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Navigating the future

China's digital mental health landscape post-COVID-19

Dr Carla de Utra Mendes

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Foreword

While COVID-19 and the often sweeping responses required by governments across the world in 2020–21 will continue to have immense economic consequences, it is most likely on people's mental wellbeing that the long-term impact will be deepest. COVID-19 has caused people to be isolated and anxious, and we have seen a sharp rise in reports of incidences of mental health issues. What is striking is that these events are occurring regardless of physical location or cultural context. It may be in different ways, and sometimes with different symptoms, but people everywhere have suffered from the pandemic's impact on not just their bodies, but also their minds.

Principally for political reasons, China (where the pandemic originated in late 2019) has experienced increasingly fraught relations with the US, Europe and others as the COVID-19 crisis has proceeded. Blame and recriminations have been common. China's own official response has often been defensive and shrill. Across the board, Western political figures have found many areas in which to question the relationship with China, even casting doubts over some of the main spaces for partnership that existed in the past.

Carla de Utra Mendes's paper is an important reminder that, despite all of this, at the level of individuals – whether in China, Europe or anywhere else – there is a great deal of parity. Chinese people, too, as statistics in this overview show, have found their daily lives made more challenging and that they are more anxious because of the pandemic. In this context, the Chinese Government, so often seen by outsiders as a controlling, negative force, in fact comes across as an entity similar to administrations anywhere else, trying to frame policies and create responses to issues that are often vast and complex, and for which new answers are keenly sought.

Dr Mendes does not avoid recognising that there are significant differences in how technology should be used to address mental health issues. She is alert to the possibilities (and perils) of artificial intelligence, and of the gathering of data on people. But her approach – clearly showing that mental ill health, whether in a system like China's or like Europe's, is a huge challenge that no one has easy answers to – is almost certainly the right one. So, too, are the areas that she highlights where, despite differences, European and Chinese partners do, and should, have deeper dialogue. This paper succinctly raises the importance of that, and the crucial nature of a wider understanding of this issue: one of the most important facing China and the rest of the world as they move beyond COVID.

Kerry Brown
Professor of Chinese Studies, and
Director of the Lau China Institute

Abstract

In China, as elsewhere, the COVID-19 pandemic brought with it a significant mental health burden in society as a result of lockdowns, anxiety and isolation, alongside economic and social determinant factors. As early as February 2020, a nationwide survey in China estimated that as many as 35 per cent of its respondents were suffering from some form of psychological distress due to the outbreak of the then epidemic.[1] Despite a rapid and comprehensive psychological provision response from the Chinese Government,[2] the impact on its mental health system was significant, bringing increased pressure on a system already fragile and with uneven geographical distribution.[3] It is important to remember that, for all the arguments about the origination of COVID-19, in terms of its impact on the lives and wellbeing of individuals, China experienced the same kinds of challenges as most other places, including the US and Europe. Because of the fierce geopolitical arguments since early 2020 about the pandemic and the relationship between China and the rest of the world, this issue of how individuals, despite the countries and cultures in which they are physically located, have all experienced similar levels of anxiety and distress is important to keep sight of. This paper therefore focuses on the common challenge of mental wellbeing, and the ways in which, like any other government, China has tried to meet these challenges.

For global mental health, the pandemic both became a significant added challenge and provoked a search for solutions in line with the need for sustainability in existing mental health services.[4] To tackle this global burden on systems, a timely United Nations Policy Document in May 2020 set out a series of recommendations for existing mental health systems, calling attention to the opportunity to integrate innovation.[5] This is particularly relevant for China, whose innovation-driven model of development not only has, and will have, profound systemic implications and potential for several applications, but will also carry incredible risks – for the health system in general, and for the mental health system in particular.

1 Qiu, J, Shen B, Zhao M, Wang Z, Xie B, Xu Y, (2020) A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations, *Gen Psychiatr*, 33: e100213, doi: 10.1136/gpsych-2020-100213.

2 Qiu D, Li Y, Li L, He J, Ouyang F, Xiao S, (2020) Policies to Improve the Mental Health of People Influenced by COVID-19 in China: A Scoping Review, *Front Psychiatry*, 11: 588137, doi.org/10.3389/fpsyt.2020.588137.

3 Zhong BL, Zhou DY, He MF, Li Y, Li WT, Ng CH, Xiang YT, Chiu HFK (2020) Mental health problems, needs, and service use among people living within and outside Wuhan during the COVID-19 epidemic in China, *Ann Transl Med* 8 (21):1392, dx.doi.org/10.21037/atm-20-4145.

4 Moreno, C, Wykes T, Galderisi S, Nordentoft M, Crossley N, Jones N, Cannon M, Correll CU, Byrne L, Carr S, Chen EYH, Gorwood P, Johnson S, Kärkkäinen H, Krystal JH, Lee J, Lieberman J, López-Jaramillo C, Männikkö M, Phillips MR, Uchida H, Vieta E, Vita A, Arango C, (2020) How mental health care should change as a consequence of the COVID-19 pandemic, *Lancet Psychiatry*, 7:813-24, doi.org/10.1016/S2215-0366(20)30307-2.

5 United Nations (2020) *Policy Brief: COVID-19 and the Need for Action on Mental Health*, p.15, unsdg.un.org/resources/policy-brief-covid-19-and-need-action-mental-health, accessed 14.04.21.

Up until the COVID-19 pandemic, several important mental health policies, laws and regulations on one side, and technological innovation on the other, had been elaborated in the prior decade or so, including the adoption of e-health policies in China concurrent with international developments.[6] However, a clearly defined policy on digital mental health is lacking. Internationally, the COVID-19 pandemic was considered a great accelerator and a call for the adoption of 'e-mental health',[7] precipitating institutions and governments to define and re-structure their digital strategies to adapt to the current and future realities. In China's case, at least since 2015 when the *Internet Plus*《互联网+》model was announced, combined with the *Healthy China Initiative* 2030《健康中国2030》announced in 2016 and in 2018 with the State Council's *Opinions on Promoting the Development of Internet plus Health Care*《国务院办公厅关于促进"互联网+医疗健康"发展的意见》, ambitions towards a national-scale digital health system have been on the government's agenda, amplified by the needs of the COVID-19 pandemic response. In this fast-developing and complex landscape, the question of digital mental health in China is not then *when* it will happen but *how* it will develop to improve and strengthen the existing mental health system. In this paper, we will explore three areas *where* we can currently see these applications being developed as well as *who* is involved, followed by three corresponding recommendations and challenges in this emerging scenario.

