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Economic and Psychosocial Impact of Covid-19 Vaccine Non-Compliance amongst Australian Healthcare Workers

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Abstract

In September 2021 public health employees in the state of Queensland, Australia, were directed to accept Covid-19 vaccination, or risk disciplinary procedures, suspension and termination of employment. We hypothesised those non-compliant with this mandate would suffer economic hardship, psychosocial harm and possible suicide risk. Wider ramifications might include loss of highly skilled personnel from the workforce. In early 2023 an online survey was disseminated through social media. This consisted of 63 questions on employment; exemptions; natural immunity; disciplinary action; appeals; economic and psychosocial harms. Of 369 participants, the majority were female (85.9%) and of nursing profession (55%). We found a reduction in income (reported by 94.4%). The majority (94.9%) believed psychosocial harm was caused as a direct result of state government policy. Anxiety and depression were experienced by 92.1% while 34.1% had had thoughts of suicide. This survey of staff disciplined for non- compliance with Covid-19 vaccine mandates in the state of Queensland, Australia, found wide-spread harm. Impact was biased against females and single parent households. Natural immunity was dismissed by authorities. The disciplinary processes failed to consider possible economic or psychological damage. The devastation caused could have intergenerational impact beyond that revealed in this study.

Keywords: Psychosocial; Economic; Healthcare Workers; Covid-19.

Introduction

After first announcement of the Covid-19 pandemic in 2020 and before vaccines became available, many healthcare workers (HCW) treated patients with heroic efforts that were welcomed by both employers and by the nation of Australia as a whole [1, 2]. While reports suggested that frontline HCW may be particularly vulnerable, with high risks of infection, such concerns did not materialise into significant harm. In September 2021, almost two years after the announcement of the virus, and as viral variants were predicted to become less and less virulent [3], all HCW in the Queensland public health system were mandated to submit to at least two doses of a Covid-19 vaccine [4]. Those who did not comply risked allegations of serious misconduct and disciplinary procedures which included suspension without remuneration and ultimately termination of employment. Many would be ostracised from colleagues, family and society. Three key matters would become major drivers for vaccine hesitancy and non-compliance with the mandate. First, the primary rationale for the mandate, i.e. reduced viral transmission, would be shown to be far less than claimed. Even as the vaccines were initially mandated, evidence showed that they had not been tested for reduction

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of transmission in the original trials [5] [6] and as 2021 progressed, data accumulated to fully confirm that the vaccines neither prevented infection nor transmission [7]; Secondly, there would be a dramatic increase globally in reports of adverse events related to the Covid-19 gene-based vaccines compared to other traditional vaccines [8-10]. And finally, the Covid-19 vaccines were only provisionally approved by the Therapeutic Goods of Australia (TGA). This approval allowed the use of these products in a public health emergency, with recognition that longer term efficacy and safety data were absent [11]. While the vaccine mandate directive did allow "in principle" exemptions on the basis of medical or religious grounds, very few of these were granted in practice [12] and a protracted disciplinary process ensued. In many cases this process continues more than 20 months after the vaccine mandates were initiated, with many HCW left in limbo and a proportion without income or final decision. Covid-19 vaccines are associated with non-trivial risks [8-10, 13, 14] and discussions of harm related to Covid-19 vaccine have thus far been limited in terms of their pathophysiologic effects. However, the choice not to take the vaccine may involve a new set of harms not previously considered by policy makers. Continued pressure from employer, isolation from peers and society in general, suspension from their careers and traumatisation from loss of both job and income, may produce significant economic and psychosocial harm. Damage from psychosocial harm is recognised to include loss of motivation, physiological manifestations of stress, depression, suicidal ideology and requirements for treatment of mental illness and even long-term medical care [15]. We hypothesised that HCW disciplined by their employers for non-compliance with a Covid-19 vaccine mandate would suffer measurable economic hardship as indicated by reduced income, sale of personal property or utilisation of government handouts as well as mental harm, stress and anxiety and possible suicidality. Still wider ramifications might include the loss of hundreds of years of experience among highly skilled workforce personnel from an already strained workforce. This study attempted, via a convenience survey, to understand the economic and psychosocial impacts of government disciplinary processes that included protracted suspension without remuneration and termination from the public health service.

