizens, permanent residents, and their immediate family who were required to self-quarantine for 14 days [7]. In early March, these travel restrictions were extended to other countries experiencing extensive outbreaks, such as Iran (1 March), South Korea (5 March), and Italy (11 March), with total international border closures on 20 March [7].

In addition to travel restrictions, the Federal Government began to implement public health measures suggested in the AHMPPI [3]. From 16 March, increasingly restrictive social distancing and self-isolative measures were imposed. Initially public gatherings were limited to 500 people or less and by 29 March all public gatherings were limited to two people [7]. Australians were encouraged to stay and work from home and leave only for essential activities such as groceries, medical care and exercise [7]. According to the Oxford Response Stringency Index on 2 April, the severity of policy responses in Australia reached a peak of 73.15; in comparison, China's stringent lockdown policies peaked at 81.02 [10]. State legislations were amended to give each jurisdiction the ability to penalise non-adherence of health policy, e.g. Public Health Act 2010 [NSW]. Fig. 2 visualises the implementation of major policy interventions by the Australian Government against the growth of confirmed COVID-19 cases. A detailed timeline of national and state policies is provided in supplementary material 2.

3.2. Policies to prepare the healthcare system

Based on the exponential growth of the contagion and the subsequent strain on critical care unit capacities internationally, the Australian Government Department Office of Health Protection funded the Doherty Institute to research the impact of COVID-19 on Australia's ICU capacity [3]. Initial forecasts from the Doherty Institute's simulated model indicated that Australia's healthcare system would not have sufficient ICU capacity to meet peak COVID-19 demand [8]. Assuming only half of all ICU beds would be available for COVID-19 patients, three scenarios were projected using this baseline assumption. Predictions showed that ICU capacity would need to increase by 150%, 200% and 300%, dependent upon the effectiveness of social distancing measures to handle peak COVID-19 demand. Total national capacity could only increase by 191% [11] if all eligible beds were refurbished and turned into COVID-19-specific ICUs, leaving the system unable to cope in two of the three projections. Table 1 lists the existing and potential ICU capacity after refurbishment by jurisdiction.

In response, state governments took initiative to develop policies through coordinated discussions at the National Cabinet and implemented a suite of strategies to reduce the potential shortage of ICU beds and corresponding constituents, such as PPE, trained staff, and ventilators. On 25 March, the Prime Minister announced the suspension of category 2 and 3 elective surgeries (surgeries that need to occur within 90 and 365 days respectively) to address potential shortages of PPE stocks to meet projected demand [7]; Australia suffered significant shortfalls in test supplies and PPE, with the national stockpile insufficient to meet demand. After expressing concerns over staff redundancies and patient care if elective surgeries were halted, the public and private sector integrated on 31 March after the Australian Government persuaded the private hospital sector to align their activities with national priorities [3]. The unprecedent move to underwrite 657 private hospitals into the public system through five year partnership agreements with each state was estimated to cost $1.3 billion [12].

Additionally, state governments funded the refurbishment of a range of facilities to increase physical ICU spaces for anticipated cases. A range of federal and state incentives were launched to ensure that refurbished ICUs could be staffed with trained professionals by encouraging medical staff to re-enter or retrain [13]. This included the funding of 3,000 scholarships for registered nurses to undertake online education to refresh their clinical skills; over 5,000 nurses completed training on clinical care requirements for COVID-19 [14]. Additionally, efforts were made to source and modify ventilators for anticipated ICU spaces. A government taskforce in conjunction with the Therapeutic Goods Administration (TGA) investigated possible off-label use and modifications to ventilators, anaesthesia machines and other devices to support COVID-19 patients [15]. As an extension to this, a grant of $31.3 million was awarded to a domestic manufacturer in Victoria to make 2,000 invasive ventilators, and by 21 April another manufacturer deliv-
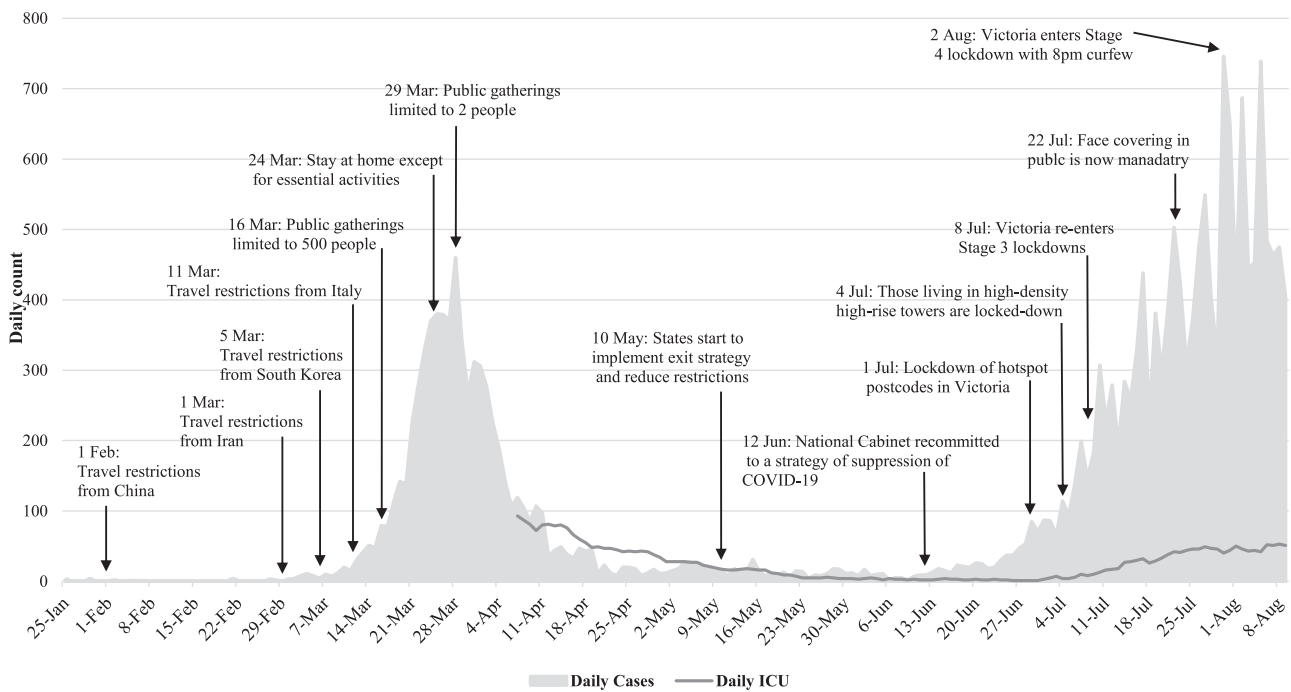
Fig. 2. Policy response to Covid-19 and daily number of cases [7,9].

Table 1
Number of ICU beds, existing and potential, March 2020 [11].

| State/Territory	Existing ICU beds	Total potential bed capacity (excl. existing)	Potential increase in supply (%)	Current availability per 100,000 population (June 2019)	Potential availability per 100,000 population (June 2019)
ACT	52	179	344	10.3	54.1
NSW	854	1725	202	10.8	31.9
NT	24	23	96	8.9	19.1
QLD	376	515	137	8.1	17.4
SA	193	155	80	8.9	19.9
TAS	51	113	222	9.4	30.7
VIC	499	1166	234	7.2	25.2
WA	179	382	213	6.2	21.4
Total	2228	4258	191	9.4	25.6

Table 2
Early ventilator capacity planning for COVID-19, March 2020 [11].

