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The Essential Network (TEN): engagement and mental health insights from a digital mental health assessment tool for Australian health professionals during COVID-19

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Abstract

Background Health professionals are at risk of poor mental health outcomes due to the COVID-19 pandemic. The Essential Network (TEN) is a blended care mental health support service for Australian health professionals, funded by the Australian Federal Department of Health. TEN comprises both digital and face-to-face components. We examined completed digital mental health assessments (Digital Mental Health Check-Up) to understand usage of TEN and the demographics and mental health of users.

Methods A total of 9889 completed assessments from a community sample of help-seeking health professionals who engaged with the Digital Mental Health Check-Up between May 2020 and December 2021 were examined. Users had the option to complete the Distress Questionnaire (DQ-5), Patient Health Questionnaire (PHQ-9), Generalised Anxiety Disorder (GAD-7), Oldenburg Burnout Inventory (OLBI-16), Work and Social Adjustment Scale (WSAS), Post-traumatic Stress Disorder Checklist (PCL-5), as well as provide demographic information on their gender, age, and profession.

Results Users were mostly women (85.7%) aged between 25 and 54 (73.7%). Nursing was the most reported profession (32.6%), followed by allied health (27.5%) and doctors (21.9%). Notably, 8.1% of users reported being in medical administration roles. Mental health measures were poor across all measures and professions and worse than would be expected from the general population. Disengagement (92.5%) from burnout and impaired social and occupational functioning (75%) were also notably high. Use of the DQ-5 as a screening tool in the Digital Mental Health Check-Up was confirmed through correlation with clinically significance scoring on all other measures and increased likelihood of opting to complete other optional measures following clinically significant scoring on the DQ-5.

Conclusions The present study indicates good usage of the TEN digital components among Australian health professionals, with use across all professional categories. While self-selection bias is inherent in the sample, mental health measures were notably poor – particularly for burnout. Such findings highlight the continued need to provide mental

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health support to health professionals both during and after the eventual resolution of the COVID-19 pandemic, as well as to develop better support for health professionals experiencing burnout.

Keywords Blended care, Mental health, Burnout, Health professionals, Healthcare workers, COVID-19

Background

The COVID-19 pandemic has placed health professionals under extraordinary stress [1]. In addition to case numbers, in Australia health professionals were also faced with waves of lockdowns (especially in the most populous states of Victoria and New South Wales) and state border closures throughout 2020 and 2021. The clear and understandable impact of pandemics on health professionals' mental health is compounded by low rates of help-seeking within the health profession [2]. Indeed, while the COVID-19 pandemic is ongoing, a review of research to date indicates high rates of post-traumatic stress disorder (PTSD) (49%), anxiety (40%), and depression (37%) [3] in health professionals, with poor mental health outcomes, such as PTSD, likely manifesting even after the eventual resolution of the pandemic [4]. In order to overcome the barriers to seeking and accessing mental health support, such as stigma [5], confidentiality [2], and concerns around reporting of impairment to professional bodies in Australia [6], health professionals need convenient access to confidential evidence-based mental health resources and professional support [7].

One model of reducing barriers to mental healthcare access is 'blended care', which represents an integration of digital (websites and apps) and person-to-person (including telehealth) care options that are matched to the consumers' needs. Blended care models have been successful in other countries [8]. Australia has much to benefit from the adoption of such systems, and the impact of COVID-19 on the mental health of a group with complex needs who require facilitation to engage with mental health support has provided fertile ground for investing in their development.

One such service – The Essential Network (TEN) – was developed by the Black Dog Institute and funded by the Australian Federal Department of Health as part of their national COVID-19 response strategy [7]. A broad range of peak bodies and organisations assembled as stakeholders during the development of TEN also facilitated TEN as a network of existing and new services available to health professionals. TEN is an integrated blended care service that spans four phases: 1) Promoting well-being, 2) early detection and prevention, 3) low-to-moderate intensity self-guided services or care options for health professionals experiencing distress, and 4) clinical care for health professionals requiring more intensive support. Educational materials, digital treatment programs, and online mental health assessments are available via the TEN website with person-to-person consultations available in person or via telehealth through a specialist mental health clinic (see [7] for a more detailed service description). Understanding engagement with the digital components of TEN, especially the online mental health assessments, may help better understand the demographics and mental health of help-seeking health professionals during the ongoing COVID-19 pandemic, as well as suggest ways of reducing the negative impact of workplace stress of health professionals at large.

The present study utilises a combination of completed online mental health assessments and website analytics to describe the demographics and mental health status of TEN website users, as well as to examine engagement with the TEN website from its launch in May 2020 to December 2021. Understanding the demographics and mental health of TEN website users has the potential to inform policymakers and employers to better support Australian health professionals during the COVID-19 pandemic and beyond. Further, such information can also inform the development of other blended care mental health services in Australia.

Methods

Program description

TEN is a blended care mental health service for healthcare workers, funded by the Australian Federal Department of Health as part of their national COVID-19 response strategy. TEN is available through a web browser (where no account is required). TEN contains a range of mental health support services, including the "Digital Mental Health Check-Up" (self-administered mental health questionnaires with automated results and feedback), self-help materials, self-guided digital mental health treatments, links to partner organisations with complementary services, as well as telehealth consultations with a clinical psychologist or psychiatrist at the Black Dog Institute. Users engage with as many or as few of these resources as they see fit, with a degree of flexibility within many of the functions (e.g., only completing certain mental health assessments, watching certain educational videos, etc.). TEN was marketed to all Australian health professionals through social media and electronic direct mail campaigns facilitated by leading industry organisations [7]. The TEN service launched in May 2020 and is currently operating.

