# MILKEN INSTITUTE

# Framing the Issues:
# Digital Mental Health in Asia

QUINTUS LIM

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The Milken Institute Asia Center extends the reach and impact of Milken Institute programs, events, and research to the Asia-Pacific region. We identify opportunities to leverage the Institute's global network to tackle regional challenges, as well as to integrate the region's perspectives into the development of solutions to persistent global challenges.

## ACKNOWLEDGMENTS

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# Executive Summary

This white paper was originally intended to be a landscape study for digital therapeutics in mental health—primarily software-based interventions that prevent, treat, or manage specific diseases and disorders in specific populations.[1] The Milken Institute ultimately pivoted towards a landscape study for digital mental health in Asia, with specific references to digital therapeutics where possible. This change is because the field of digital therapeutics is very young in Asia, and its boundaries are not widely agreed upon. In addition, initiatives under digital mental health can have valuable lessons for (and complementarity with) digital therapeutics in mental health.

The Milken Institute supplemented desktop research with more than 20 off-the-record interviews with stakeholders across Asia, including mental HealthTechs, researchers, regulators, and investors (henceforth "interviewees"). Any quotations throughout this paper that are both unnamed and uncited come from these interviews. Although the white paper's content is generally applicable across Asia, case studies and examples mostly focus on China, Japan, Singapore, and South Korea, which are the more technologically mature markets in health care. With health systems worldwide bracing for a wave of mental illnesses in the wake of COVID-19, the Institute hopes that this paper grants policymakers, investors, and innovators some clarity in this area of need and sparks further attention and efforts.

- Section 2 outlines the rising disease burden in mental health, while highlighting longstanding problems of under-provision, stigma, and high costs in Asia.

- Section 3 surveys the mixed results in governments' efforts to shift mental health care out of hospitals, the lack of uptake in insurance programs, and the fragmentation in community initiatives.

- Section 4 briefly describes seven technological innovations in mental health: digital phenotyping, virtual reality, neurostimulation, social media analytics, apps and platforms, games, and chatbots.

- Section 5 quantifies the investment landscape for mental HealthTech in Asia-Pacific. Developing markets face an almost existential demand for HealthTech, powering the majority of innovations in the region. Mature markets rely on their multipronged support for innovation. Mental HealthTech startups remain in the early stage and tend to see smaller funding rounds compared to HealthTech in general.

- Section 6 focuses on initiatives across China, Japan, South Korea, and Singapore to support young startups, establish data protection and privacy, and develop regulations and reimbursement for digital health. It also cites case studies from the US and Germany for further consideration.

- Section 7 explores the main challenges to digital mental health, such as study attrition, inconsistent app quality, the trade-off between data restrictions and innovation, and the increasing signs of a digital divide.

- Section 8 highlights case studies of collaborations and partnerships in six main areas: pharmaceuticals, insurers and employers, corporations and big tech, public-private partnerships, social impact bonds, and philanthropy. It also discusses challenges observed in these areas.

# Mental Health: Brace for Impact

## "The biggest mental health institutions in the United States are our prisons and jails."
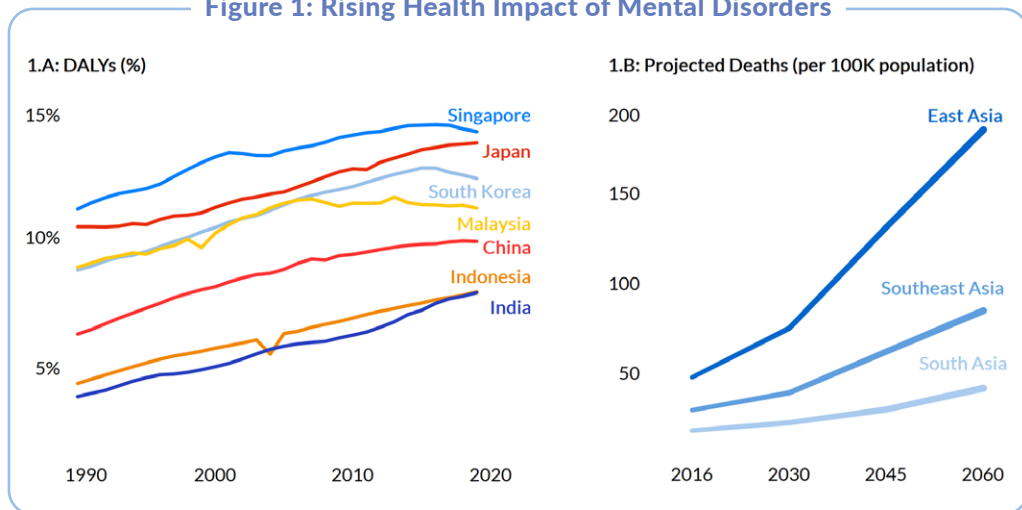
This striking message by a former US official[2] presents a sober warning to all countries worldwide, both on the costs of neglecting mental health and, more deeply, how each society wants to be known for its treatment of the mentally ill. The US has, by far, the largest spending on health care and is a world leader in research and innovation. Conversely, many parts of Asia are poorly resourced and unprepared to lift taboos, yet just as susceptible to mental illnesses, if not more. This leads to a sobering question for Asians: Are we any different?