Materials and Methods

Access to survey data held by a third party was approved by The University of Queensland Research and Ethics committee (2023/HE001085) on June 19, 2023. The study was conducted in accordance with the Declaration of Helsinki. Participants voluntarily filled out questionnaires and provided consent for publication. Data from any person who completed the survey but then later indicated non-consent was removed before analysis. Full data is held by a third party (Australian Medical Professionals Society, AMPS, and Nurses Professional Association of Queensland, NPAQ). As of 23rd September 2022, there were 2,438 Queensland Health employees who had not registered two doses of a Covid-19 vaccine as required by mandate to remain in the workplace [16]. This became our potential survey group. Using Slovan's formula [17], ($n = N / (1 + Ne2)$ and a 5% error margin we calculated a sample size of 344 (on the basis of 2,438 non-compliant HCW) as the minimum survey stop point. A convenient sampling method was used to distribute the online survey link through targeted closed social media groups on Telegram, Signal, Facebook Messenger comprising affected HCW's and also via email to financial members of the Australian Medical Professionals Society, (AMPS), and Nurses Professional Association of Queensland, (NPAQ). Anonymous responses were recorded via Google Docs spreadsheet. In order to increase responses, the survey was sent out at seven (7) day intervals up to a maximum four times to the aforementioned groups. The survey was run between March 31st and May 7th 2023 and consisted of 63 multiple choice or short answer questions broken into the following categories: employment (14 questions); vaccine exemptions (5 questions); Covid infection and natural immunity (5 questions); disciplinary action (8 questions); economic (11 questions) psychosocial harms (8 questions); appeals process (5 questions); and additional comments (7 questions).

Inclusion criteria for completion of the survey required employment by Queensland Health in some capacity (full-time, part-time, casual or contract) at the time of enforcement of the vaccine mandate (30th September 2021). Individuals not employed by Queensland Health at this time were asked not to complete the survey. All participants were asked to complete the survey once only. It was an open survey, and anyone with the link was able to take part. Due to the anonymous nature of the survey, it was not possible to check the uniqueness of each respondent. IP addresses were not checked. Since no incentives were provided for completion, it is considered unlikely that anyone made repeated submissions.

Results

Responses to this survey were completed by 376 HCW. Replies from seven (7) HCW indicated that they did not work for the Queensland Health Service as of 31st September 2021 and therefore did not meet inclusion criteria. These were excluded prior to analysis. Although not specifically targeted, there were 6 individuals included from the Queensland ambulance service as they are subject to the same Queensland Health Covid-19 vaccine directive. A total of 369 responses were thus confirmed to meet inclusion criteria and all subjects indicated consent for publication of their results. The main characteristics of the survey participants are listed in Table 1. A majority were female (85.9%) and from the nursing profession (55%). Across the 369 HCW in this study, experience ranged from 3 months to 48 years of employment, with a total of 4774.25 years of public service.

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Table 1: Characteristics of study population (N=369)

Sex	Male % (N)	14.1 (52)
	Female % (N)	85.9 (317)
Employment Status	Full-time % (N)	39.6 (146)
	Part-time % (N)	55 (203)
	Casual % (N)	14.6 (20)
Length of Service (years)	average (SD)	12.9±8.8
	>10 yrs service (%)	221 (59.9)
	total years of service	4774.25
Employment sector		Female/Male
Administration	49	44 / 5
Aged Care	1	1 / 0
Allied Health	46	35 / 11
Assistant in Nursing	1	0 / 1
Biomedical Tech	3	0 / 3
Contractor	1	1 / 0
Corporate	1	1 / 0
Dental	2	2 / 0
Food Services	2	1 / 1
Home Care	1	1 / 0
IT	1	1 / 0
Maternity and midwifery	17	17 / 0
Medical	11	4/11
Medical Support	1	0 / 1
Nurse	204	192 / 12
Operational	5	3/2
Oral Health	4	4 / 0
Queensland Ambulance Service	6	4 / 2
Pathology	3	2 / 1
Patient Support	1	0 / 1
Protective Services	5	0 / 5
Wards person	4	4/ 0

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A reduction in income compared to pre-vaccine mandates was reported by 94.4% of survey participants with 70.7% being female (Figure 1A). Since September 2021 36% of respondents had not found re-employment at the time of the survey (Figure 1B), while in those that had found employment, 42.8% were in non-skilled labour (Table 2). A minority (18.2%) of individuals had been re-employed in the private health services (Table 2). Our survey indicated that 59.3% had been below the Australian national poverty line ($489/week (singles) or $1089/week (couples)) for a period of two weeks or more (Figure 1C). Noting the poverty line for singles, 46% of respondents were from single income homes (Figure 1D). Government financial support was accessed by 20% of respondents (Figure 1E), who were mostly female (66 vs 8). Community food bank services (not available in every location) were accessed by 11% (Figure 1F).