Several iterations of the Digital Mental Health Check-Up operate at the Black Dog Institute. This paper examines data from two such iterations: the General Digital Mental Health Check-Up (General Check-Up) and the TEN Digital Mental Health Check-Up (TEN Check-Up). Between May 2020 and June 2021, TEN Website users were directed to the General Check-Up, a comprehensive online mental health screening tool intended for a wide range of users (see below). When completing an assessment on the General Check-Up, users could indicate that they were a health professional. As a result of service enhancements, from June 2021, TEN Website users were instead directed to the TEN Check-Up, a then newly deployed online assessment tool that tailored assessments to the primary mental health concerns of health professionals (see below), as well as the option for users to provide more detail about their healthcare specialisation.

Sample

This study examined a naturalistic community sample of help-seeking healthcare workers who engaged with the General Check-Up and/or TEN Check-Up between May 2020 and December 2021. In total, 10,308 digital mental health check-ups were completed over this period, this includes any users of the General Check-Up indicating that they were healthcare workers, as well as all users of the TEN Check-Up. Using website analytics to isolate repeated measures (see Website Analytics below), a total of 8051 unique General Check-Up assessments were isolated. Due to limitations in analytic technology available when the June 2021 service enhancements were deployed, repeated measures could not be identified within the TEN Check-Up – leading to a total of 1981 TEN Check-Up assessments.

Data collection and measures

Online assessments

Users of the General Check-Up are initially prompted to complete measures of depression (Patient Health Questionnaire (PHQ-9)) [9] and anxiety (Generalized Anxiety Disorder (GAD-7)) [10], after which they can choose to complete a measure of PTSD (PTSD Checklist for DSM-5 (PCL-5)) [11]. Other optional measures are included in the General Check-Up, including eating disorder symptoms (Sick, Control, One, Fat, Food (SCOFF)), alcohol overconsumption (Alcohol Use Disorders Identification Test (AUDIT)), obsessive–compulsive disorder symptoms (Obsessive–Compulsive Inventory (OCI)), psychosis symptoms (Psychosis Screening Questionnaire (PSQ)), bipolar disorder symptoms (Mood Disorder Questionnaire (MDQ)), and health anxiety symptoms (Whiteley Index 6 (WI-6)). As these measures were not available in the more targeted TEN Check-Up, they were not included in the present analyses. All questionnaires in the General Check-Up are freely available for research and clinical use without license. After completing an assessment, users may optionally provide information on their age, gender, whether they are a health professional, whether they have seen a professional about their mental health, and whether they have been distressed by COVID-19.

Users of the TEN Check-Up are initially prompted to complete a measure of general psychological distress (Distress Questionnaire 5 (DQ-5)) [12], after which they can choose to complete the PHQ-9 [9], GAD-7 [10], PCL-5 [13], along with measures of burnout (Oldenburg Burnout Inventory (OLBI)) [14], and/or occupational and social functioning (Work and Social Adjust Scale (WSAS)) [15]. All questionnaires in the TEN Check-Up are freely available for research and clinical use without license. After completing these optional questionnaires (if any), users can choose to provide information on their age, gender, state of residence, healthcare profession, whether they have seen a professional about their mental health, and whether COVID-19 affected their mental health on 1–5 Likert scale (strongly disagree to strongly agree).

Data from the General Check-Up and TEN Check-Up are recorded automatically on secure University of New South Wales servers.

Website analytics

The online engagement behaviours of TEN website users were captured using the SAS Customer Intelligence 360 (SAS CI360) [16] tool at a detailed level. Each user was assigned a visitor identification (ID) when they visited the TEN website the first time. Information of the users' interaction with the TEN website, such as location and device data, page visits, and form submissions were anonymously collected to construct a unique user ID profile. This profile was then combined with existing Digital Mental Health Check-Up data to form a virtual picture of the user without identifying them. Using SAS CI360 and the Digital Check-Up database of completed screening assessments, we captured users' timestamps of each page click within the TEN Website, when a user clicked to start the Digital Check-Up, and answers to each Digital Check-Up question. We then matched the completed assessment in the Digital Check-Up with the visitor ID by comparing the survey answers and creation timestamp. Repeated measures from the same user were then identified using the timestamp for the completed PHQ-9 and isolated. We did not collect user's IP address or any personal identifiable information during this process.

Statistical analysis

Service usage was quantified using the date and time that the first questionnaire was completed in any given assessment; PHQ-9 on the General Check-Up, and DQ-5 on the TEN Check-Up. These data were used to examine trends in service usage over time, as well as common days of the week and times of day that users engaged with TEN.

Means and 95% confidence intervals were calculated for the total score on all mental health measures both overall and between reported professional groups. Mental health measures common across both the General Check-Up and TEN Check-Up were collated. To define clinical significance for each measure, the normative categorisation of mental health symptom severity was assigned according to the established cut-offs of each measure. Scores on DQ-5, OLBI, WSAS, and PCL-5 yield a binary categorisation of clinically significant or not [12, 13, 17, 18], while PHQ-9 and GAD-7 scores can be categorised from Normal to Severe [9, 10]. For the purposes of later analyses, PHQ-9 and GAD-7 scores categorised as Moderately Severe or above were considered clinically significant symptoms that would likely warrant psychological and/or psychiatric treatment.