State/Territory	Standard ICU ventilators	Other ICU ventilators	Anaesthetic machine ventilators	Non-invasive ventilators and others	Total
ACT	47	9	34	9	99
NSW	730	189	545	252	1716
NT	27	8	4	2	41
QLD	451	89	192	119	851
SA	204	20	140	71	435
TAS	49	18	35	6	108
VIC	525	146	369	122	1162
WA	151	53	157	42	403
Total	2184	532	1476	623	4815

ered 3,000 out of 5,500 purchased ventilators (500 invasive and 5,000 non-invasive) [7]. The number of standard ventilators and other ventilators that could be used for respiratory support by jurisdiction in Australia are listed in Table 2.

As well as ensuring that enough ventilators were made available to fulfil the ordered number of ICU refurbishments to meet the projected case load, the Australian Government dedicated $2.4 billion to set up additional respiratory clinics nationwide in response to the outbreak, and provided $10 million of funding for extra COVID-19 tests [3]. By 13 May, 436 additional respiratory clin-

ics were operational nationwide, which included 102 GP-led and 29 Australian Defence Force respiratory clinics, and 305 state fever clinics funded jointly by the Commonwealth and States [3]. While the private and public hospital merge secured predominantly ICU capacity, on 7 April, peak demand for ICU totaled only 93 admissions [9], whilst the cessation of category 2 and 3 surgeries consequently led to the deterioration of many peoples' health conditions due to halted surgical waiting lists [3]. The Australian Institute of Health and Welfare reported that across Australia in 2017-18, a total of 161,430 patients required ICU admission of which 39,510

(a)

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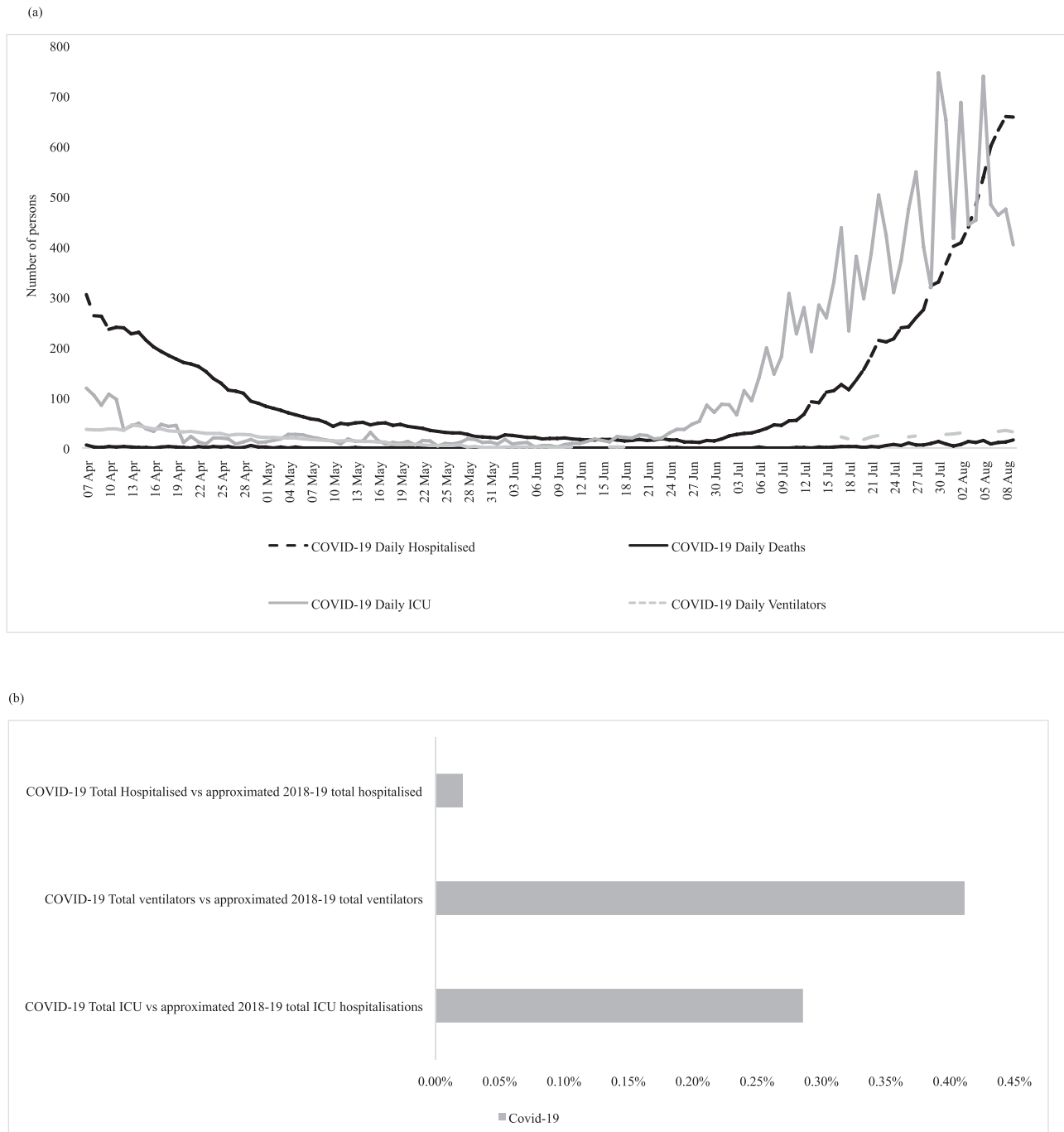
Fig. 3. Demand for ICU in Australia (COVID-19 data between 1 January to 10 June 2020, 5-month average, between 1 July 2017 and 31 June 2018) [9,16].

needed continuous ventilatory support [16]. Using these records as a proxy, total COVID-19 admissions to ICU and ventilatory support represented only 0.4% and 0.28% respectively, demonstrating that COVID-19 cases requiring these services in the January-July period were far below the demand of ICUs needed for elective surgeries (Fig. 3) [9,16].

Primary care, especially general practice services went into crisis as patient attendance declined [16–17], and healthcare staff lacked PPE and experience to deal with the highly infectious disease. One solution was a vast expansion of Australia's telehealth services. This was a major revolution in Australian healthcare, as the introduction of telehealth services had long been impeded by a combination of government-feared costs and healthcare provider

conservatism [18]. In response to COVID-19, telehealth services subsidised by Medicare were listed in the temporary Medical Benefits Scheme and were promptly expanded to allow doctors to deliver more services via video-conference and telephone, reducing face-to-face contact and the subsequent risk of COVID-19 transmission [19–20]. By 20 April, over 4.3 million telehealth services were delivered to patients [21]. However, it was not without faults, as rapid introduction meant that governance was delayed, and evidence emerged that some telehealth services took advantage of consumers [22]. Furthermore, software issues and poor access to internet services in urban, remote, and regional areas hindered clinicians' deliverability of services, especially to vulnerable populations [18].