6 World Health Organisation (2016), *Global diffusion of eHealth: Making universal health coverage achievable. Report of the third global survey on eHealth*, p.14, who.int/observatories/global-observatory-for-ehealth, accessed 20.05.21.

7 Wind TR, Rijkeboer M, Andersson G, Riper H, (2020) The COVID-19 pandemic: the 'black swan' of mental health care and a turning point for e-health, *Internet Interventions* 20 (100317), doi.org/10.1016/j.invent.2020.100317.

Current areas of mental health digital transformation

1. COVID-19 'psychological crisis intervention'

Not only was China ahead in being the first country to suffer from the then epidemic of COVID-19, but it also anticipated emerging mental health problems as a priority in this scenario, releasing its first guideline for 'psychological crisis intervention'《心理危机干预》on 26 January 2020, three days after declaring the lockdown in Wuhan.[8] Past lessons of the first SARS pandemic in 2003–4 have contributed to the creation of Chinese systems of psychological preparedness[9] and the establishment of national-level psychological crisis intervention plans, however in need of management and organisational improvement they may be.[10] With COVID-19, a State Council *Joint Prevention and Control Mechanism*《国务院联防联控机制》was established[11] with an overall strategy known as 'mobilization of "Everything"' during the first stage of the epidemic.[12] This was backed up in mental health with more than two dozen government guidelines and professional bodies' codes and regulations released from the end of January until March/April 2020 in stages between intervention and rehabilitation and considering different population targets.[13] Expert consensus and deliberation on online and remote provision of mental health services in order to assure quality, regulation and ethical considerations during COVID-19 was an essential component.[14]

In this 'speed' response,[15] technology and big data played a vital part in China's control and intervention model.[16] Immediacy was also the reaction of China's digital ecosystem[17] and social media platforms such as WeChat《微信》and Weibo《微博》in providing several services for psychological assistance to both institutions and individuals.[18] Within China's national digital health strategy, *Internet Hospitals*《互联网医院》, also played to great advantage during the pandemic.[19] Those adhering to remote medical provision or telemedicine benefited from free-of-charge online appointments, possibly reducing anxiety or 'health anxiety' in people seeking access to medical treatment.[20] Intervention to increase mental health literacy through psychoeducation was also a big component of this model: government, mental health institutions and professional bodies released self-help manuals, online training videos and awareness campaigns to address mental health problems during the pandemic,[21] reflecting a great investment in addressing common mental health problems in the general population.

Emerging and new technologies were also being applied in different mental health settings, albeit with limited scope. In Shenzhen Mental Health Center, advanced technologies such as virtual reality (VR) were used with a small number of patients as 'adjunctive therapy' – namely, VR exposure therapy for anxiety and phobia in the context of the pandemic – with good results.[22] In the Shanghai

8 Dong L, Bouey J (2020) Public Mental Health Crisis during COVID-19 Pandemic, China, *Emerg Infect Dis*, 26 (7): 1616-1618, doi: 10.3201/eid2607.200407; Qiu D et al (2020).

9 Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, Ng CH, (2020a) Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed, *The Lancet Psychiatry*, 7, doi.org/10.1016/S2215-0366(20)30046-8v; He et al, 2020.

10 Duan, L, Zhu G (2020) Psychological interventions for people affected by the COVID-19 pandemic, *Lancet Psychiatry*, 7 (4) :300-302, doi.org/10.1016/S2215-0366(20)30073-0.

11 Ning Y, Ren R, Nkengurutse G (2020) China's model to combat the COVD-19 epidemic: a public health emergency governance approach, *Global Health Research and Policy*, 5:34, doi.org/10.1186/s41256-020-00161-4.

12 Zhou L, Wu Z, Li Z, Zhang Y, McGoogan JM, Li Q, Dong X, Ren R, Feng L, Qi X, Xi J, Cui Y, Tan W, Shi G, Wu G, Xu W, Wang X, Ma J, Su X, Feng Z, Gao GF (2021) One Hundred Days of Coronavirus Disease 2019 Prevention and Control in China, p.2, *Clinical Infectious Diseases*, 72 (2) 332-339, doi.org/10.1093/cid/ciaa725.

13 Qiu D et al (2020). See Ju and colleagues for a description of what the authors called a '*mental health support system in response to COVID-19*' (Ju Y, Zhang Y, Wang X, Li W, Ng RMK, Li L, (2020) China's mental health support in response to COVID-19: progression, challenges and reflection, Fig.1, *Globalisation and Health*, 16:102, doi.org/10.1186/s12992-020-00634-8).

14 Xiang YT, Zhao N, Zhao YJ, Liu Z, Zhang Q, Feng Y, Yan XN, Cheung T, Ng CH, (2020) An overview of the expert consensus on the mental health treatment and services for major psychiatric disorders during COVID-19 outbreak: China's experiences, *Int. J. Biol. Sci.* 16(13): 2265-2270. doi: 10.7150/ijbs.47419.

15 Poland in Burki T, (2020). China's successful control of COVID-19, p.1240, *The Lancet Infectious Diseases*, 20: 1240-1241, doi.org/10.1016/S1473-3099(20)30800-8.

16 Hua J, Shaw R, (2020) Corona Virus (COVID-19) 'Infodemic' and Emerging Issues through a Data Lens: The Case of China. *Int. J. Environ. Res. Public Health*, 17, 2309; doi: 10.3390/ijerph17072309.

17 Chan T, Lang N, Modi S, Tang T, von Szczepanski K, (22-07-2020) How Chinese Digital Ecosystems Battled COVID-19, *BCG Publications*, bcg.com/en-gb/publications/2020/how-chinese-digital-ecosystems-battled-covid-19, accessed 03.05.2021.