One-way ANOVAs and pairwise comparisons, corrected for multiple comparisons using the Bonferroni correction, were used to compare average scores on all mental health measures between doctors, nursing, and allied health groups. Pairwise binomial logistic regression, holding age and gender constant, was used to examine whether reported professional group was associated with clinically significant scoring on all mental health measures. Somers' D was used to examine whether normative category (i.e., severity) on the DQ-5 was associated with normative category on other mental health measures. Finally, binomial logistic regression was used to examine whether normative category on the initial DQ-5 was associated with whether TEN Check-Up users elected to complete any of the additional mental health questionnaires.

Ethics approval

This study received approval from the UNSW Human Research Ethics Committee (HC Number HC210252). As use of the Digital Mental Health Check-Up and TEN website is anonymous, a waiver of consent was requested from, and approved by, the UNSW Human Research Ethics Committee in line with waiver of consent guidelines outlined in the National Statement on Ethical Conduct in Human Research. All methods were carried out in accordance with the National Statement on Ethical Conduct in Human Research and ethical approval granted by UNSW Human Research Ethics Committee.

Results

Data cleaning

In total, data from 8394 General Check-Up assessments were exported. After matching website analytics to completed assessments in the General Check-Up data to isolate unique users, 276 repeated measure records were identified. Given users completed assessments at intervals of their choosing, rather than the established sensitivity intervals of each questionnaire, repeated measures were removed to enable more accurate cross-sectional analyses. Removed repeated measures constituted all assessments completed after the first assessment. A further 67 records were removed from users who indicated they were under the age of 18. Data from 8051 remaining General Check-Up assessments were analysed.

Data from 2284 TEN Check-Up online assessments were exported. A total of 155 TEN Check-Up users who opted to provide information on their profession were removed due to reporting not working in a healthcare role; 276 records were removed as the DQ-5 had not been completed; while 27 were removed as the users reported being under 18. This left data from 1838 TEN Check-Up assessments to be included in analyses.

Demographics

Health professionals using the General Check-Up were mostly female (82.6%) and aged between 18 and 54 (87.9%) (Table 1). Similarly, where data were reported,

Table 1 General Check-Up users' demographics alongside Australian Institute of Health and Welfare (AIHW) data on the demographics of registered Australian health professionals [19]

	General Check-Up Users (%)	AIHW Workforce % (2020)
Gender		
Male	1282 (15.9%)	29.1%
Female	6647 (82.6%)	70.9%
Other	42 (0.5%)	
Prefer not to say	80 (1.0%)	
Age		
18–24	1574 (19.6%)	
25–34	2517(31.3%)	34.0%
35–44	1644 (20.4%)	23.5%
45–54	1353 (16.8%)	21.4%
55–64	815 (10.1%)	16.7%
65–74	133 (1.7%)	
75 +*	15 (0.2%)	

*AIHW data on age of registered Australian health professionals includes a 65+ age group. As such, 75+ age group is included in 65-74 AIHW workforce %

health professionals using the TEN Check-Up were mostly female (85.7%), aged between 25 and 54 (73.7%), and based in either NSW (49.9%) or VIC (20.7%), the two Australian states hardest hit by public health and social measures. Nursing was the most reported profession, accounting for 32.6% of TEN Check-Up users. Doctors (e.g., general practitioners, physicians, etc.) accounted for 21.9% of users, while allied health (e.g., psychologists, social workers, etc.) accounted for 27.5% of users (Table 2).

A small group of users from other areas of healthcare provided data but not in sufficient numbers to be considered representative of their respective professions. This group comprised disability support workers, paramedics, aged care workers, and other similar clinical roles, and accounted for 4.7% of users. Due to the small size and heterogeneity of the group, these users' data were excluded from any between-group comparisons. Relatedly, while TEN was primarily designed and targeted at registered health professionals, users related to healthcare also completed TEN Check-Up assessments. These were categorised into (1) "Medical Admin", which accounted for 8.1% of users and combined administrative roles, such as administrative staff and managers in healthcare settings; and (2) "Medical Technical", which accounted for 4.1% of users and broadly combined researchers, scientists, and other technician roles, such as radiographers. Lastly, 1.1% of users were categorised as Other, these were a small number of reported roles that did not fit into other categories within healthcare, such as cleaners and chaplains (Table 2).