3.2.1. Australia's testing, tracing and treatment strategy

The Australian Government adopted the WHO recommended triple-T (Testing, Tracing and Treatment) strategy to combat community spread during the COVID-19 pandemic in lieu of a viable cure or vaccine [23]. Given the short supply of testing kits, the Communicable Diseases Network Australia initially recommended strict testing criteria that prioritised testing of overseas arrivals and contacts of known COVID-19 cases who presented with fever symptoms; the criteria frequently changed as test kits became more available [24]. The Australian Health Protection Principal Committee (AHPPC) advised the National Cabinet that diagnostic testing would be a key strategy in Australia's approach to control community transmissions as restrictive policies de-escalated [3]. However, a high testing rate, in addition to fast test results, would be required to identify COVID-19 in communities and to respond quickly to local outbreaks. Given this, funds were provided for the innovation of faster test results, leading to the development of Polymerase chain reaction assay tests that take less than 24 hours [3]. Moreover, multiple state governments partnered with pathology labs and provided funding to increase testing capacity [3]. Delays in test results produced consequent lags in contact-tracing efforts and substantially increased the chances of community transmission; it had been suggested that Victoria's long delays (5-7 days) in processing tests may have caused public disobedience of self-isolation requirements whilst people waited for results [7].

Research efforts targeting SARS-CoV-2 were supported by an Australian Government grant totaling $66 million for the development of vaccines, anti-viral therapies and clinical trials of potential treatments [3]. Australia was at the forefront of vaccine development; phase 1 trials commenced in early May using the spike protein of the SARS-CoV-2 virus to create antibodies. Industry collaboration was significant within Australia and led to the pioneering of the "molecular clamp" vaccine technology [25]. Eager for a vaccine, the Australian Government announced an additional $13.6 million to the original $5 million in funding. Until a vaccine is available, with earliest predictions stating 2021, the Australian Government must continue to rely on targeted testing, tracing, and quarantine strategies [3].

The tracing strategy was funded by the Australian Government, mostly through state health departments. The Australian Government later initiated a technology-based phone app solution (COVIDSafe), that used Bluetooth technology to trace contacts within 1.5 metre proximity of confirmed cases by registering anonymous codes between users [3]. The Australian Government considered this technology an important pre-requisite for the exit strategy and aimed for 40% public adoption [26]. Public concern for anonymity and safe storage of personal data resulted in limited adoption [3]. Detection levels remained sufficiently low for states to easily conduct manual tracing until July, when community transmissions in Victoria required support from other state health departments to continue manual tracing. Even with the increase in community transmissions occurring in NSW and Victoria, by 9 August COVIDSafe app downloads remained below 7 million [3].

3.3. Economic policy responses

Stringent lockdown measures were a double-edged sword; although citizens were protected from the spread of the virus, these measures, which included a deliberate closure of much of the economy, left Australia vulnerable to an imminent economic crisis. One protective measure was to limit the scope of the lockdown in substantial industries, including building and construction (one of the largest employers) and mining (the largest export industry).

Fiscal stimulus started very cautiously; on 12 March, the Australian Government announced the first of its COVID-19 stimulus packages and pledged $17.6 billion to support business investment activities and employment. Within ten days it was clear this was insufficient and the package increased by a further $66 billion, followed eight days later by a wage subsidy scheme of $130 billion with additional provisions totalling $320 billion (adjusted) over the next three years [7,27–28].

The two keystone policies were the 'JobKeeper' and 'JobSeeker' initiatives, the first aimed at helping businesses to retain their current employees (with strict limits), paying $1,500 fortnightly per employee, and the second as an additional income support of $550 per fortnight effectively doubling existing amounts for unemployed persons [28]. This has since been revised to a two-tier system, paying different rates to part-time and full-time employees [7]. Some additional provisions aimed at supporting households and businesses included tax relief measures, temporary early release of superannuation, and instant asset write-offs. State governments provided different moratoriums on payroll taxes that included state-specific waivers or deferrals. In response to the second lockdown in Victoria, a sick-leave payment of $1500 per fortnight was enacted to increase adherence of workers to stay home when feeling ill [7].

Concurrently, the Reserve Bank of Australia (RBA) implemented a range of monetary policies to shield the Australian economy from the lockdown strategy. On 19 March, the RBA implemented four significant decisions to facilitate the flow of credit within Australia [27]. Firstly, the target cash rate, the interest rate used between banks on unsecured overnight loans, was set to a historic low of 0.25% to keep the costs of funding down to support Australian households and businesses with readily available credit to promote investments [27]. Secondly, the RBA implemented plans to artificially set the yield target on three year Australian Government securities to 0.25% by purchasing bonds in the secondary market. Thirdly, authorised deposit-taking institutions (ADIs) could take advantage of a three year funding facility containing $90 billion at a fixed rate of 0.25%. Fourthly, ADIs were given additional support with the RBA's commitment to remunerate exchange settlement balances at 10 basis points, thereby mitigating costs to the banking system. Further significant measures undertaken to boost credit market support included the opening of eligible collateral holdings to allow corporate investment-grade Australian dollar securities [27].

3.4. Economic impacts

3.4.1. Key indicators

Despite the Australian Government's significant fiscal policy and the RBA's monetary policy measures, latest data showed a severe economic slump in the first half of the year, not seen in Australia since the recession in 1991 [29]. The Australian Treasury estimated that the lockdown cost Australia more than $1.4 billion per week [28]. The first quarter of 2020 uncovered a 0.3% contraction in Gross Domestic Product (GDP), leading to an annual growth of only 1.4% in the year ending this first quarter [1]. The effects of COVID-19 restrictions were observed in the following quarter, with further contractions in GDP consequently leading to a negative growth estimate for the year ending June 2020 [27]. The RBA put forward an overall GDP contraction estimate of around 6-7% for 2020 with a 5% return in growth over 2021. This growth outcome is highly dependent on the effectiveness of the fiscal response, efforts to mitigate the spread of the virus, and progress in easing restrictions. For instance, the reintroduction of restrictions in Victoria to reduce virus transmission was expected to result in a 2 percentage point reduction in national GDP growth in the third
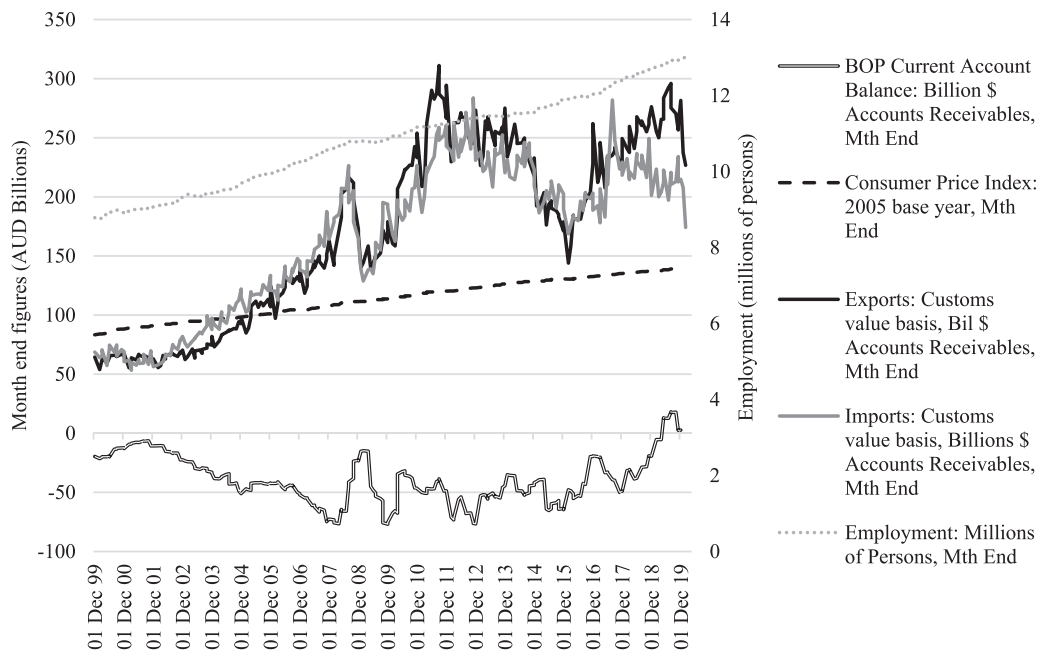
Fig. 4. Australia's National Accounts [31]. Copyright 2020 FactSet. All rights reserved.