Psychosocial harm as a result of the vaccine mandates was noted by 94.9% of respondents (Figure 2A). Anxiety and depression were reported by 92.1%, while 34.1% had experienced thoughts of suicide (Figure 2B and 2F). Personal relationships were affected as a result of not taking a Covid-19 vaccine for 92.7% of survey respondents (Figure 2C), while a formal diagnosis of psychosocial harm from a medical practitioner was reported by 19.5% of individuals (Figure 2D). Only 15.2% of subjects had taken up an offer of free counselling from Queensland Health (Table 2), whereas significantly more had sought a fee based private counsellor (34.7%) (Figure 2E).

At the time that disciplinary action was imposed by government, staff were offered the right to appeal. This involved arbitration through the Queensland Industrial Relations Commission (QIRC). The process only provided the option to decide whether the imposition of disciplinary procedures (suspension with/without remuneration and termination) was fair and reasonable. It did not evaluate or judge any detailed issues which may have been raised by an individual such as religious/medical exemption or an evaluation of the scientific literature. Of the 369 subjects in this survey, 49% submitted an appeal of which 41% subsequently withdrew, either as a result of advice from their union, or as a personal choice with loss of faith in the system. Of the remainder of cases submitted for review, 86% had not yet been heard before the Commission. No respondent in this survey identified a favourable outcome through the appeal process.

Figure 3 (A-D) reports the responses to the questions of whether HCW believed they were treated fairly, and whether they felt pressured or coerced by Queensland Health to take the Covid-19 vaccines. Also, whether they believed the decision not to be vaccinated was the right choice despite the significant consequences and finally whether they would return to their original role if vaccine mandates were revoked.

Registered HCW are required to abide by The Australian Health Practitioner Regulation Agency (AHPRA) policies and procedures. In this survey 259 respondents were AHPRA