18 Liu S, Yang L, Zhang C, Xiang YT, Liu Z, Hu S, Zhang B (2020) Online mental health services in China during the COVID-19 outbreak, *The Lancet Psychiatry*, 7 (4):17-18, doi: 10.1016/S2215-0366(20)30077-8.

19 Gong K, Xu Z, Cai Z, Chen Y, Wang Z, (2020) Internet Hospitals Help Prevent and Control the Epidemic of COVID-19 in China: Multicenter User Profiling Study, *J Med Internet Res*, 22(4): e18908, doi: 10.2196/18908.

20 Shu M, Li J (2020) Health digital technology in COVID-19 pandemic: experience from China, p. 259, *BMJ Innov*, 6:259-261, doi: 10.1136/bmjinnov-2020-000477.

21 Kang C, Tong J. Meng F, Feng Q, Ma H, Shi C, Yuan J, Tang S, Liu L. Xu L, Xi YJ, Li W, Zhao X, Yang J (2020) The role of mental health services during the COVID-19 outbreak in China, *Asian J Psychiatr*, 52: 102176, doi.org/10.1016/j.ajp.2020.102176.

22 Zhang W, Paudel D, Shi R, Liang J, Liu J, Zeng X, Zhou Y, Zhang B (2020) Virtual Reality Exposure Therapy (VRET) for Anxiety Due to Fear of COVID-19 Infection: A Case Series, p. 2669, *Neuropsychiatr Dis Treat*, 16: 2669-2675, doi: 10.2147/NDT.S276203.

Mental Health Center, artificial intelligence (AI) and VR were used to create an encompassing 'mental wellness system for COVID-19', which enhanced the digital opportunities for community and social support during the pandemic, as well as addressing training needs for mental health workers.[23] In Chengdu, a similar model 'COVID-19 Psychological Resilience Model'[24] claimed an approach as 'integrated psychological intervention' with onsite and online social media and internet intervention.[25] But many more examples of China's use of technological advancement in health during COVID-19 can be found. Some of these made international headlines, such as AI-assisted CT scanning for COVID-19 patients,[26] smart hospitals with robot assistance, and the 'Health Code'《健康码》– a QR trace-and-track system for monitoring and controlling further outbreaks.[27] From the market perspective, the pandemic offered immense economic possibilities for corporate companies such as Tencent WeDoctor《腾讯/微医》, Ping An Good Doctor《平安好医生》and Ali Health《阿里健康》to provide millions of remote consultations during COVID-19 with thousands of medical professionals.[28] In sum, the digital sphere assumed an important role in China's health system during the COVID-19 outbreak, bringing it closer to the country's transformation into a 'Digital China'《数字中国》that was recently announced in the 14th Five-Year Plan《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》.[29]

2. From psycho-boom 2.0 to 4.0

Beyond the pandemic, the digital ecosystem and cyberspace in China have huge potential for mental health interventions: from March 2020, there was an increase of 85.4 million users, reaching 989 million netizens by the end of year.[30] Adherence to and the popularity of different forms of psychological support have been part of Chinese society's growing middle class in what Kleinman, and later Huang,[31] called a 'psycho-boom'.[32] This is aligned with the perception of a mental crisis occurring in China as a consequence of the acceleration of economic growth and development since the late 70s, which has generated an increased interest in psychological wellbeing by both the market and the Chinese government.[33] Also, for society, 'digital self-help'[34] or the 'uberisation of mental health'[35] is a growing area in what we understand here as China's 'psycho-boom 2.0',[36] given the 'ubiquitous' nature of smartphones in China.[37]

Adding to these factors is an apparent good cultural acceptability, as China is seen as a 'positive outlier' in the adoption of technology, with rates as high as 89 per cent in telehealth use and 73 per cent in telemedicine use among healthcare professionals.[38] In mental health, this

23 Qiu JY, Zhou DS, Liu J, Yuan TF (2020) Mental wellness system for COVID-19, *Brain Behav Immun* 87:51-52, doi: 10.1016/j.bbi.2020.04.032.
24 He Z, Chen J, Pan K, Yue Y, Cheung T, YuanY, Du N, Zhao Y, Feng Y, Zhou D, Lu F, Chen Y, He M, Xiang YT, 2020, The development of the 'COVID-19 Psychological Resilience Model' and its efficacy during the COVID-19 pandemic in China, p. 2833, *Int J Biol Sci*, 16 (15) 2828-2834, doi: 10.7150/ijbs.50127.
25 He et al, 2020, p.2828.
26 Zhang K, Liu X, Shen J, Li Z, Sang Y, Wu X, Zha Y, Liang W, Wang C, Wang K, Ye L, Gao M, Zhou Z, Li L, Wang J, Yang Z, Cai H, Xu J, Yang L, Cai W, Xu W, Wu S, Zhang W, Jiang S, Zheng L, Zhang X, Wang L, Lu L, Li J, Yin H, Wang W, Li O, Zhang C, Liang L, Wu T, Deng R, Wei K, Zhou Y, Chen T, Lau JYN, Fok M, He J, Lin T, Li W, Wang G (2020) Clinically Applicable AI System for Accurate Diagnosis, Quantitative Measurements, and Prognosis of COVID-19 Pneumonia Using Computed Tomography, *Cell*, 181: 1423-1433, doi.org/10.1016/j.cell.2020.04.045.
27 Such as Hongshan Sports Center of Wuhan, Smart Field Hospital (Shu & Li, 2020, p.259).
28 He D, Gu Y, Shi Y, Wang M, Lou Z, Jin C, (2020), COVID-19 in China: the role and activities of Internet-based healthcare platforms, *Global Health & Medicine*. 2(2):89-95, doi: 10.35772/ghm.2020.01017.
29 Center for Security and Emerging Technology (13.05.21) *Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035*, cset.georgetown.edu/publication/china-14th-five-year-plan, accessed 21.05.21.
30 Xinhuanet (03.02.21) *China has nearly 1bln internet users*, xinhuanet.com/english/2021-02/03/c_139717749.htm, accessed 18.06.21.
31 Kleinman A, (2010) Remaking the moral person in China: implications for health, *The Lancet*, 375 (9720): 1074-1075, doi.org/10.1016/S0140-6736(10)60466-7; Huang HS (2016) The Emergence of The Psycho-Boom in Contemporary Urban China, in Chiang H (ed) *Psychiatry and Chinese History*, 174-192, Oxon, UK, NY: Taylor & Francis (original from 2014).
32 Zhang calls it 'psy-fever' Zhang, L. (2014). Bentuhua: Culturing Psychotherapy in Postsocialist China. *Culture, Medicine and Psychiatry*, 38 (2), 283-305. doi: 10.1007/s11013-014-9366-y. Huang situates the concept as borrowed by Bach and Molter and Schülein in the late 70s (Huang, 2016/2014, p.229).
33 Yang, J (2018) *Mental Health in China. Change, Tradition and Therapeutic Governance*, Cambridge UK: Polity; Zhang,L (2020) *Anxious China. Inner Revolution and Politics of Psychotherapy*, Oakland CA: University of California Press.
34 UN, 2020, p.8. During the outbreak of COVID-19 in China, incentives for self-help became even more significant in part to compensate the lack of and to support existing mental health professionals to respond to demand (Qiu D et al, 2020; Kang et al, 2020) and in part to adapt to prevention measures.
35 Hickie IB, (2019) The 'uberisation' of mental health care: a welcome global phenomenon, *Med J Aust* 211(7), doi.org/10.5694/mja2.50342.
36 See Huang HY (2017) Therapy Made Easy. E-Commerce and Infrastructure in China's Psycho-Boom, *China Perspectives* [Online], 4, journals.openedition.org chinaperspectives/7468, accessed 20.05.21.
37 Yin H, Wardenaar KJ, Wang Y, Wang N, Chen W, Zhang Y, Xu G, Schoevers RA, (2020) Mobile Mental Health Apps in China: Systematic App Store Search, *J Med Internet Res* 2020: 22 (7): e14915 doi: 10.2196/14915.
38 Phillips (n.d) *Future Health Index 2019. Transforming healthcare experiences. Exploring the impact of digital health technology on healthcare professionals and patients*, p.19,25, philips.com/a-w/about/news/future-health-index/reports/2019/transforming-healthcare-experiences.html, accessed 23.04.21.; Global Digital Health Index (GDHI) (2019) *The State of Digital Health* 2019,p.21 digitalhealthindex.org/stateofdigitalhealth19, accessed 25.04.21.