quarter [27]. Early estimates of Australia's gross debt were expected to reach 40% of GDP; this debt-to-GDP ratio is much lower than many other nations' [30]. Fig. 4 shows Australia's National Accounts and a favourable Balance of Payments (BOP) position [31]. Despite credit rating agency Standard and Poor's (S&P) revision of Australia's AAA credit rating, the outlook went from stable to negative in April [32], while Moody's Investor service maintained its outlook as stable in June [33].

3.4.2. Consumption and investment

The abrupt shock of the pandemic on consumption and investment contributed to recessionary pressures. Overall household consumption plummeted during the March to April period despite strong retail spending that increased by 8.5% due to consumer stockpiling (Fig. 5). There was a strong recovery in total retail turnover in the April to May period from -17.6% to 16.8%, which quickly fell again in June to 2.7% [1]. The fall in output was due to a weakened services sector, which was impacted by social distancing policies. Restrictions on commerce and travel were expected to drop output further in the upcoming quarter [1]. The Consumer and Business Confidence Indices fell between the March to April period by 19.1% and 9.8% respectively (Fig. 6). Consumer and business confidence recovered in May as restrictions started to ease, but fell again in the June-July period by 11.3% and 5.0% respectively [34]. Results from the April ABS survey revealed that many business sectors in Australia predicted adverse consequences [1]. The Arts and Recreation, and the Accommodation and Food services sectors anticipated some of the worst outcomes of all employment sectors, as seen in Table 3. Within the Accomodation and Food services sector, 69% responded by reducing staff hours, 62% reduced headcount, 33% encouraged staff to take leave and 19% diversified services, such as providing takeaway [1,35]. Businesses within this sector were 67% more likely to report that the JobKeeper scheme had influenced their employment decisions and this was particularly true for small and medium businesses [1]. Of small, medium and large businesses, 61%, 60% and 45% respectively, registered for the payment scheme [34].

3.4.3. Labour market

Strict policy measures had a profound impact on labour market activity. Significant effects occured in the first half of 2020 due to the lagged nature of labour market adjustment to such shocks, particularly regarding labour market participation and employment figures. The RBA forecasted an unemployment rate of 10%, and a plunge in total hours worked by around 20% by the end of the second quarter [27]. Fig. 7 shows the impact of policy stringency on the labour market. Reduced cashflow, increased uncertainty and changed work conditions resulted in sharply reduced employment figures. This is despite the fiscal stimulus through JobKeeper and JobSeeker payments, which softened the true downturn [36]. The peak unemployment rate was forecast to reach 10% by the end of 2020 and remain above 7% by the end of 2021 [27]. However, the Grattan Institute predicted 14-26% of workers could lose employment due to lockdown policies, with the burden felt more amongst low-socioeconomic populations [36]. Responses to prevent further dismal employment outcomes are highly dependent on employers' willingness to preserve employees through reduced hours where necessary in favour of job cuts [27,36].