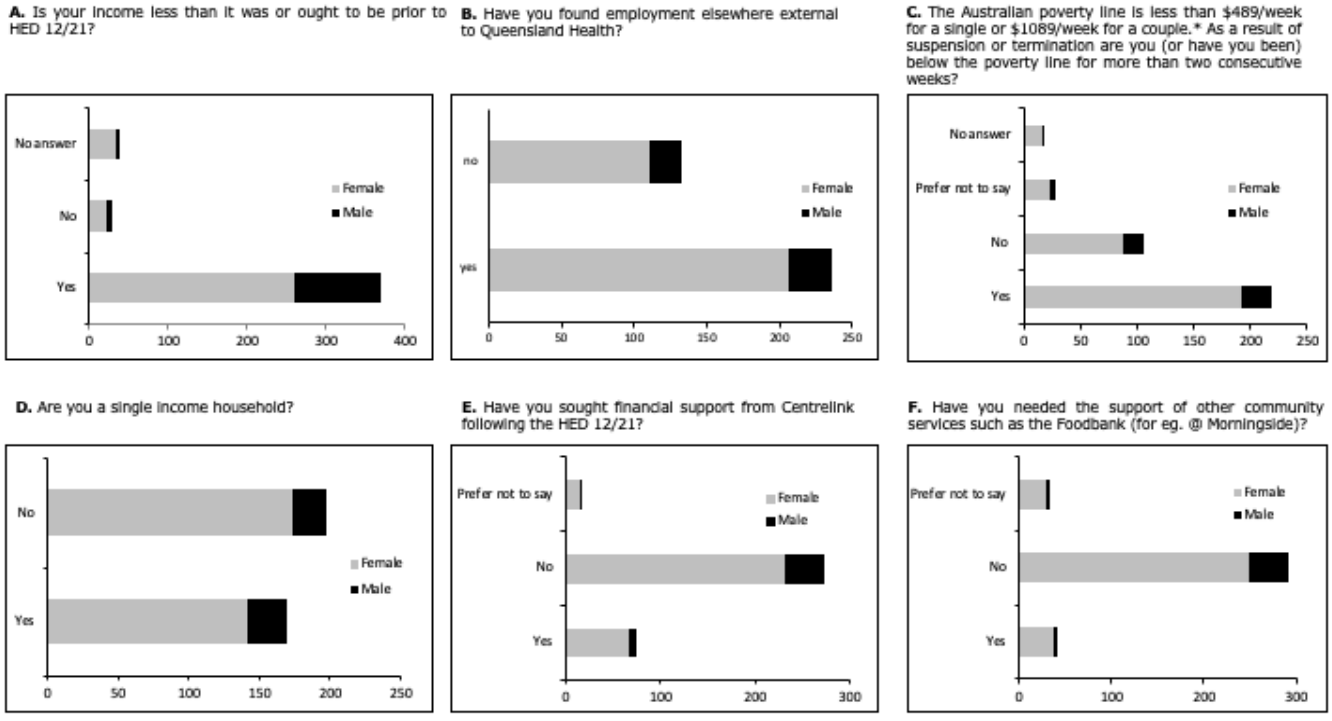

Figure 1: Economic effects of suspension and termination in Health Care Workers. [Subfigure heading] 1A and 1D: HED 12/21- Health Employment Directive 12/21 [4] Total responses (369). Fig D; no answer from 2 respondents. Fig E; no answer from 4 respondents. Fig F; no answer from 2 respondents.

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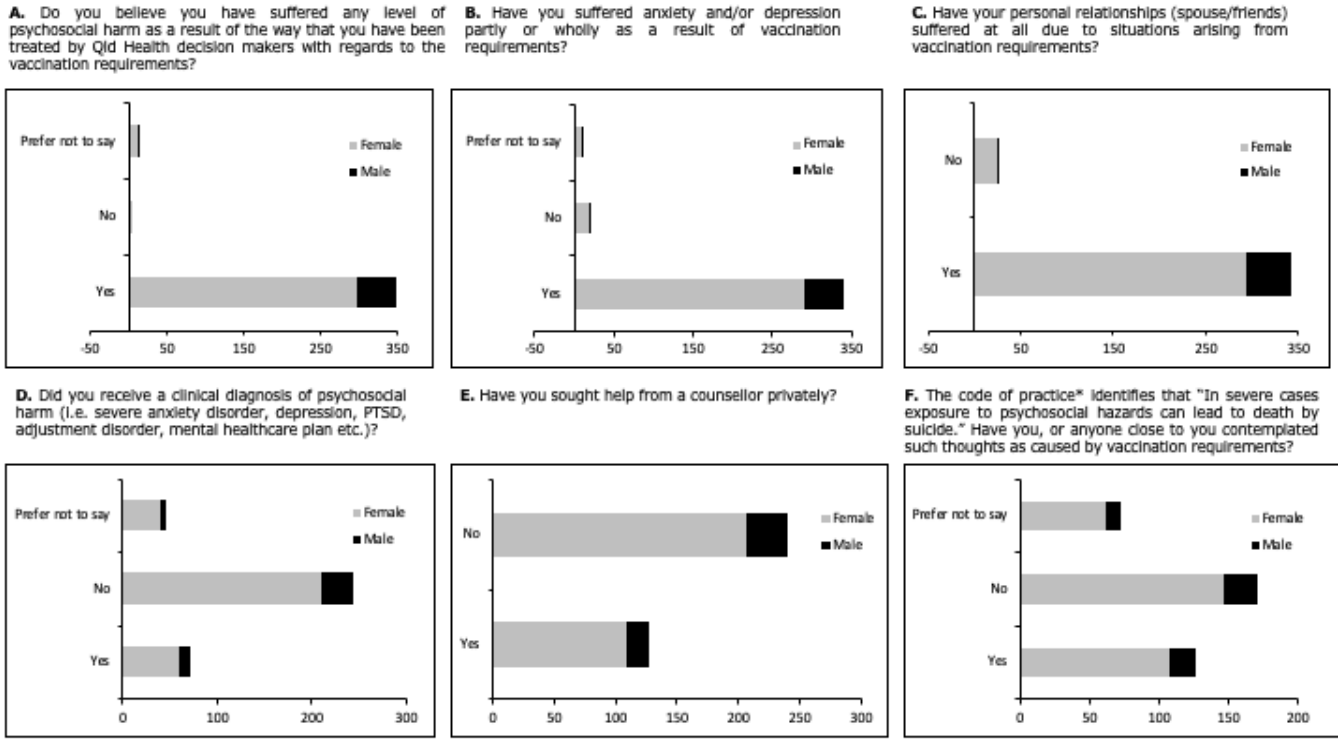

Figure 2: Mental Health outcomes in Health Care Workers. [Subfigure heading] Total responses (369). Fig D; no answer from 7 respondents. Fig E; no answer from 1 respondent. Fig 2F; * [15]