acceptability can benefit from a growing understanding that, despite caveats, evidence-based digital mental health interventions are proving efficacious.[39]

As stated, China's ambitions in digital health are part of a major plan to achieve a *Healthy China* by 2030, in line with international UN Sustainable Development Goals.[40] It is also by 2030 that China aims to be a 'world leader in AI', in continuation with the *New Generation Artificial Intelligence Development Plan*《新一代人工智能发展规划》(AIDP; 2017), the 13th Five-Year Plan《中华人民共和国国民经济和社会发展 第十三个五年规划纲要》(2016–20) and the *Made in China* 2025《中国制造2025》plan (2015).[41] In this context, alongside other 'frontier' technologies, neuroscience is at the forefront of China's national scientific and technological ambitions,[42] indicating that the 'fourth-industrial-revolution'[43] digital solutions are going to have a tremendous impact on the future of mental health. Will this in turn create a sort of 'psycho-boom 4.0' in China?

Attesting to this hypothesis, the *Brain Science and Brain-Inspired Intelligence* or *China Brain Project*《中国脑计划》(2016–30) is expected to have, for the coming future, an accelerator effect on 'brain-inspired AI technology'.[44] The COVID-19 pandemic brought increasing awareness about neurological and psychiatric problems as potential negative consequences of the disease – these are still being researched by the international scientific community in studies such as Taquet and colleagues.[45] In the latter, possibilities of digitalisation in health, such as the use of electronic health records in research, could have an impact not only on monitoring but also on the prediction and prevention of mental and brain health problems in the future. China has an urgent need in this respect, as more than 1.3 billion of its population suffer from 'chronic neurodegenerative or neuropsychiatric disorders',[46] and so research on early diagnosis and prevention could make a significant difference while 'offering the largest data base for researchers to work with'.[47] Early diagnosis and prevention is one of the main applications of the *China Brain Project*, under the model *One Body, Two Wing*s《一体两翼》, alongside the development of 'brain-machine intelligence technologies'.[48] In this regard, the project aims to be in line with European developments such as the *Human Brain Project* and America's *The Brain Initiative*,[49] whereas other areas in which China claims to have a unique advantage (eg non-human primate research) may not be directly compatible with the current international trends in brain research.[50] The alignment of the important tradition of Chinese medicine with technology can give this development unique characteristics.[51]

3. Big data, big dreams

Within China's context for national health system innovation development and for its technological self-reliance, big data plays a crucial role. This was recognised by China's State Council in 2016 with an official plan for the use of big data in the health sector.[52] In this regard, another area of significant investment in terms of health and mental health systems is dependent on the expansion of the use of electronic health records (EHRs) and the integration of data with other technologies such as the Internet of Things (IoT). However, for China, this poses

39 Cuijpers P (31.03.21) Scalable digital interventions for depression during the COVID-19 pandemic in Global and Community Mental Health Research Group, *Scalable digital interventions to address mental health during the COVID-19 pandemic. Perspectives from the Western Pacific Region*, um-gmh.com/digital-mental-health-intervention-conference/recordings, accessed 24.05.21.

40 Liu GG, Chen X (2019) China in transition: health, wealth, and globalisation, *The Lancet Public Health*, 4(9):444-445, doi.org/10.1016/S2468-2667(19)30151-3.

41 Roberts H, Cowls J, Morley J, Taddeo M, Wang V, Floridi L (2020) The Chinese approach to artificial intelligence: an analysis of policy, ethics and regulation, *AI & Society* (2021), 36:59-77, doi.org/10.1007/s00146-020-00992-2.

42 Kaja A (06.04.21), China's 14th Five-Year Plan (2021-2025): Signposts for Doing Business in China, Covington & Burling LLP in *Lexology* [Webpage], lexology.com/library/detail.aspx?g=61a368c0-ece4-441f-81b2-87827491058e, accessed 20.05.21.