Worsening unemployment is likely to put downward pressure on economic recovery, preventing full return to previous levels in the short-run [29]. From March to June, the unemployment rate rose by 2.2 percentage points to 7.4% (Fig. 8), while the underemployment rate rose 4.9 points to 13.7% in the March to April period, but returned to 11.7% in June [1]. However, the biggest concern was the unprecedented 2.4% fall in the labour force participation rate in May, indicating that many people did not or could not actively look for work or were not able to work [1]. A few factors could have been responsible; firstly, JobSeeker payments exceeded some part-time and casual incomes that may have influenced reduced labour force participation. Secondly, with partial closures of schools, one parent may have been staying home for childcare. Women are three times more likely to care for children full-time, which may be reflected by the female participation rate which decreased 2.9 points to 58.4%, while male participation rates fell 1.9 points to 68.9% [1]. Additionally, female dominated employment sectors were hit hardest, especially retail and hospital-
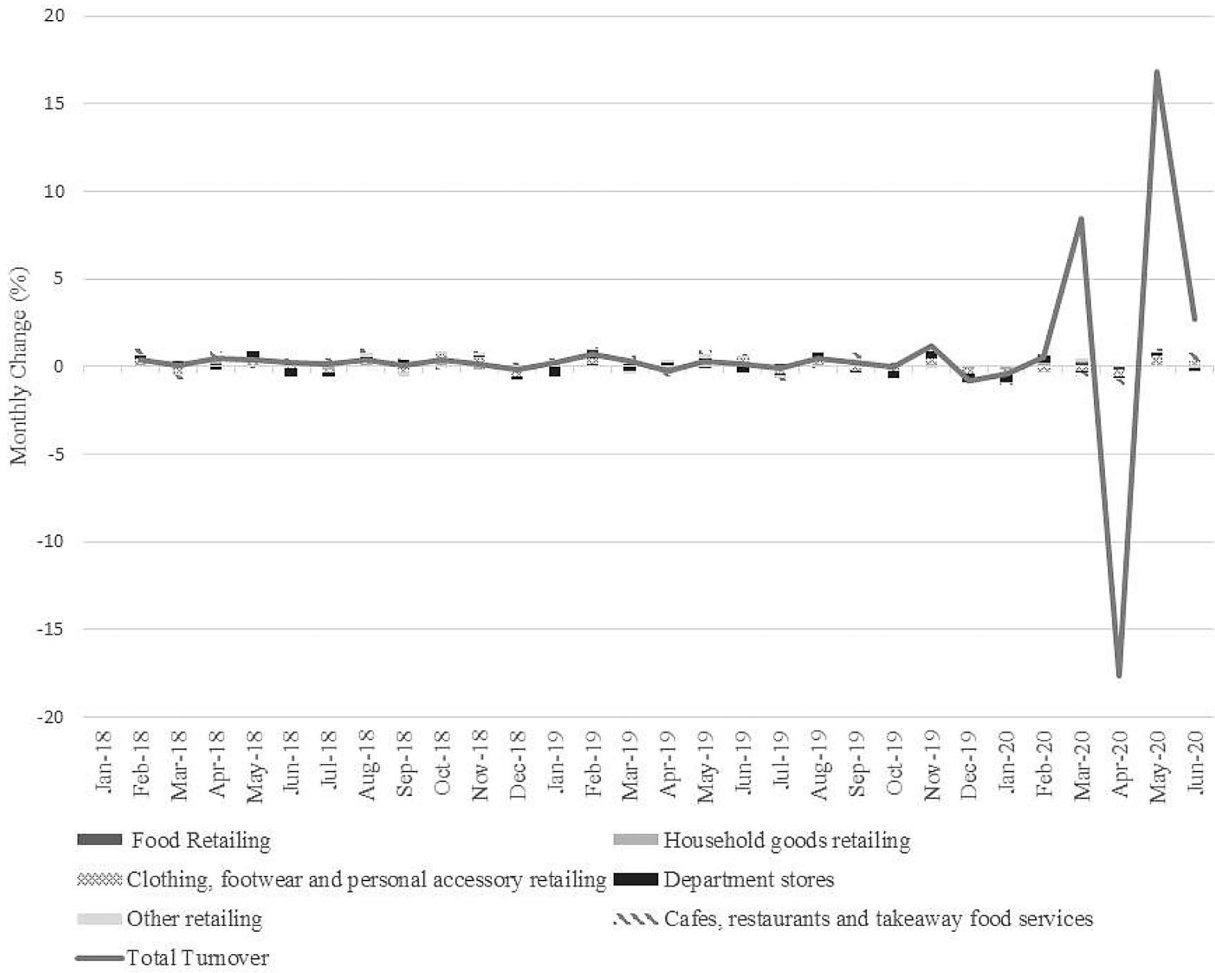
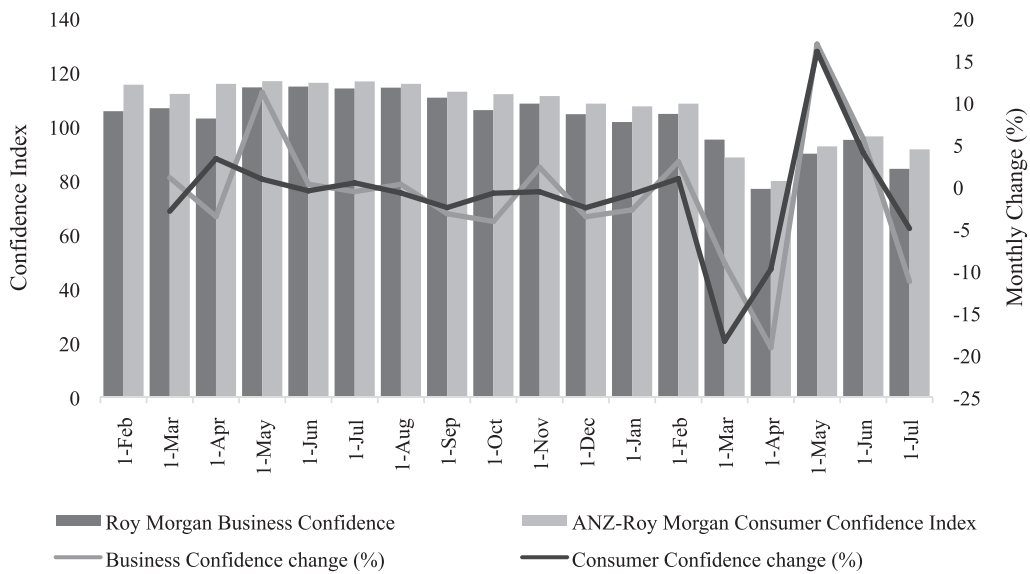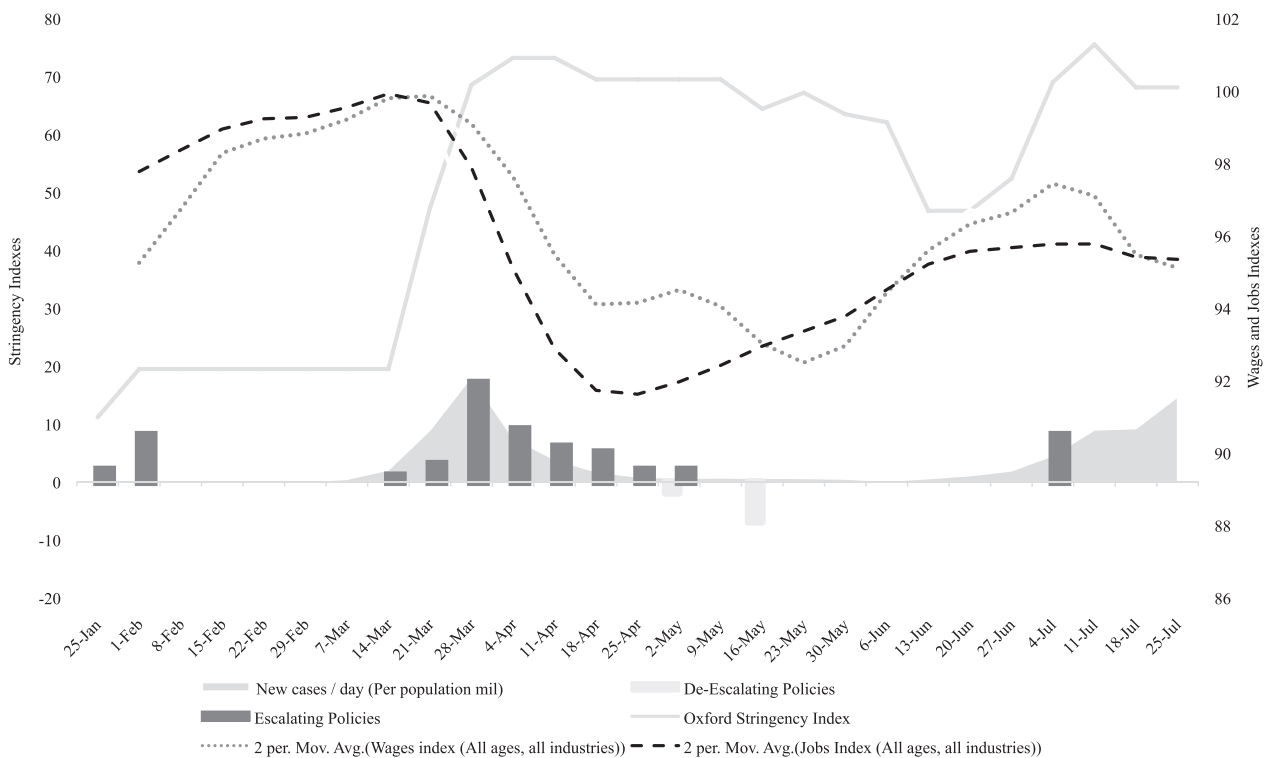**Fig. 5.** Monthly retail turnover by sector, seasonally adjusted using current prices (% change) [1].

Fig. 6. Business and consumer confidence, 2019-2020 [34].

Table 3
Anticipated adverse business impacts due to COVID-19, by industry [1].