Table 2: Survey Responses (Total and by Sex)

		Total	Female/Male
Are you/ were you AHPRA registered	Yes	259	231 / 28
	No	110	86 / 24
Have you received a caution or disciplinary action from AHPRA	Yes	33	33 / 0
	No	336	284 / 52
Have you received any Covid-19 vaccine doses, and how many?	No dose	331	
	one dose	9	
	Two dose	21	
	Three dose	1	
	Trial dose	4	
	Prefer not to say	3	
Has your GP ever advised you against Covid-19 vaccination?	Yes	51	45 / 6
	No	240	213 / 27
	Never Discussed	78	59 / 19
Did you apply for a Covid-19 vaccination exemption in Sept/Oct 2021 with Queensland Health?	Yes	324	277 / 47
	No	45	40 / 5
If you applied for an exemption, what category did you apply for (select one or more)?	Medical	58	
	Religious	37	
	Exceptional	131	
	medical + religious	22	
	medical + exceptional	19	
	religious + exceptional	19	

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	conscientious objection	10	
	no answer	14	
Was your exemption ever granted?	Yes (Full)	0	
	Yes (Temporary)	18	16/2
	No	306	
If you were granted an exemption, were you able to return to work?	Yes	1	1 / 0
	No	17	15/2
Did you ever work with Covid-19 positive or suspected patients pre-vaccine mandate (i.e. prior to September 2021)?	Yes	172	145 / 27
	Maybe	75	62 / 13
	No	122	110 / 12
Do you think you were ever infected by Covid-19?	Yes	253	218 / 35
	No	125	98 / 27
	No answer	1	1 / 0
When infected, did you need hospitalisation?	Yes	3	2/1
	No	266	
Have you tried returning to work by claiming natural immunity via ATAGI medical exemption or serology?	Yes	54	43 / 11
	No	263	232 / 31
	No answer	52	42 / 10
Was a temporary exemption ever approved on the basis of natural immunity by Queensland Health?	Yes	2	2 / 0
	No	52	
Did you resign with vaccination requirements as a factor?	Yes	48	45 / 3
	No	306	259 / 47
	No Answer	15	45335
Were you terminated relating to the vaccination requirements?	Yes	207	176 / 31
	No	148	128 / 20
	No answer	14	45304
Have you discussed your mental health with your GP since the vaccination requirements?	Yes	181	159 / 22
	No	156	130 / 26
	Prefer not to say	32	45410
Did you access the free counselling support (i.e. Benestar) offered by Qld Health?	Yes	56	50 / 6
	No	296	252 / 44
	Prefer not to say	17	15/ 2
If you found employment elsewhere has it been in the private health sector using your current skills and qualifications?	Yes	67	62 / 5
	Somewhat	51	43 / 8
	No	168	141 / 27
If you found employment elsewhere is it non-degree (i.e. mostly unskilled) based employment?	Yes	159	131 / 28
	No	107	97 / 10
How many hours per week of alternative employment have you found?	<10	41	37 / 4
	10-20	65	58 / 7
	20 - 30	80	62 / 18
	30 - 38	60	49 / 11

AHPRA - Australian Health Practitioner Regulation Agency; GP- General Practitioner; ATAGI- Australian Technical Advisory Group on Immunisations.