43 Schwab, K, (12.12.15), The Fourth Industrial Revolution. What It Means and How to Respond, *Foreign Affairs*, foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution, accessed 20.07.21; For the 14th Five Year Plan in this regard see Cooper B, (01.04.21) China's 14th Five-year Plan (2021-2025) Report, Hill+Knowlton Strategies , sec.2 [Webpage] hkstrategies.com/en/chinas-14th-five-year-plan-2021-2025-report, accessed 20.05.21.

44 Poo MM, (2018) Towards brain-inspired artificial intelligence, p.785 *National Science Review*, 5 (6): 785, doi.org/10.1093/nsr/nwy120.

45 Taquet M, Geddes JR, Husain M, Luciano S, Harrison PJ (2021). 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: a retrospective cohort study using electronic health records, *The Lancet Psychiatry*, 8 (5):416-427, doi.org/10.1016/S2215-0366(21)00084-5.

46 Chan et al, 2013, Phillips et al, 2019 in Wang Y, Yin J, Wang G, Li P, Bi G, Li S, Xia X, Song J, Pei G, Zheng JC (2019) Responsibility and Sustainability in Brain Science, Technology, and Neuroethics in China – a Culture-Oriented Perspective, p.375, *Neuron*, 101 (3) :375-379, doi.org/10.1016/j.neuron.2019.01.023.

47 Mu-Ming Poo in CGTN (05.08.18) What is China's Brain Project and how does it differ from brain projects in the US and Europe? 3:21-3:39 youtube.com/watch?v=gV0f5mPpnDg, accessed 20.05.21.

48 Poo MM, Du JL, Ip NY, Xiong ZQ, Xu B, Tan T (2016) China Brain Project: Basic Neuroscience, Brain Diseases, and Brain-Inspired Computing, p.592, *Neuron*, (92): 591-596, dx.doi.org/10.1016/j.neuron.2016.10.050.

49 Mu-Ming Poo in The Brain Forum (17.06.16) China Brain Project and non-human primate research, Prof. Mu ming Poo, 13:03-06, youtube.com/watch?v=4GAXlgXrTIA, accessed 16.06.21.

50 Cyranoski D (2016) Monkey Kingdom. China is positioning itself as a world leader in primate research, *Nature* 53: 300-202, doi.org/10.1038/532300a.

51 Poo et al, 2016.

52 Zhang L, Wang H, Li Q, Zhao MH, Zhan QM, (2018) Big data and medical research in China, p.2 *BMJ* 360: j5910, doi: 10.1136/bmj.j5910.

a series of challenges, as research using EHRs is not yet common and, despite the high use, access to and quality of records, remains to be improved.[53] China's dreams of national health innovation have the advantage of a large population sample capacity, but the country still needs to address issues related to communication, quality and centralisation of data to advance its technological developments.[54]

Within this context, a major global concern relates to the protection and privacy of data.[55] Most recent initiatives demonstrate the Chinese Government's efforts to reinforce the protection of personal information but also the complex framework of its 'data governance puzzle'.[56] Within this complexity, tensions may emerge between the different actors engaged in the ownership, collection and use of data, and between centralised government control, citizens' rights and the incentives necessary 'to nurture the new digital economy'.[57] For the Chinese Government, health data in specific cases such as genetic data are usually considered 'the state's collective resource',[58] and this is important when understanding data and privacy in context. Adding to this aspect is the industry side in the push and pull between private companies, government and individual data use (and abuse). This is not unique to China, as there is a global need in the health market for the adoption of stronger regulatory principles and standards, as reflected in propositions such as 'Transparency for Trust'[59] and calls to develop specific and more robust ethical guidelines for digital mental health.[60] However, the context of the dynamic between government control and regulation and the need to push for innovative development from private companies points to a specific need facing China's 'principal contradiction' under Xi Jinping, ie '[...] unbalanced and inadequate development and the people's needs for a better life'.[61] This specific 'need for a better life' has huge implications regarding the provision for and prevention of mental ill health, but it depends from which side of the spectrum this is being considered. Problems for what Roberts and colleagues call the 'dual ecosystem' between government and industry in China leave the user stranded in the middle of a battlefield over their private data.[62] Moreover, in systemic terms, the integration of large data and other forms of fragmented data from medical software types such as apps poses one of many dilemmas: it is simultaneously required for responding to urgent needs and to solve common problems but must also be in line with global principles of digital governance in mental health.[63]

Online benefits, offline harms? Current needs for digital mental health

1. Establish a system for risk assessment and quality control in digital interventions

Beyond the apparent optimism that digital provision brought to mental health during the COVID-19 pandemic, an understanding of risk and substantial quality control is necessary in the existing 'challenging to navigate' digital landscape.[64] In China, an in-depth review of 63 of the 997 mental health apps in Chinese, or with Chinese versions, on both Android and iOS argued for further improvement and regulation provision.[65] Recent years have seen stronger regulation on medical device registration in