	Reduced demand for goods or services	Supply chain uncertainty	Staff shortages	Reduced cash flow	Reduced access to credit or additional funds	Reduced ability to pay operating expenses	Government restrictions	Uncertain financial markets
	%	%	%	%	%	%	%	%
All Businesses	69	41	15	72	24	41	53	44
Mining	38	33	31	38	17	17	52	51
Manufacturing	82	59	9	75	33	57	53	65
Electricity, Gas, Water and Waste Services	44	32	24	40	8	18	43	32
Construction	73	58	8	77	31	35	39	42
Wholesale Trade	81	66	34	69	27	46	66	56
Retail Trade	61	59	27	62	16	41	47	42
Accommodation and Food Services	84	48	17	88	38	70	84	41
Transport, Postal and Warehousing	69	37	10	69	27	46	42	20
Information Media and Telecommunications	78	35	1	67	33	34	36	35
Financial and Insurance Services	41	18	8	45	18	19	37	62
Rental, Hiring and Real Estate Services	66	25	32	63	25	37	46	47
Professional, Scientific and Technical Services	62	23	2	65	16	31	40	47
Administrative and Support Services	80	34	20	81	12	61	74	46
Education and Training	79	17	21	88	25	57	79	30
Healthcare and Social Assistance	57	33	32	68	16	23	73	27
Arts and Recreation Services	83	18	27	84	24	71	94	34
Other Services	73	43	5	86	30	48	61	52

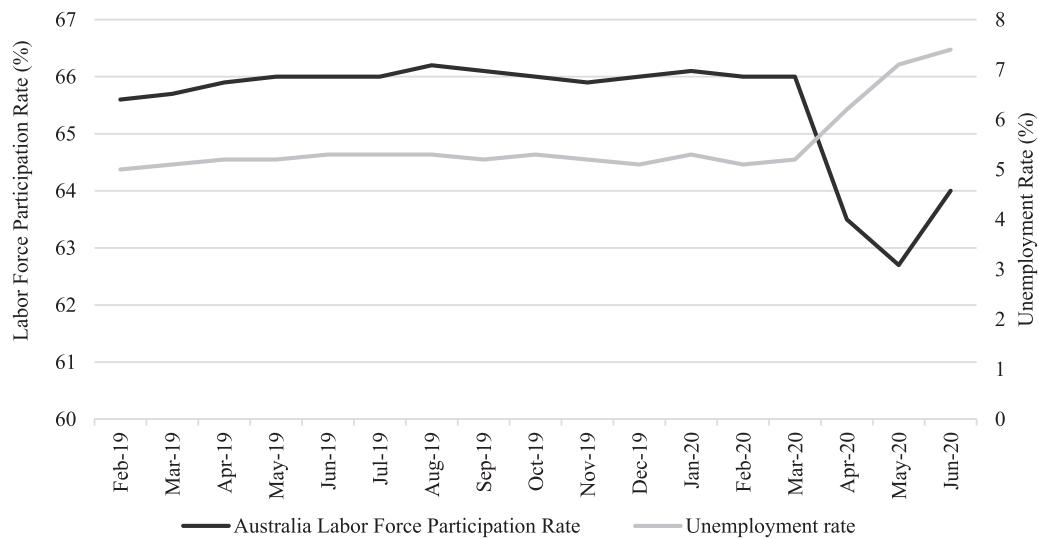**Fig. 7.** Policy stringency and labour market effects [1,6–7,9–10].

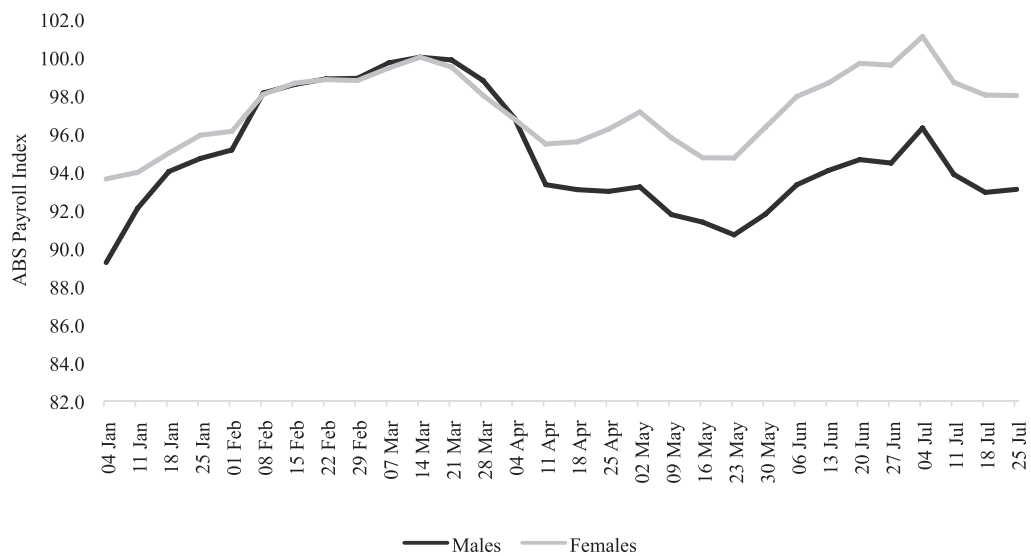**Fig. 8.** Labour Force Participation and Unemployment Rates [1].

Fig. 9. ABS Payroll Index, the relationship between an employee and their employing enterprise, where the employee is paid in the reference week through the Australian Tax Office payroll system [1].

ity. Male dominated industries were relatively more protected e.g. building and construction. Fig. 9 shows a payroll index developed by the ABS that considers the relationship between enterprises, their employees and payment patterns.

Although Australia performed well internationally for health outcomes related to COVID-19 through lockdown policies, the Australian economy suffered in the short-run. The COVID-19 pandemic is a stress test for Australian resilience and brought into sharp focus that Australia is underprepared for inevitable future pandemics. Infectious disease experts have stated that pandemics will occur with increasing frequency and ranging severity in the future; it is important that the economic lessons that can be learned do not dissipate into a repertoire of forgetfulness. We consider that the swift fiscal and monetary responses were necessary, and that Australia should continue to develop and improve existing systems that would facilitate proactive responses in future crises.

4. Proposing an Australian Economic Pandemic Response Plan (AEPRP)

Economic contractions are not unique to the COVID-19 pandemic. Evidence from history demonstrates that there are varying levels of negative economic consequences associated with pandemics e.g. the Spanish Flu [37–38]. The Australian and global experience of COVID-19 given the hindsight of history, provides a rationale for an economic pandemic response plan to limit repercussions that range from temporary to potentially long-lasting. Using lessons from the first stages of the current pandemic, we strongly recommend the development of a formalised and scalable Australian Economic Pandemic Response Plan (AEPRP) to be used alongside the already well-established health pandemic response plans. To make the economy resilient to global shocks, we additionally recommend the development of an Australian Economic

Resilience Plan (AERP). These plans should be used in conjunction to protect the economy from future global pandemics.

4.1. Resilient supply chains

The rapid border closures and localised lockdowns of workplaces around the world created unexpected and significant interruptions to supply-chains, and consequently disturbed the flow of medical supplies and PPE. Supply-chain disruptions were compounded when some nations restricted the trade of medications and other medical supplies [39]. Due to shortfalls, many governments repurposed existing manufacturing capacities to produce products needed during the pandemic. Pharmaceuticals and medical supplies are amongst the 25 most imported goods and services in Australia, with approximately 68% imported from the USA and Europe (2018-19) [40]. Despite this, the Australian Government closed international borders, contradicting global health recommendations by the WHO, that advised against travel and trade restrictions [41]. To prepare for demand and supply side shocks, particularly regarding vital pandemic resourcing needs, repurposing existing manufacturing capacities and technologies would help to ensure sufficient emergency supplies. For the AEPRP, appropriately diversified and alternative stress-tested supply-chain arrangements that allow flexibility to match demand during global crises should be developed. Additionally, joint ministerial agreements should continue to be regularly revised between Australia and key trading partners. Commitment to open and transparent exchange of the flow of essential goods such as medical supplies and services, food products and energy resources should be incorporated [40].