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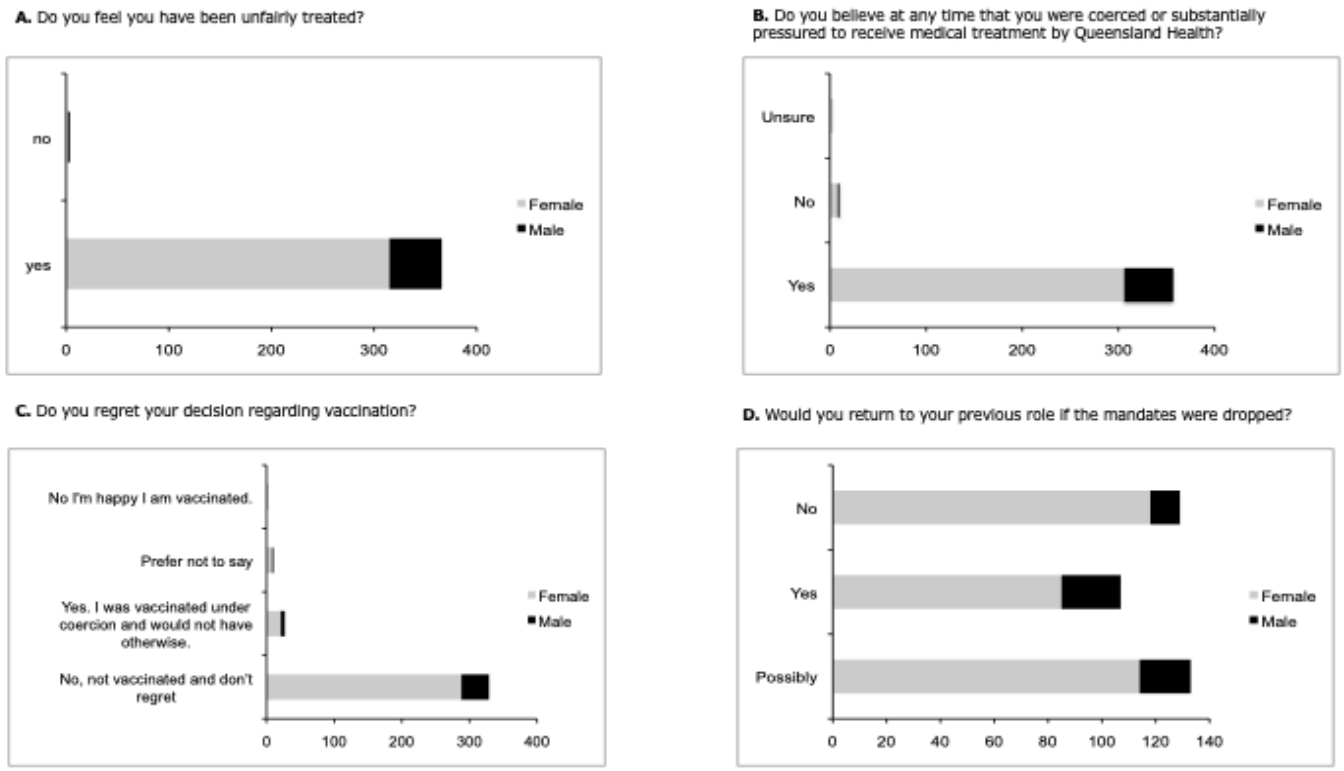

Figure 3: Health Care Worker perceptions on treatment.

registered and since the implementation of the Queensland Health Covid-19 vaccine mandate in September 2021, 33 have received a caution from AHPRA (Table 2) for violation of social media guidelines and/or public pronouncements against government endorsed and mandated health policies.

Queensland Health had a policy of paid special discretionary leave while applications for vaccine exemptions were being processed. Our survey indicated that this policy was not evenly applied. One hundred and fifty respondents did not apply for special discretionary leave, however twenty-three received payment of the leave. In contrast, 169 respondents did apply for the special leave and only 119 received payment on first application, 16 took multiple applications before success and 34 were denied.

Discussion

We report that HCW disciplined for non-compliance with a Covid-19 vaccine mandate experienced significant economic and psychosocial harm. To our knowledge this is the first such study to investigate the economic and psychosocial effects of non-compliance with a Covid-19 vaccine as well as the first study to investigate damage associated the economic and psychosocial effects of non-compliance with a Covid-19 vaccine mandate. The majority of respondents were women (85.9%) who worked predominantly in the nursing or administrative professions. Income was significantly below pre-mandate levels for 94.4% of survey participants, 70.7% female, while 59.3% experienced an income below the recognised Australian national poverty line for more than two consecutive weeks. Given the penalty for non-compliance with the mandate was suspension or termination from employment, it is no surprise that income was substantially lower than pre-mandate levels. However, given the link between income and psychosocial harm, it is an important observation. The data of most concern in this survey was that 34% of respondents indicated suicidal ideation consistent with severe psychosocial harm. Those HCW who refused to comply with the mandate had either researched the risks versus the benefits of the Covid-19 mRNA and viral vector DNA vaccines or knew of anecdotal reports of harm and made informed decisions based on the data [18, 19]. Educated HCW who chose not to take a Covid-19 vaccine, for whatever reason, were sadly lumped together and labelled "vaccine hesitant" or "anti-vaxxers", a derogatory term that insinuates a lack of scientific reason [20, 21]. The cost of non-compliance for them was either prolonged suspension without remuneration or termination. Given the collection of evidence that indicates these vaccines are neither effective at prevention of infection or transmission [22, 23], nor safe, with levels of harm greater than all previous vaccines [9, 24], it seems the mandates have been disproportionally costly for non-compliant individuals and caused significant inequality between the compliant and the non-compliant. The Covid-19 vaccine employment directive reasonably allowed for exemptions to be given for medical, religious or exceptional