Table 2 TEN Check-Up users' demographics and healthcare profession alongside Australian Institute of Health and Welfare (AIHW) data on the demographics and professions of registered Australian health professionals [19]

	TEN Check-Up Users (%)	AIHW Workforce % (2020)
Gender		
Male	152 (13.4%)	29.1%
Female	973 (85.7%)	70.9%
Other	11 (1.0%)	
Unreported	702 (28.2%)	
State		
NSW	573 (49.9%)	29.8%
VIC	238 (20.7%)	26.0%
QLD	172 (15.0%)	21.2%
WA	46 (4.0%)	10.1%
SA	51 (4.4%)	7.6%
ACT	43 (3.7%)	1.9%
TAS	21 (1.8%)	2.3%
NT	5 (0.4%)	1.2%
Unreported	689 (36.5%)	
Age		
18–24	77 (6.6%)	
25–34	335 (28.7%)	34.0%
35–44	298 (25.5%)	23.5%
45–54	227 (19.5%)	21.4%
55–64	185 (15.9%)	16.7%
65–74	41 (3.5%)	
75 +*	4 (0.3%)	
Unreported	671 (36.5%)	
Profession		
Doctors	244 (21.9%)	21.7%
Nursing	363 (32.6%)	52.2%
Allied Health	306 (27.5%)	26.0%
Clinical Other	52 (4.7%)	
Medical Admin	90 (8.1%)	
Medical Technical	46 (4.1%)	
Other	12 (1.1%)	
Unreported	725 (39.4%)	

Unreported percentages shown as a percentage of entire sample, other demographic percentages calculated as a percentage of reported data

*AIHW data on age of registered Australian health professionals includes a 65+ age group. As such, 75+ age group is included in 65-74 AIHW workforce %

Service usage

Based on completion of the PHQ-9 and GAD-7, between May 2020 and December 2021 the General Check-Up was used by an average of 16.1 (95% CI: 14.9–17.3) unique users per day. In contrast, based on completion of the DQ-5, between June 2021 and December 2021 the TEN Check-Up was used by unique users on average 11.78 (95% CI: 9.38–14.18) times each day (Fig. 1).

Examining the day of the week that users accessed the Digital Mental Health Check-Up, we observed that Monday through to Thursday were the most common days to utilise the service, while Saturday and Sunday were the least common. Looking at the times at which users accessed the service, usage was consistent throughout the typical 9.00–17.00 working hours, with the most activity occurring in the evening between 20:00 and 23:00.

Mental health measures

Overview

Overall, health professionals who completed a digital mental health check-up (either via General Check-Up or TEN Check-Up) scored highly on the DQ-5 (Table 3), as well as extremely high on the disengagement and moderately high on the exhaustion subscales of the OLBI (Table 4). Health professionals who completed the WSAS also scored high for this measure (Table 5), with most also experiencing Moderate or higher anxiety or depression, as assessed by the PHQ-9 (Table 6) and GAD-7 (Table 7), respectively. Around a third of health professionals who

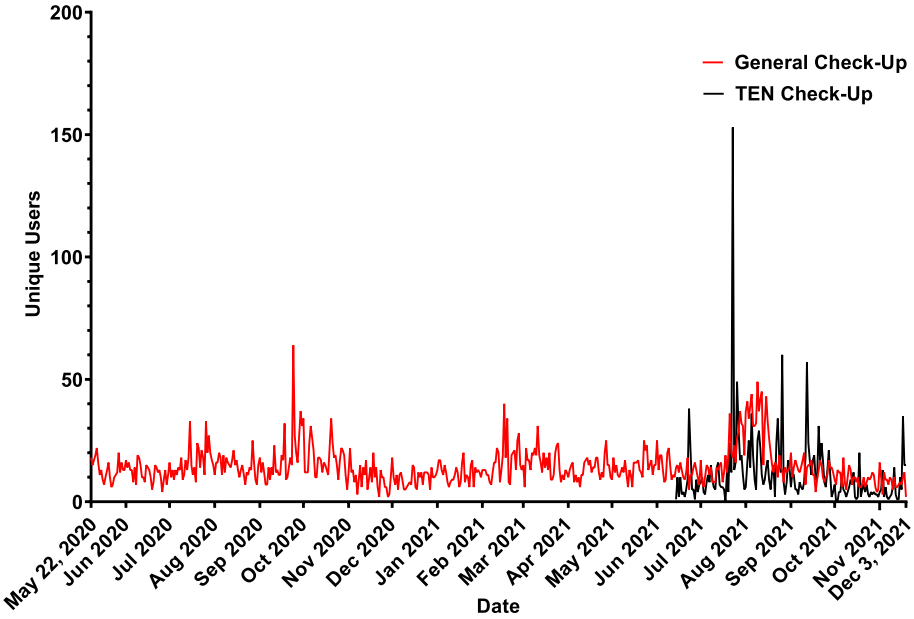

Fig. 1 General Check-Up and TEN Check-Up unique users between May 2020 and December 2021

Table 3 Table depicting DQ-5 scores and proportion indicated for general psychological distress across healthcare specialisations

Profession	DQ-5		
	n	Mean (95% CI)	Clinical *n* (%)
Overall	1838	14.50 (14.33–14.68)	1551 (84.4%)
Doctors	244	14.77 (14.31–15.24)	214 (87.7%)
Nursing	363	14.75 (14.40–15.10)	319 (87.9%)
Allied Health	306	14.52 (14.16–14.88)	272 (88.9%)
Clinical Other	52	15.96 (14.89–17.03)	49 (94.2%)
Medical Admin	90	15.10 (14.40–15.80)	82 (91.1%)
Medical Technical	46	15.48 (14.59–16.37)	43 (93.5%)
Unreported	725	14.04 (13.74–14.35)	561 (77.4%)

completed the PCL-5 reported symptoms consistent with a DSM-5 diagnosis of PTSD (Table 8). Lastly, on a scale of 1–5 (strongly disagree to strongly agree) health professionals reported only slight agreement that COVID-19 had affected their mental health (Table 9).