53 Zhang et al., 2018, p.1.
54 Zhang et al.,2018, p.2.
55 Significant advances in regulation have been made, at least since China's *Cybersecurity Law* (2017), which in 2018 included the *Personal Information Security Specification* coinciding in time with the European Union's *General Data Protection Privacy Act* (GDPR), and an important step to protection of personal data (Sacks S, Shi M, Webster G, (08-02-2019) The Evolution of China's Data Governance Regime: A Timeline [Blog Post], *DigiChina New America*, newamerica.org/cybersecurity-initiative/digichina/blog/china-data-governance-regime-timeline, accessed 24.05.21).
56 Shi, M. (14-12-2020) China's Draft Privacy Law Both Builds On and Complicates Its Data Governance [Blog Post], *DigiChina New America*, newamerica.org/cybersecurity-initiative/digichina/blog/chinas-draft-privacy-law-both-builds-on-and-complicates-its-data-governance, accessed 24.05.21. Shi mentions the most recent and important developments in this area such as the draft of *Personal Information Protection Law* (PIPL), the *Draft for Data Security Law of the People's Republic of Chin*a of 2020 and the *Civil Code* that came into effect in January 2021.
57 Shi, 2020, sec.2,par.3.
58 Chen Y, Song L (2018) China: concurring regulation of cross-border genomic data sharing for statist control and individual protection, p.610, *Human Genetics*, 137: 605-615, doi.org/10.1007/s00439-018-1903-2.
59 Wykes, T, Schueller S (2019) Why Reviewing Apps is Not Enough: Transparency Principles of Responsible Health App Marketplaces, *J Med Internet Res*, 21 (5): e12390, doi.org/10.2196/12390.
60 Wykes, T, Lipshitz J, Schueller SM (2019) Towards the Design of Ethical Standards Related to Digital Mental Health and all Its Applications, *Curr Treat Options Psych*, 6:232-242, doi: 10.1007/s40501-019-00180-0.
61 Meng J (18.10.2017) Principal contradiction facing Chinese society has evolved in new era: Xi, *Xinhua*, xinhuanet.com/english/2017-10/18/c_136688132.htm, accessed 24.05.21. See also Roberts et al, 2020, p.65.
62 See Sacks and Laskai in Roberts et al., 2020, p.70.
63 Such as: Allen S, Hammett R, Schweizer M, (2021) *Global Governance Toolkit for Digital Mental Health: Building Trust in Disruptive Technology for Mental Health*, White Paper, World Economic Forum and Deloitte, weforum.org/whitepapers/global-governance-toolkit-for-digital-mental-health, accessed 17.04.2021.
64 Lagan S, D'Mello RD, Vaidyam A, Bilden R, Torous J (2021) Assessing mental health apps marketplace with objective metrics from 29, 190 data points from 278 apps, p.2, *Acta Psychiatr Scand*, 00:1-10, doi: 10.1111/acps.13306.
65 Shang J, Wei S, Jin J, Zhang P (2019) Mental Health Apps in China: Analysis and Quality Assessment, *JMIR Mhealth Uhealth*, 7(11):e13236, doi: 10.2196/13236.

China, including for medical software,[66] but systems for evaluating, promoting and procuring evidence-based apps, IoT devices, AI solutions and other digital interventions similar to those being developed internationally[67] seem to be lacking. In this regard, a case is made for mental health systems, as Quintana argues, as collaborative 'learning systems' in the establishment of shared robust policy and knowledge frameworks, strategies for implementation and evidence-based evaluation mechanisms[68] that can then be incorporated into future plans for psychological crisis intervention. In this sense, China can not only learn from other e-mental-health policies but also provide lessons on its immediate incorporation of digital and remote provision that could be beneficial for other mental health systems regarding both the opportunities and shortcomings. In line with urgent calls for an international 'pandemic treaty',[69] this should also include mental ill health prevention and intervention through digital means. And, with the digital capacity for monitoring and early detection proposed as 'early warning signs' systems[70] – not just for pandemic outbreaks, but for future mental health crises – a discussion on the ethics of mental health surveillance is ever more needed.

2. Contribute to pursue global ethical AI development in mental health

AI is most definitely an area of priority in China's innovative model and 'China is a central actor in the international development and governance of AI'.[71] However, these two statements find themselves in an unresolved tension manifested in other systemic considerations. For example, the 'dual circulation' economic strategy《国内国际双循环》that the Xi government referred to from mid-2020, which stressed self-reliance and internal innovation (one circulation) gaining priority in the dialectic with international co-operation/competitiveness (the other). In this area, there is significant space for engaging partners such as the EU and the UK, as seen in projects that can transform the future of health and mental health.[72] An impediment to this is related to the fundamental understanding of ethics, processes and applications, competitive 'tech wars', and the shareability of national health data beyond borders.[73] These blockers are significant and may hinder developments in global digital health co-operation. While several areas for the application of AI are promising (including precision psychiatry), others that engage monitoring and control can become a matter of systemic political and economic tension. This is particularly problematic when it comes to mental health. There are specific examples from both before and during COVID-19 in which such systems of real-time monitoring with the aid of AI have been used for suicide prevention, as in the case of the *Tree Hole*《树洞》project that, up to the end of 2020, prevented thousands of potential suicide attempts by analysing and rating netizens comments on online 'tree holes'.[74] Despite the benefits of prevention and timely intervention, such applications open (in the least) a debate on the limits and scope of government and industry action on individual data for the benefit to society and to the individual themselves, given the fear of 'surveillance creep'[75] of monitoring systems. The space of the digital in mental health, or what Bemme and colleagues called the 'digital psy', becomes a highly debated field as COVID-19-accelerated technological adoption raises many questions regarding potential (and potentially harmful) applications.[76] A global debate on how

66 Beckett, N. (14-12-2020) Digital Health Apps and Telemedicine in China, CMS Expert Guides [webpage], CMS Law.Tax, cms.law/en/int/expert-guides/cms-expert-guide-to-digital-health-apps-and-telemedicine/china, accessed 22.02.2021.

67 Examples such as *NHSX's Digital Technology Assessment Criteria for Health and Social Care (DTAC)* nhsx.nhs.uk/key-tools-and-info/digital-technology-assessment-criteria-dtac, accessed 24.05.21; the *ORCHA* platform and the *One Mind PsyberGuide* (WEF & Deloitte, 2021).

68 Yuri Quintana in DCI BIDMC (06.03.21) *Towards a Global e-Mental Health Community*, youtube.com/watch?v=KQXSderpj4c, accessed 20.05.2021

69 World Health Organization (30.03.21) COVID-19 shows why united action is needed for more robust international health architecture, who.int/news-room/commentaries/detail/op-ed---covid-19-shows-why-united-action-is-needed-for-more-robust-international-health-architecture, accessed 25.05.21.

70 Inkster B, Digital Mental Health Data Insights Group (DMHDIG), (2021) Early Warning Signs of a Mental Health Tsunami: A Coordinated Response to Gather Initial Data Insights from Multiple Digital Services Providers, *Front. Digit. Health*, 2: 578902, doi.org/10.3389/fdgth.2020.578902.