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circumstances [4]. The reality was that across the state of Queensland, out of the 2,013 exemption applications, only one permanent exemption approval was given (disclosed RTI [12]) and the bar was clearly set very high even for temporary exemptions. Data from this survey indicated that while 324 individuals (87.8%) applied for an exemption, no permanent exemptions were given (despite recommendations against vaccination from medical specialists for at least 51 of these individuals) or having supporting letters from religious leaders. There were 18 temporary exemptions granted in this survey (Table 2) (5.5% of applications), 16 of which were women. For these individuals, however, they were informed that they could not return to work and that there were no alternate duties available. It is unknown whether the Covid-19 vaccine exemption applications were assessed centrally by a singular relevantly qualified team or separately by each of the sixteen health districts, whether there were appropriate representations from medical, religious or infectious disease experts or if the committees merely consisted of delegated executives. The Australian Technical Advisory Group on Immunisation (ATAGI) recommend a non-vaccination period of 6 months post SARS-CoV-2 infection [25]. This advice regarding prior infection and subsequent natural immunity has largely been ignored by authorities in the Queensland Public Health system. Natural immunity is both robust and highly and continuously adaptive to regional viral mutation. Currently there is significant data on a large scale to demonstrate a lower incidence of SARS-CoV-2 infection in previously infected individuals compared to those with a primary two dose vaccination series [26-28]. In our study 68.6% indicated a prior Covid-19 infection and fifty-four had applied for a temporary vaccine exemption using either serological evidence of antibodies or with an appropriately endorsed ATAGI medical exemption form. One individual granted a temporary exemption on this basis was not allowed to return to clinical duties or any other non-clinical duties. Given the significant infringements vaccine mandates impose on human rights, as well as the potential health risks, mandates must demonstrate that they are justified, reasonable and proportionate. Recognition of natural immunity for those HCW suspended or terminated from employment could begin to restore trust in the medical and scientific community.

Globally women make up a majority of the part-time workforce [29] and this is reflected in our survey, (91% female respondents either part-time or casual). This raises issues around the gender pay gap and the nature of single income households. Our data reveals that among participants, 36% had not found re-employment; 83.5% of these were women. Where re-employment had been found, it did not make use of healthcare skills and qualifications in 67.4% of cases, 82.3% of whom were female. Women were more likely than men to be single income and were more likely to rely on friends and family for financial help. About 20% of individuals in this study needed to access social welfare, (Australian Government- Centrelink), women 89% versus men 11%. Many highly technical medical and nursing skills cannot be readily sustained or easily utilised in any future health employment. These are professions that are continuously developed while in service.

Numerous studies indicate that workers who lose a job experience significant and persistent economic consequences [30, 31]. These studies identified that real income is around one-third lower in the year of job loss, with about four years required for full income recovery. Workers who find new employment tend to work fewer hours at lower hourly rates of pay. This study has, however, revealed that considerable economic and psychosocial impacts have occurred with a disproportionate effect upon women. Some of those terminated in the public health system were able to find work in the private healthcare system once vaccine requirements were removed for private healthcare settings in September 2022. Just over 18% of those surveyed had found re-employment in the private health sector and a further 13% had found part-time work there.

Our survey of 369 HCW indicated a loss of 4774.25 years of experience. The loss of the 2438 HCW originally non-compliant with the mandate, as indicated by Queensland Health's own data [16] could represent tens of thousands of experience years lost to the public healthcare system. It might take the healthcare service decades to replace such an experience loss. In Australia, the states of Western Australia and Tasmania as well as the Northern Territory have lifted Covid-19 vaccine mandates for HCW in the public system. In Queensland, the state where this survey was conducted, similar requirements for employees in the private health system were lifted in September 2022. France, who had suspended more than 3,000 HCW in 2021, recently changed stance from "mandatory" to "recommended" [32]. The UK dropped mandatory vaccination for nurses in March 2022 after consultation revealed more than 79% of nurses wanted the mandates revoked [33]. It would be logical to assume the Queensland Health service has been less than agile in in response to the evidence now available on vaccine safety and efficacy, as well as the pathogenicity of current SARS-CoV-2 variants. Healthcare work is by nature full of occupational hazards, long hours and irregular shifts. The Covid-19 crisis multiplied demands upon the system including issues related to organisational leadership engagement [34]. Healthcare settings globally have recognised the psychosocial burden placed on employees throughout this pandemic [35-37]. It is thus reasonable for HCW to expect a level of care and interest from their employers, and this should extend to those staff suspended (but still technically employees) for non-consent to mandates.