Healthcare specialisations

A series of one-way ANOVAs were conducted comparing average scores on all mental health measures between doctors, nursing/midwifery, and allied health practitioners. These analyses found a significant difference between groups on the disengagement subscale of the OLBI: $F(2, 616) = 3.781$, $p = 0.023$. Pairwise comparisons, corrected for multiple comparisons

Table 4 Table depicting OLBI scores and proportion indicated for burnout across healthcare specialisations

Profession	OLBI				
	n	Exhaustion		Disengagement	
		Mean (95% CI)	Clinical *n*	Mean (95% CI)	Clinical *n*
Overall	865	2.17 (2.15–2.18)	424 (49.0%)	2.41 (2.40–2.43)	800 (92.5%)
Doctors	189	2.18 (2.15–2.21)	94 (49.7%)	2.39 (2.36–2.43)	174 (92.1%)
Nursing	235	2.14 (2.10–2.17)	105 (44.7%)	2.39 (2.35–2.42)	209 (88.9%)
Allied Health	195	2.18 (2.15–2.21)	100 (51.3%)	2.45 (2.42–2.49)	182 (93.3%)
Clinical Other	34	2.18 (2.10–2.26)	19 (55.9%)	2.43 (2.33–2.52)	32 (94.1%)
Medical Admin	64	2.14 (2.08–2.19)	32 (50.0%)	2.44 (2.37–2.50)	61 (95.3%)
Medical Technical	28	2.17 (2.08–2.25)	13 (46.4%)	2.44 (2.35–2.53)	27 (96.4%)
Unreported	114	2.19 (2.14–2.24)	59 (51.8%)	2.42 (2.37–2.47)	110 (96.5%)

Table 5 Table depicting WSAS scores and proportion indicated for impaired functioning across healthcare specialisations

Profession	WSAS		
	n	Mean (95% CI)	Clinical *n* (%)
Overall	505	16.02 (15.23–16.80)	379 (75.0%)
Doctors	105	16.02 (14.44–17.60)	83 (79.0%)
Nursing	121	16.35 (14.61–18.09)	90 (74.4%)
Allied Health	126	14.60 (13.00–16.21)	87 (69.0%)
Clinical Other	20	18.25 (13.16–23.24)	16 (80.0%)
Medical Admin	35	16.40 (13.70–19.10)	28 (80.0%)
Medical Technical	21	17.71 (13.58–21.85)	16 (76.2%)
Unreported	71	17.00 (14.93–19.07)	55 (77.5%)

using the Bonferroni correction, indicated that the allied health group (mean = 2.45, 95% CI = 2.41–2.49) reported somewhat higher disengagement than the nurses group (mean = 2.39, 95% CI = 2.35–2.42, $p = 0.032$). No significant difference was observed between the doctors group (mean = 2.39, 95% CI = 2.36–2.43) and other groups (ps ≥ 0.089). Groups did not differ significantly on the exhaustion subscale of the OLBI ($p = 0.055$).

A significant between groups effect was also observed on the PHQ-9: $F(2, 480) = 7.882$, $p < 0.001$. Pairwise comparisons, corrected for multiple comparisons using the Bonferroni correction, found that the allied health group (mean = 10.25, 95% CI 9.47–11.04) had significantly lower ratings of depression than the doctors (mean = 12.83, 95% CI = 11.78–13.88, $p < 0.001$) and nursing (mean = 11.78, 95% CI = 11.00–12.57, $p = 0.022$) groups. No significant difference was observed between the doctors and nursing groups ($p = 0.330$). No significant between groups differences were observed for the DQ-5, WSAS, GAD-7, PCL-5, or impact of COVID-19 (all ps ≥ 0.137).

A series of pairwise binomial logistic regressions explored whether belonging to a professional group was associated with the severity of mental health symptoms (indicated by normative category), holding age and gender constant. The allied health group was less likely to report clinically significant psychosocial impairment on the WSAS (odds ratio (OR) = 0.50, 95% CI 0.26–0.97,

Table 6 Table depicting PHQ-9 scores and severity of indication across healthcare specialisations

Profession	PHQ-9						
	n	Mean (95% CI)	None	Mild	Moderate	Moderately severe	Severe
Overall	8844	12.97 (12.83–13.11)	936 (10.6%)	2013 (22.8%)	2290 (25.9%)	1957 (22.1%)	1648 (18.6%)
Doctors	109	12.83 (11.78–13.88)	4 (3.7%)	31 (28.4)	38 (34.9%)	22 (20.2%)	14 (12.8%)
Nursing	203	11.78 (11.00–12.57)	15 (7.4%)	69 (34.0%)	58 (28.6%)	36 (17.7%)	25 (12.3%)
Allied Health	171	10.25 (9.47–11.04)	21 (12.3%)	70 (40.9%)	43 (25.1%)	26 (15.2%)	11 (6.4%)
Clinical Other	30	14.30 (12.00–16.60)	1 (3.3%)	6 (20.0%)	10 (33.3%)	6 (20.0%)	7 (23.3%)
Medical Admin	54	12.43 (11.07–13.78)	2 (3.7%)	15 (27.8%)	20 (37.0%)	11 (20.4%)	6 (11.1%)
Medical Technical	28	9.71 (8.24–11.19)	1 (3.6%)	15 (53.6%)	8 (28.6%)	3 (10.7%)	1 (3.6%)
Unreported*	8243	13.07 (12.93–13.21)	891 (10.8%)	1806 (21.9%)	2110 (25.6%)	1853 (22.5%)	1583 (19.2%)