4.2. Labour force recommendations

The early lockdown measures implemented by the Australian Government were necessary to supress the spread of the virus, as evidence suggests that early intervention mitigates social and economic costs [42–44]. Impacts of labour market supply and demand shocks that typically define pandemics require consideration of appropriate fiscal stimulus to aid economic recovery. Lessons learned from the Australian fiscal response should be incorporated into the AEPRP. Income support payments such as JobKeeper and JobSeeker are essential to provide financial support rapidly as they utilise existing payment systems and are a form of income insurance that are indispensable during crises [45–47]. Exemptions from income insurance means-testing prevents asset selloffs that place downward pressure on prices that cause further economic strife [45], and averts precautionary savings and reduced economic activity, which in situations of uncertainty such as a crisis results in reduced investment and consumption [42]. Compensation to workers encourages adherence to social distancing measures as people change work commitments to reduce the risk of infection and are often required to do so by employers [42]. Nevertheless, significant shortcomings in the JobKeeper and JobSeeker should be addressed.

Fiscal payments made up front rather than in arrears would help support impacted businesses [46]. Extending the scheme to temporary visa holders and short term casuals would provide aid to some of the hardest hit sectors [46–48]; short term casuals represent 41% of the casual labour force, constituting 46.3% of the Food and Accommodation sector and 33.9% of the Arts and Recreation services [47]. As an indicator, in 2016, 68% of working holiday makers, around 50% of student visa holders and 86% of temporary work (skilled) visa holders were in the labour force [1]. These sectors contribute significantly to GDP, providing reason to support temporary visa-holders and casuals [46]. The initial Job-Keeper scheme's flat-rate meant that part-time workers were overpaid and since then, a two-tiered system had been implemented; a

similar provision is recommended for the AEPRP [46]. Lessons from Victoria's second lockdown indicates the need to financially compensate employees without sick-leave entitlements to encourage self-isolation [3]. As restrictions evolve during a pandemic, supplemented income insurance schemes which play a role in supporting economic endurance should be continuously reassessed for optimal recovery.

4.3. Response modelling

It is essential that the AEPRP includes innovative techniques that integrate epidemiological and macroeconomic models into one insightful pandemic response model. The current pandemic highlighted the need to incorporate behavioural responses into predictive models, as the sole use of epidemiological modelling to inform policy resulted in overestimations of cases. There are key distinctions between public and private behavioural incentives towards lockdowns. Risk attitudes of individuals tend to ignore the potential harm they pose to the public whilst infected, while governments are incentivised to protect the public through risk-averse policies [42]. In this way, econometric models which incorporate human behaviour associated with risk can aid in predicting the spread of a virus, whilst epidemiological models can contribute disease-specific nuances that affect aspects such as spread and severity. Inferences can be made on the information required to provide efficient forecasts; these models provide insight for pandemic panning and should be embedded into the AEPRP. We are not the first to realise the advantage of these models, however, we advocate for their inclusion in the AEPRP as we believe they are paramount when making important decisions under uncertainty [42–44].

4.4. Technology recommendations

The AEPRP should harness technology with a planned data network response to expedite data sharing from local, state, and national levels to inform policymakers of essential virus transmission information. In the early stages of the pandemic, limited information meant that policymakers made decisions without a true grasp of the potential impact of the virus [8]. Initially, only aggregated national case numbers were reported [3]. However, as data became more readily available from states and territories, much more detailed information was reported, including: demographic data for cases and fatalities, the number of tests performed, recoveries, source of transmission, ICU utilisation, hospital admissions and ventilator use [9]. During nationwide emergencies, data technology and systems can support efficient means of communicating patient data relating to key risk identifiers (pandemic-specific), such as symptoms, travel history or other factors that can identify potential cases [49]; COVIDSafe was an early attempt. Such data would provide information on infection rates and severity to aid rapid responses, which can impel early mitigation and prevent unnecessary loss of life. When data are not available domestically, it would be pertinent to use global data for rapid proactive responses during future pandemics. We suggest that we learn from this pandemic to incorporate technological solutions that can be used earlier and more accurately.

4.5. Healthcare sector recommendations

Although the public and private hospital integration secured additional ICU capacity, it came at a significant cost to the Australian public through inadequate healthcare provision and inefficient financing [21]. Indeed, the government guaranteed the survival of no other sector during the pandemic, and as such, the private sector was a clear winner [21]. The public-private deal was funded
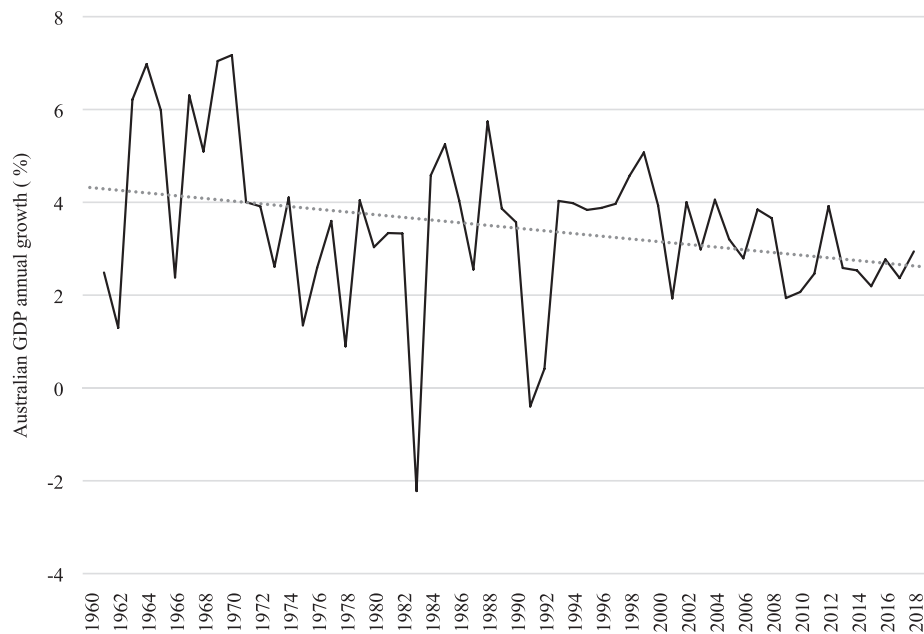
Fig. 10. Australia's long-term GDP growth rate [63].

by public sector finances rather than utilising existing payment systems, where subsidies could have had temporary risk-adjusted measures to finance needed resources for the crisis. Funding provisions were agreed to by the Commonwealth despite underlying issues in the sector prior to the pandemic that were exacerbated by continuous opting-out of PHI within the 25-34 age-group, whilst simultaneously the 75-95+ age group increasingly claimed PHI entitlements that exemplifyed the adverse selection problem [50] (supplementary material 3). Given that pandemics place additional pressure on health finance allocation, we believe that Australia would benefit from economic foresight and planning to limit inefficiencies and potential misallocation of vital resources. Therefore, we recommend that national and state governments alongside private hospitals, discuss crisis collaboration and financing arrangements post-COVID-19 to prepare a plan of approach for future pandemics.