71 Roberts et al, 2020, p.72.

72 Projects such as the *China-EU draft 2020 Strategic Agenda for Cooperation*, plans for joint research in innovation, including health and ICT are mentioned (EU-China 2020 Strategic Agenda for Cooperation, p.9, eeas.europa.eu/delegations/china/15398/eu-china-2020-strategic-agenda-cooperation_en, accessed 12.04.21) or UK examples such as *China-UK Research Centre for AI Ethics and Governance* (ai-ethics-and-governance.institute, accessed 25.05.21). However, plans for future cooperation will have to account for the most recent EU first AI legal framework proposal released this April, (EUR-lex, eur-lex.europa.eu/legal-content/EN/TXT/?qid=1623335154975&uri=CELEX%3A52021PC0206, accessed 18.06.21), where further restrictions will likely be in place.

73 As Cheng and Song state, genomic data is even more sensitive as related to national biosecurity and interests that are connected to competitiveness (Cheng &Song, 2018, p. 607). As the authors explain, there have been precedents in problems with Chinese genomic data in international projects, some of which directly related to mental health (Chen & Song, 2018, p.607).

74 Global Times (27.01.2021) AI helps to prevent suicides during COVID-19 epidemic, globaltimes.cn/page/202101/1214074.shtml, accessed 24.05.21. According to Global Times, 'Tree holes are places on the Internet where people express secrets and their feelings and thoughts without worrying about being discovered by people around them in reality.' (*Global Times*, 2021, par.5).

75 Calvo, R (2020) Health surveillance during covid-19 pandemic, *BMJ*, 369: m1373, doi.org/10.1136/bmj.m1373.

76 Bemme D, Brenman N, Semel B, (08.08.2020) Tracking Digital Psy: Mental Health and Technology in an Age of Disruption, *Somatosphere* [Blog], somatosphere.net/2020/tracking-digital-psy-mental-health-and-technology-in-an-age-of-disruption.html, accessed 24.05.21.

'disruptive technologies'[77] such as AI align with digital surveillance can generate mental health risk factors, rather than preventing them, is therefore necessary. According to Roberts and colleagues, as the AIDP plan mentions 'AI's potential for understanding group cognition and psychology', its applications/implications for social and moral governance need to be considered in this ethical debate as China aims to be globally leading in defining norms and standards in the field.[78] In 2019, eight principles on AI were released by *China's National New Generation Artificial Intelligence Governance Expert Committee* 《国家新一代人工智能治理专业委员会》, emphasising specific values such as 'harmony and friendliness' and 'shared responsibility', but also 'respect for privacy' and 'fairness and justice'.[79] We need to be considering how these will fit with other international principles[80] when applied to mental health.

Working out a clearer framework for moral evaluation is important in view of the very evident differences in values between Europe, the US and China. It is clear that there is common cause in looking after the wellbeing of people in separate communities. But how best to do this, and what the role of AI and other technologies might be, clearly differs. The important thing is to ensure that these debates happen as far as possible with an understanding that all those involved, from China to Europe and others, aim to safeguard the mental health and wellbeing of their populations – and that the differences are ones of approach or emphasis. This is not to deny that these areas of misalignment are significant. It is to stress that dialogue, communication and, through these, co-operation based on clear mutual understanding are important to address them. And, as China is assuming a more central position in AI development, and commits to G20 principles based on Organisation for Economic Co-operation and Development (OECD) principles for AI,[81] its participation in the discussion of a global ethical framework for digital innovation and governance in mental health is ever more needed.

3. Strengthen psychosocial support to develop a people-centred digital system

How does digital mental health provision move from an individualised person-centred approach via an app on someone's phone to a large-scale collective planning and intervention process while addressing the individual needs of particular and vulnerable groups? This seems to be the conundrum facing the transformation of Chinese society on more than one level. However, if we think of what a 'Chinese model' of digital mental health could be, it is at the level of people-centred care that digital solutions need an integrated model from which to function.[82]

Digitalisation affects all levels of a social system and can have several impacts (at different levels) on mental health. Proposals being made for a new 'social contract for the digital age'[83] not only need to incorporate within mental health care concrete definitions of the therapeutic relationships between patients and providers, but also extend this reflection to further systemic considerations. A people-centred digital system in line with the Chinese Government's and society's goals and principles[84] is unlikely to be based on an individual, person-centred form of governance[85] (at least not for the time being). However, the market dynamics and societal demand in this context

77 Bower JL, Christensen CM (1995) Disruptive Technologies: Catching the Wave, *Harvard Business Review*, hbr.org/1995/01/disruptive-technologies-catching-the-wave, accessed 02.07.21.

78 Roberts et al, 2021, p.66,68.

79 Zhang L, (09.09.19) China: AI Governance Principles Released, *Library of Congress Law* [Webpage] loc.gov/law/foreign-news/article/china-ai-governance-principles-released, accessed 26.05.21.

80 See Roberts et al, 2021.

81 OECD, oecd.ai/ai-principles, accessed 26.05.21

82 The China Joint Study Partnership's 2016 policy summary and recommendations for the adoption of a *People-Centered Integrated Care* (PCIC) based on the WHO definition, is particularly relevant in this context, as China was already shifting its policy in this direction (World Bank Group (2016), *Deepening Health Reform in China. Building High-Quality and Value-Added Service Delivery, Policy Summary*, p.21, documents.worldbank.org/curated/en/800911469159433307/Deepening-health-reform-in-China-building-high-quality-and-value-based-service-delivery-policy-summary, accessed 19.06.21). Further recommendations by the World Bank and WHO for the model implementation in China followed in 2019 (World Bank Group (2019), *Healthy China. Deepening Health Reform in China. Building High-Quality and Value-Added Service Delivery*, documents.worldbank.org/curated/en/690791553844042874/Deepening-Health-Reform-in-China-Building-High-Quality-and-Value-Based-Service-Delivery, accessed 19.06.21). For a comprehensive view of related factors to integrated mental health care in China, see Liang D, Mays VM, Hwang W-C, (2018) Integrated mental health services in China: challenges and planning for the future, *Health Policy and Planning*, 33, 2018:107-122, doi.org/10.1093/heapol/czx137.

83 Saran S, Chapman T, Sharma M, (30.05.18) A New Social Contract for the Digital Age, G20 *Insights*, g20-insights.org/policy_briefs/a-new-social-contract-for-the-digital-age, accessed 16.06.21.