*Unreported profession includes users who either declined to provide specialisation in TEN Check-Up and users unable to provide specialisation in General Check-Up

Table 7 Table depicting GAD-7 scores and severity of indication across healthcare specialisations

Profession	GAD-7					
	n	Mean (95% CI)	None	Mild	Moderate	Severe
Overall	8816	10.30 (10.18–10.41)	1481 (16.8%)	2695 (30.6%)	2332 (26.5%)	2308 (26.2%)
Doctors	130	9.72 (8.98–10.47)	12 (9.2%)	56 (43.1%)	43 (33.1%)	19 (14.6%)
Nursing	214	9.98 (9.36–10.60)	19 (8.9%)	91 (42.5%)	62 (29.0%)	42 (19.6%)
Allied Health	161	9.42 (8.70–10.13)	20 (12.4%)	72 (44.7%)	40 (24.8%)	29 (18.0%)
Clinical Other	30	11.73 (9.80–13.67)	2 (6.7%)	7 (23.3%)	11 (36.7%)	10 (33.3%)
Medical Admin	44	10.32 (9.05–11.59)	1 (2.3%)	20 (45.5%)	16 (36.4%)	7 (15.9%)
Medical Technical	23	10.09 (8.36–11.81)	1 (4.3%)	12 (52.2%)	6 (26.1%)	4 (17.4%)
Unreported*	8208	10.32 (10.20–10.45)	1426 (17.4%)	2436 (29.7%)	2151 (26.2%)	2195 (26.7%)

*Unreported profession includes users who either declined to provide specialisation in TEN Check-Up and users unable to provide specialisation in General Check-Up

Table 8 Table depicting PCL-5 scores and proportion indicated for PTSD across healthcare specialisations

Profession	PCL-5		
	n	Mean (95% CI)	Clinical *n* (%)
Overall	2285	8.32 (8.16–8.48)	723 (31.6%)
Doctors	65	7.08 (6.17–7.99)	19 (29.2%)
Nursing	94	6.40 (5.67–7.14)	21 (22.3%)
Allied Health	73	6.25 (5.45–7.04)	15 (20.5%)
Clinical Other	25	8.20 (6.49–9.91)	11 (44.0%)
Medical Admin	27	7.41 (5.91–8.90)	8 (29.6%)
Medical Technical	16	6.75 (5.61–7.89)	1 (6.3%)
Unreported*	1981	8.56 (8.38–8.73)	647 (32.7%)

*Unreported profession includes users who either declined to provide specialisation in TEN Check-Up and users unable to provide specialisation in General Check-Up

Table 9 Table depicting COVID-19 mental health impact across healthcare specialisations

Profession	COVID-19 Impact	
	n	Mean (95% CI)
Overall	1194	3.55 (3.48–3.62)
Doctors	238	3.57 (3.43–3.71)
Nursing	357	3.62 (3.50–3.75)
Allied Health	298	3.53 (3.40–3.67)
Clinical Other	52	3.35 (2.97–3.72)
Medical Admin	88	3.56 (3.31–3.81)
Medical Technical	45	3.78 (3.41–4.15)
Unreported	104	3.33 (3.05–3.60)

$p=0.042$) and Moderately Severe or higher depression symptoms on the PHQ-9 (OR = 0.51, 95% CI 0.29–0.91, $p=0.023$) compared to doctors group, however profession did not predict symptom severity for DQ-5, OLBI, GAD-7, or PCL-5 (ps ≥ 0.082).

Owing to the high heterogeneity and/or relatively small sample sizes of the clinical other, medical admin, and medical technical categories, these groups were not included in comparisons of health professional mental health measures.

General psychological distress as a predictor of clinically significant mental health concerns

Somers' D was used to measure the strength and direction of association between clinical significance on the DQ-5 and clinical significance on other mental health measures. Clinical significance on the DQ-5 was found to have a strong, positive correlation with clinical significance on the PHQ-9 (Somers' D = 0.614, $p<0.001$) and the GAD-7 (Somers' D = 0.624, $p<0.001$), a moderate, positive correlation with clinical significance on the WSAS (Somers' D = 0.511, $p<0.001$), weak, positive correlation the PCL-5 (Somers' D = 0.274, $p<0.001$). No significant correlation was observed between clinical significance on the DQ-5 and clinical significance on the exhaustion (Somers' D = -0.063, $p=0.303$) and disengagement (Somers' D = -0.007, $p=0.815$) subscales of the OLBI.

Binomial logistic regression was also used to examine whether clinical significance on the DQ-5 predicted whether users went on to complete any of the optional mental health measures. Clinical significance on the DQ-5 meant users were more likely to complete the OLBI (OR = 3.06, 95% CI 2.30–4.06, $p<0.001$), WSAS (OR = 3.37, 95% CI 2.31–4.92, $p<0.001$), PHQ-9 (OR = 7.15, 95% CI 4.93–10.37, $p<0.001$), GAD-7 (OR = 6.18, 95% CI 4.30–8.89, $p<0.001$), and PCL-5 (OR = 3.05, 95% CI 1.99–4.48, $p<0.001$).