Furthermore, pandemic planning needs to consider the importance of managing existing healthcare needs during crises. Hospitals in Australia faced significant constraints even prior to the pandemic in meeting high demand for surgical intervention [16]. Policy responses to reduce elective surgeries placed additional burdens on struggling healthcare systems; these restrictions have resulted in further stress on healthcare resources that consequently need to meet accumulated patient demand. We would urge that existing resources are judiciously allocated to non-pandemic patients [51] and emphasise the importance of an equally rapid reopening of elective surgeries due to high social and economic costs associated with long surgical waiting lists that exacerbate productivity losses.

Additionally, many people forewent highly effective, more conservative treatments, evidenced by a significant downturn in patient bookings with allied health professionals [52]. The Primary Health Network plays a vital role in early identification, management and prevention of chronic diseases that are extremely important to the general health of Australia's population, which is characterised by a high burden of disease. Consequences of an underutilised primary health network are yet to be realised [53] (supplementary material 4). International experience has shown that places that could mobilise primary care and keep people out of hospitals had better health outcomes during the pandemic

[54]. These services were halted and underutilised due to PPE shortages.

Given significant shortages of PPE during COVID-19 and the inability to purchase additional quality international supplies, we recommend that the Australian Government should increase the national PPE stockpile to pandemic capacity. Regardless of the additional costs related to storage and monitoring, this option is relatively inexpensive compared to other measures, such as suspending elective surgeries or lockdowns [3,21,52,55]. As a part of evaluating policy responses, research could quantify life years gained or lost due to lockdown policies to minimise adverse policy impacts. We recommend that economic planning is used to optimally allocate healthcare resources to balance pandemic medical care with existing healthcare requirements of the population. To allow efficient resource allocation during pandemics, we recommend the establishment of a deciding committee of hospital and primary healthcare representatives who consult daily on resources to conjointly meet pandemic-specific and existing healthcare demands.

4.6. Education recommendations

The final recommendation for the AEPRP is to closely examine the impact of policies on education; households are disproportionally affected by stringent policy measures shaping labour market prospects, with the burden on families extenuated by school closures [56]. Australia needs to be prepared for a contagion that effects the younger population. The Australian Government policy response was inconsistent; national policies strongly opposed school closures, but the states (which control schooling) closed schools to most students or discouraged attendance [3]. While the education sector showed it was able to rapidly switch to online delivery, concerns over digital inclusion, technological skills, disengagement, family support, and emotional wellbeing suggest that the transition to online education can adversely affect students and result in poorer educational outcomes [56]. In Australia, the projected achievement gap for 5th grade school students averaged to approximately 6 weeks of missed education, whilst disadvantaged students could lose the equivalent of 4 to 16 weeks above and beyond the existing 16-month gap [57]. Therefore, we recom-

mend significant investment into education with considerable effort to create engaging and accessible online and off-campus delivery. Universities were not prepared for the sudden cessation of international student enrolment, with heavy dependency on international student fees, especially from China [58]. As the world's third largest provider of international education services, contributing 8% to Australia's share of exports and roughly $40 billion to the economy in 2019 [40], the industry experienced significant shocks due to the closure of international borders. Considerable secondary effects on GDP and employment occurred quickly, which posed a threat to the industry's survival [58]. Given the heavy reliance, we advise that international students be allowed to travel to Australia with mandatory testing and quarantining guidelines in place.

4.7. Australian Economic Resilience Plan (AERP)

Over the medium to long term, investment in innovations and technologies by the Australian Government would aid the economy and health sector to better prepare and endure pandemics or economic shocks. The future of Australia's economy depends on increasing long-term GDP growth, and therefore on government funding and investment into sectors that have the most potential for global comparative advantage to place Australia on a promising trajectory [59]. Evidence supports that per capita income increases with the growth rate of technology, which is in turn associated with positive population growth, and in the long-run contributes to economic resilience [60]. Technology boosts innovation, which in turn has positive externalities on the economy, economic efficiency and sustainability [61]. Equally, investment in social infrastructure, including physical and human capital support long-run economic performance by effectively increasing output per worker and hence economic productivity [62]. Additionally, a move to a digitised economy will sustain innovation and productivity as well as ensure greater resilience to future pandemics [61].

Although the mining sector in Australia will most likely prevent the worst of the recession [29], over-reliance on this sector is improvident. Australia's long-term GDP growth rate has been declining over several years (Fig. 10), despite the strength of the commodities sector [63]. A shifted focus to investment in the education sector would counteract reliance on commodities and strengthen the economy. Firstly, as the world's third leading exporter of educational services [40], it is advised that future funding and investment should be strengthened in this area. This would allow the continued development of high-quality education for Australia to maintain its competitive advantage as it contributes to positive long-term effects on the rate of GDP growth [59].

Similarly, investment to provide higher quality education for all ages would support a stronger domestic labour force that is competitive internationally [59]. Successive Australian Government cuts to research funding has partially driven overreliance of the tertiary sector on international students. A reignition of investment to support domestic students through provisions such as research grants would balance university exposure to the international student market. Additionally, this would have the added benefit of protecting research from the negative aspects of pandemics. The hydroxychloroquine debacle highlighted the continued need to keep scientific research robust, even during pandemic pressures [64]. If public trust in science becomes eroded, the likelihood of adherence to scientific-backed policies, even public uptake of future vaccines, will be impeded [64]. Regardless of the proposed urgency advocated by governments, we suggest that robustness and scientific rigor must not be allowed to fall by the wayside, as seen with the withdrawal of a hydroxychloroquine article in the Lancet [65]. Though naïve to suggest in the current research era paradigm of publish or perish, a solution to heal this mentality is increased

and continued public funding. Consequently, an Australia resilient to anticipated pandemics should have a robust research industry, making Australia a world leader in scientific research.

5. Conclusion

The Australian Government and RBA implemented significant policy interventions to secure the wellbeing of the population impacted by the COVID-19 pandemic. The approach to pandemic decision-making (AHMPPI) placed the health sector at the forefront, resulting in early travel restrictions followed by a series of nation-wide lockdowns that aided in controlling the contagion, whilst the Doherty Institute's simulation model informed the introduction of significant measures primarily aimed at preparing ICU surge capacity [8]. Fiscal stimulus initiated by the Australian Government promptly followed suit to provide urgent support to labour markets. The RBA equally initiated significant successive monetary policy measures to improve liquidity in capital markets and reduced the cash rate target to historic lows that aided lending and borrowing across the country to boost support for individuals and businesses. There is great value and opportunity to be gained by integrating economics in decision-making to prepare a country for substantial and unexpected supply and demand shocks that characterise pandemics. All throughout history pandemics have shocked economies with potentially long-lasting effects, which provides added foresight to the proposed initiation of an AEPRP in conjunction with the existing pandemic response plan. Australia is indeed a lucky country, having entered the pandemic with a substantially well-off budget position and strong healthcare sector to complement the stringent and timely mitigation measures; preparedness for future pandemics is the next important challenge Australia must face.

Supplementary materials

Supplementary material associated with this article can be found in the online version, at doi:10.1016/j.hlpt.2020.08.017.

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