In late March 2023, the Queensland Health service announced commitment to ensure the psychosocial well being of all staff by following the "Managing Psychosocial Hazards

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at Work Code of Practice 2022". This code recognises and supports the mental health welfare of employees [15]. Yet it would seem from our survey that these former employees have been left to battle economic and psychosocial harms alone. We report that 34.1% of survey participants had thought of suicide at some point in their disciplinary process. What is unrecognised in the delivery of these punitive measures for Covid-19 vaccine non-compliance is that a vast number of these respondents were presumably mentally healthy pre-Covid-19 pandemic. The loss of employment, income and isolation from colleagues previously considered friends are significant drivers behind this mental health crisis. Layered on top of these pressures and undoubtedly indistinguishable from the above drivers of psychosocial harm is the continued harsh criticism from the top tiers of leaders of industry and government who stigmatise those who remain unvaccinated [20, 38, 39].

We recognise that the questions asked in this survey do not extend to the fully validated psychiatric questionnaire structures for mental health, depression or even suicidal ideation. However, the economic and psychosocial harm experienced by these HCW is undeniable. A voluntary free text section of this survey allowed personal stories to be shared. Such entries were added by 56% of respondents. Accounts included serious physical harm after first dose of the Covid-19 vaccines, rejection of multiple medical exemptions signed by GP's and medical specialists, marriage breakdowns, sale of homes and assets, and use of personal vehicles as main accommodation. Previously successful people in society have been reduced to severe depression with physical manifestations and borderline poverty. Given that this is the first study to document economic harm in employees who did not give consent to the Covid-19 vaccine, it is possible that decision makers had not fully anticipated such adverse impact from their mandate.

This study has several limitations. While our use of social media networks and email lists resulted in a good response rate, it may have under-represented staff who resigned or were terminated early in the disciplinary process (and who no longer join discussion groups). Further, women are perhaps more likely to complete surveys than men, which results in a bias. While this does not invalidate the responses, it may underestimate important drivers of psychosocial harm in men. This study also did not evaluate any psychosocial harm experienced by those who took the vaccines against their better judgment, in order to remain employed. Potentially the number who took the vaccine under pressure and coercion to keep employment may have far exceeded those who were suspended or terminated from the health care system.

Conclusion

Our results suggest considerable harm has been experienced by healthcare staff who chose not to be vaccinated against Covid-19. The economic and psychosocial consequences for these principled individuals are by no means trivial or even reasonable when compared to the relatively low threat now posed by the significantly mutated SARS-CoV-2 virus. Public trust in our major health, political and media institutions has been profoundly damaged. Penalising employees for vaccine rejection is neither the most effective nor fair way to improve vaccination rates when it brings significant psychosocial and economic risks for the most vulnerable. The disciplinary processes have been carried out remotely by delegated executives without due regard for potential economic or psychosocial harm. Penalties also compound disadvantage for women and single income homes. In all arguments for and against mandatory vaccination in the healthcare sector one truth must prevail: vaccination mandates must demonstrate greater benefit that any harm they may cause. The economic and psychosocial devastation of individuals who exercised their medical freedom to not comply with this government vaccine mandate could ultimately have intergenerational consequences beyond those revealed in this study and will certainly be of interest to the world of psychology for years to come.

Ethics approval and consent to participate

The study was approved by the University of Queensland Research Ethics and Integrity Unit (2023/HE001085) June 19, 2023. Each participant was informed about the characteristics of the study and checked a consent tick-box within the survey.

Consent for publication

Not applicable

Availability of data and materials

Data is held by a third party (Australian Medical Professionals Society, AMPS, and Nurses Professional Association of Queensland, NPAQ). The corresponding author can be contacted for access to full dataset.

Competing interests

CM is a financial member of NPAQ; PIP is a financial member of AMPS.

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Authors' contributions

Conceptualization, C.M. and P.R.; methodology C.M., P.R. and P.I.P.; data analysis, C.M.; writing—original draft preparation, C.M. and P.R.; review and editing, C.M., P.R. and P.I.P.; All authors have read and agreed to the published version of the manuscript.

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