Discussion

Overview

The present study used data from an online mental health assessment tool and website analytics to examine engagement with TEN, a blended care mental health support service for Australian health professionals, from its launch in May 2020 to December 2021. In addition to evaluating use of this "Digital Mental Health Check-Up" tool, the completed online assessments also provided the opportunity to assess help-seeking Australian health professionals' mental health during the COVID-19 pandemic. While response bias makes drawing conclusions regarding health professionals' mental health more broadly difficult, almost all symptoms of common mental illnesses were more severe among TEN users than would be expected within the general population [20]. Additionally, burnout, general psychological distress, and impaired social and work functioning were notably high.

Service usage

The present study made novel use of website analytics to isolate repeat users of an otherwise anonymous service. Service usage appears good, with 9889 healthcare workers completing online assessments between May 2020 and December 2021. To date, however, few digital mental health support services for health professionals have published data on service usage, making comparisons difficult. Nonetheless, the combination of consistent advertising through a variety of mediums alongside co-development with, and promotion by, peak professional bodies appears to have driven TEN's reach [7]. Usage of the Digital Mental Health Check-Up was relatively stable over the observed period, with peaks in usage occurring during planned marketing activities. Usage of the service

was highest Monday to Thursday and peaked during the evening – likely reflecting the pressures of the working week and free time in the evenings. Interestingly, many users engaged with the service during working hours. While the present study used novel methods to isolate repeated users, these analytics were not in place at the time of data collection for the TEN Digital Mental Health Check-Up. As such, a limitation of the present study is that a proportion of these latter measures are likely not independent measures. Based on the number of records removed from the General Digital Mental Health Check-Up, around 3% of records in the TEN Digital Mental Health Check-Up are likely to be repeated users.

Mental health measures

Research from previous pandemics has highlighted the severe burden and associated mental health impact experienced by health professionals during such events [21], with more recent research from the COVID-19 pandemic highlighting the poor mental health measures experienced by health professionals [22]. In line with this, the present study observed higher than expected rates of clinically significant mental health symptoms in health professionals using TEN compared to the general population. National Australian data from 2020–2021 indicated that during this period 15.4% of Australians experienced psychological distress, 3.8% experienced generalised anxiety disorder, 6.3% depression, and 5.7% PTSD [20]. In contrast, in health professionals using TEN we observed that 84.4% had clinically significant psychological distress, 52.7% moderate or higher anxiety, 66.6% moderate or higher depression, and 31.6% clinically significant PTSD symptoms. While the present study used less stringent criteria to define poor mental health, a large cross-sectional study of the Australian general population's mental health from the start of the COVID-19 pandemic observed that 27.6% had clinically significant depression and 21% anxiety using identical measures and criteria [23]. While there is no comparable data estimating the prevalence of burnout in the general population, 92.5% of TEN users reported clinically significant disengagement due to burnout. Burnout among health professionals has been extensively reported both prior to [24], and during [22], the COVID-19 pandemic, however the proportions we observed are concerningly high. Additionally worrying, 75% of TEN users reported clinically significant impairments to social and work functioning. Taken together, these findings highlight the high rates of clinically significant mental health symptoms in health professionals who have engaged with TEN during the COVID-19 pandemic.

The TEN Digital Mental Health Check-Up (our targeted assessment tool implemented in June 2021) included a measure of psychological distress (DQ-5) to quickly triage users experiencing higher levels of distress and suggest that they complete a more detailed assessment. The results indicate a strong relationship between severity of psychological distress and severity of most other mental health symptoms, particularly for depression, anxiety, and psychosocial impairment. This finding is in line with the validation of the DQ-5, in which it performed better than the Kessler Psychological Distress scales (K6 and K10) in screening for a range of common mental health conditions [12]. Notably, however, psychological distress as measured by the DQ-5 was not associated with severity of burnout as measured by the OLBI. Despite this, more distressed users were much more likely to go on to complete all the available questionnaires, even those that were optional. This suggests that the DQ-5 worked well as an initial screener in the TEN Digital Mental Health Check-Up.

Intriguingly, health professionals in the present sample were relatively neutral in their assessment of whether COVID-19 impacted their mental health. While this finding may seem at odds with the seriousness of the mental health measures observed, this might reflect that health professionals have been at risk of poor mental health long before the COVID-19 pandemic [25], that many of these online assessments were completed at a later stage of the pandemic, and/or the relatively low COVID-19 case numbers in Australia for much of the pandemic compared to other countries. Further, the health professionals completing these online assessments had self-selected to engage with a mental health service, with further self-selection to complete specific mental health measures based on their concerns. This likely biased the sample compared to a more cross-sectional evaluation of all health professionals in Australia, although, at an earlier stage of the pandemic another large, cross-sectional study of health professionals observed similar levels of anxiety and depression [22].

Healthcare specialisations

More detailed occupational data captured from June 2021 indicated that nurses and midwives were the largest professional group, accounting for 32.6% of users, followed by allied health (27.5%), and doctors of varying areas of practice (21.9%). This finding is perhaps unsurprising, given that nursing is the largest single healthcare profession in Australia, although nurses were still underrepresented in our sample relative to the national population [19]. While mental health symptoms were worse than would be expected compared to the general population in all three occupational groups, the present study did suggest that allied health were experiencing slightly more severe burnout-related disengagement compared

to nurses, though both groups reported severe burnout. Conversely, allied health had slightly lower severity of depression and were less likely to report impaired work and social functioning compared to both doctors and nurses. While these findings may highlight specific areas of concern for each occupational group, these differences were minor and therefore likely not meaningful, as all groups were experiencing substantial rates of poor mental health symptoms.