84 As a unifying principle, the concept of 'people-centredness derived from Confucian doctrines' brings attention to the holistic nature of understanding both individual and collective, as well as the surrounding environment as crucial elements in psychosocial support (J. Yang, personal communication, May 2021). In this holistic frameworks, alongside with brain development, the inclusion of the heart《心》is extremely important in conceptualising mental health in China (J. Yang, personal communication, May 2021). A people-centred approach is also one of China's main principles of economic and social development (Center for Security and Emerging Technology (02.12.20) 'Proposal of the Central Committee of the Chinese Communist Party on Drawing Up the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2030', cset.georgetown.edu/publication/proposal-of-the-central-committee-of-the-chinese-communist-party-on-drawing-up-the-14th-five-year-plan-for-national-economic-and-social-development-and-long-range-objectives-for-2030, accessed 24.04.21.

85 See Roberts et al, 2020.

add complexity to this landscape and, as explained, the issue of big data in this context can become a contested field.

Technological development is not the mere transposition of an offline existence into an online space without a much-needed social and human philosophy behind its construction. A people-centred approach needs to be understood as a significant social improvement, otherwise there is a risk of further alienation and the creation of more (not fewer) mental health problems. In this sense, existing plans for the *2021 Notice of Key Tasks for the National Psychosocial Service System*《关于印发全国社会心理服务体系建设试点2021年重点工作任务的通知》point to the need for a corresponding digital psychosocial support system that continues to strengthen mental health digital literacy and the 'accessibility of psychological resources'.[86] This includes the provision of digital training for current and future medical professionals,[87] and tackling specific digital divides analogous to existing geographical imbalances (in rural-urban and within-urban settings) in resource allocation and provision.[88] To improve quality of care, the inclusion of evidence-based digital interventions is crucial in this context, as building trust in a digital mental health system should become a priority moving forward, by strengthening regulatory and insurance systems and promoting a model of 'responsible innovation'.[89]

Conclusion: What does digital development mean for the future of mental health in china?

Easing the fear that digital will become ubiquitous for now, it seems the Chinese Government's intention during the first pandemic outbreak was to create a mixed online-offline system[90] to resolve major shortcomings in its existing mental health system and to be able to respond efficiently. This is an important factor to consider, as mental health professionals elsewhere were calling for action to speed up the adoption of blended models in a world hit by the COVID-19 pandemic.[91] Quintana called for a global 'integrated blended strategy',[92] as healthcare systems are still developing the incorporation of digital solutions or digitally transforming their existing structures.[93] Following the three areas mentioned, it is in this integrated path (internal, internal/external and offline/online) that we see what could be the main recommendations for China's future of digital mental health, adding to a consideration of its technological benefits an understanding of its foreseeable harms.

Solutions to the future of mental health will depend on whether technology is considered a temporary solution or a long-term sustainable intervention. In China, it seems the latter. However, a question to be asked, not just regarding China but globally, is whether the digital ecosystem will provide a fair, safe and healthy mental health landscape, or if it is 'too fast, too soon'. This is a particular problem for China's anxiety for economic growth in relation to social development and in the co-relationship between mental health and productivity.[94] What needs to be considered in this respect is that automation will be much needed in the future of work due to the lack of mental health professionals to meet demand,[95] the prospect of a falling demographic (as attested by China's recent Census, released on 11 May 2021),[96] and the population's shifting needs and demands in the pursuit of a better quality of life.

The push for innovation in this respect could create a double-bind situation in which the cure and the disease are the same. In a field in which the first steps are only now being taken, close, constant attention to the needs of people offline is necessary so as not to throw the baby out with the bathwater in the development of digital mental health in China.

86 Lu Q, Liu L, Wang Y, Shi L, Xu Y, Lu Z, Que J, Yue J, Yuan K, Yan W, Sun Y, Shi J, Bao Y, Lu L, (2020) Online Survey on Accessing Psychological Knowledge and Interventions During the COVID-19 Pandemic – China, 2020, p.801, *CDC Weekly*, 2 (41), 797-803, doi: 10.46234/ccdcw2020.218; see Qiu D et al, 2020 which mentions adding Wuhan to the list of pilot areas.

87 Torous J, Wylkes T (2020) Opportunities From the Coronavirus Disease 2019 Pandemic for Transforming Psychiatric Care with Telehealth, *JAMA Psychiatry*, 77 (12): 1205-1206, doi: 10.1001/jamapsychiatry.2020.1640.

88 Tong M, Xu J, 2020) The historical review of Chinese mental health policy since 1949, *China Journal of Social Work*, 13:3, 198-206, doi: 10.1080/17525098.2020.1763549.

89 *OECD Recommendation on Responsible Innovation in Neurotechnology* in WEF & Deloitte, 2021, p.61.

90 See, for example in Kang et al., 2020.

91 Wind et al, 2020; also Van der Vaart et al, Kooistra et al in Wind et al, 2020, p.1. We understand here the concept of 'blended' as a combination of online and offline services and in a broader definition, while the term also encompasses specific blended therapies (see, for example, 'blended cognitive-behavioral therapy (bCBT)' in Romijn,G, Provoost,S., Batelaan N., Koning J, Balkom Av, Riper H, (2021) Does it blend? Exploring therapist fidelity in blended CBT for anxiety disorders, *Internet Interventions*, 25:100418, doi.org/10.1016/j.invent.2021.100418.

92 Quintana, 2021, 3:22.

93 In the United Kingdom, for example, in 2019, the National Health Service created a unit responsible for its digital vision, NHSX.

94 N. Manning, personal communication, March 2021.

95 According to Liang and colleagues, although there is optimism in the increase of mental health professionals due to plans such as 'National Mental Health Working Plan (2015–20)', there is still a shortage and a need for training to meet the demand (Liang et al, 2018, p.114).

96 Davidson H, Ni V. (11.5.2021), China's population growing at slowest rate in generations, *The Guardian*, theguardian.com/world/2021/may/11/chinas-population-growing-at-slowest-rate-generations-one-child, accessed 17.05.21.

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Lau China Institute

Bush House, North East Wing,
40 Aldwych, London
WC2B 4BG