While TEN was developed for use by health professionals, the anonymous nature of the digital components of TEN mean that anyone is able to access the Digital Mental Health Check-Up and complete mental health assessments. To these ends, a number of smaller occupational groups working in non-clinical roles not usually defined as health professionals or who support the healthcare system were identified. In particular, administrative staff, such as practice managers and receptionists, accounted for 8.1% of TEN Digital Mental Health Check-Up users reporting their profession. Within the primary care setting these administrative staff are often front-facing and must frequently manage distressed or difficult patients [26]. Given the role of primary care in Australia's COVID-19 vaccine programme, these staff were likely placed under substantial stress. Similarly, recent research from the United States indicated that hospital administrative staff and ancillary staff with indirect patient contact reported high levels of stress due to COVID-19 and higher levels of depressive symptoms [27]. Taken together, this may highlight an unmet need for mental health support services for healthcare administrative staff. Indeed, in 2022 TEN's scope was expanded to include practice managers as eligible for TEN's clinical services.

While small and highly heterogenous, the clinical other occupational group, consisting of roles such as disability support workers and aged care workers, had notable poor mental health measures across most measures. Aged care was particularly strained by the COVID-19 pandemic in Australia, with high turnover and insufficient staff [28]. Occupations, such as aged care workers, may also lack employee assistance programs or other employer or hierarchal support [29, 30]. While the present sample is small and likely further prone to selection bias, these measures highlight that the workplace mental health of these roles deserve further attention.

Demographics

In 2020 women made up 70% of health professionals in Australia [19]. Considering this disparity, the finding that over 80% of TEN users were female is perhaps less striking. The remaining gender disparity in usage of TEN is likely explain by gender differences in help-seeking, with factors such as male doctors being less likely to seek help for depression [2] contributing to fewer men engaging with TEN. While TEN sought to overcome barriers to help-seeking among health professionals, such as concerns around confidentiality and mandatory reporting [2, 6], these findings indicate that TEN's advantages in these areas need to be better communicated to eligible health professionals. While there was some discrepancy between General Check-Up and TEN Check-Up users, there was a general trend for TEN users to be younger than would be expected based on the national distribution [19]. While senior doctors are more likely to seek help from person-to-person services for depression [2], TEN remains a blended care service with a large front-facing digital component. Older adults have historically been less comfortable with digital services due to a lack of experience or familiarity [31], which may explain the reduced usage of one of TEN's digital components among older age groups. Finally, nearly 50% of TEN users were located in NSW. While NSW is the most populous state in Australia, this is still disproportionate to the 30% of Australian health professionals working in NSW [19]. This bias towards engagement in NSW is likely driven by the Black Dog Institute being located in NSW and, thus, having the strongest brand recognition in NSW.

Conclusions

In conclusion, the present study examined digital mental health assessments completed by health professionals as part of TEN, a blended care mental health support service for Australian health professionals, between May 2020 to December 2021. In addition to highlighting service usage and typical user demographics, the present study indicates wider than expected use of TEN among supporting roles in healthcare, such as administrative staff. This may indicate an unmet need for mental health support among these groups. Further, despite the self-selection bias inherent in the sample, mental health measures were notably poor for all professions – particularly for burnout and impaired social and work functioning. Such findings highlight the continued need to provide mental health support to health professionals both during and after the eventual resolution of the COVID-19 pandemic.

Abbreviations

DQ-5	Distress Questionnaire
GAD-7	Generalised Anxiety Disorder
OLBI-16	Oldenburg Burnout Inventory
PCL-5	Post-traumatic Stress Disorder Checklist
PHQ-9	Patient Health Questionnaire
PSTD	Post-traumatic stress disorder
TEN	The Essential Network
WSAS	Work and Social Adjustment Scale

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Authors' contributions
Authors MJC, AD, PS, MR, MJB, and PAB were responsible for the design of the study. YS and MP were responsible for data extraction and data management of the Digital Mental Health Check-Up. MJC, AD, PS, and MR were responsible for data analysis. MJB, JMN, NC, JT, SBH, HC, and PAB were responsible for the development and delivery of The Essential Network (TEN). All authors provided input on preparation of the manuscript and have read and approved the final manuscript.

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Availability of data and materials
The dataset analysed during the current study are not publicly available due to the use of a waiver of consent approved by UNSW Human Research Ethics Committee to analyse the dataset and reasonable expectations around the use and sharing of data through a waiver of consent.

Declarations

Ethics approval and consent to participate
This study received ethical approval from the UNSW Human Research Ethics Committee (HC Number HC210252). As use of the Digital Mental Health Check-Up and TEN website is anonymous, a waiver of consent was requested from, and approved by, the UNSW Human Research Ethics Committee in line with waiver of consent guidelines outlined in the National Statement on Ethical Conduct in Human Research. All data collection and analysis were carried out in accordance with the National Statement on Ethical Conduct in Human Research.

Consent for publication
N/A.

Competing interests
The authors declare no competing interests.

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