More than a decade since the World Health Organization (WHO) declared "no health without mental health," its message bears heeding more than ever. Many countries have suppressed certain infectious diseases and chronic illnesses, but these successes have not been replicated in mental diseases. Across Asia, the share of disability-adjusted life years (DALYs) due to mental and neurological conditions has generally risen for the past three decades, growing more than 1 percent per decade (see Figure 1). DALYs per population have generally been rising as well. In 2018, it was estimated that one in seven people in Singapore had experienced mental illness at some point in their lives.[3] Similarly, in China, a nationwide study from 2012 to 2015 estimated that one in six had experienced a mental disorder, excluding dementia.[4]

That many countries do not conduct or regularly update mental health surveillance studies is further concerning. Policymakers cannot allocate resources adequately and efficiently without good visibility of mental illnesses. Sufferers may continue to feel isolated, which discourages them from seeking help. Health systems and other service providers lacking granular projections may have to rely on guesswork for investments in capacity and workforce. In Japan, for instance, the English-language mental helpline, TELL Lifeline, found to the staff's surprise that half their callers were Japanese nationals.[5] Similarly, counselors at the suicide-prevention center Samaritans of Singapore were surprised by the strong user traffic for their text messaging service, even though it was soft-launched with no initial announcement.
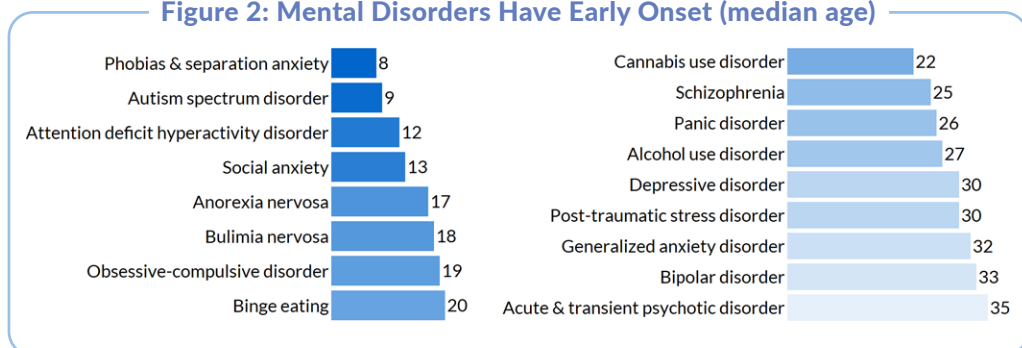
## Figure 1: Rising Health Impact of Mental Disorders

**1.A: DALYs (%)**

- 15%
- 10%
- 5%

Singapore
Japan
South Korea
Malaysia
China
Indonesia
India

1990  2000  2010  2020

**1.B: Projected Deaths (per 100K population)**

- 200
- 150
- 100
- 50

East Asia
Southeast Asia
South Asia

2016  2030  2045  2060

*Sources: Institute for Health Metrics and Evaluation (2020), World Health Organization (2016)*

The WHO forecast in 2016 that under "business-as-usual" conditions, projected deaths attributable to mental illness will grow exponentially over the next four decades (see Figure 1), almost quadrupling in Northeast Asia. Though already concerning, mortality statistics fail to capture the years of ill health that sufferers typically endure before the end of their lives. In contrast to other prevalent chronic diseases, mental illnesses tend to have a much earlier onset—by decades at times (see Figure 2). A meta-analysis of 192 studies found that the median age at onset was 12 years for neurodevelopmental disorders, 25 years for personality disorders, and 31 years for mood disorders.[6] This trend is also observed in Asia. In China, for instance, nearly 83 percent of those who received therapy on the psychotherapy platform Jian Dan Xin Li were aged 18 to 35 years.[7]

## Figure 2: Mental Disorders Have Early Onset (median age)

| Disorder | Age |
|---|---|
| Phobias & separation anxiety | 8 |
| Autism spectrum disorder | 9 |
| Attention deficit hyperactivity disorder | 12 |
| Social anxiety | 13 |
| Anorexia nervosa | 17 |
| Bulimia nervosa | 18 |
| Obsessive-compulsive disorder | 19 |
| Binge eating | 20 |
| Cannabis use disorder | 22 |
| Schizophrenia | 25 |
| Panic disorder | 26 |
| Alcohol use disorder | 27 |
| Depressive disorder | 30 |
| Post-traumatic stress disorder | 30 |
| Generalized anxiety disorder | 32 |
| Bipolar disorder | 33 |
| Acute & transient psychotic disorder | 35 |

*Source: Solmi et al. (2021)*

Onset in individuals' formative years can have adverse effects later in their lives. Those suffering from mental disorders have life expectancies 10 to 15 years lower than the general population.[8] Physical health and productivity are also heavily impacted. The WHO, for instance, estimates that every dollar invested in scaling up treatment for depression and anxiety will give a 400 percent return in better health and ability to work.[9] If anything, forecasts of exponentially rising deaths underestimate the challenge at hand.

Worsening matters, most data in Figures 1 and 2 were estimated before the onset of COVID-19. Post-traumatic stress disorders, anxiety, depression, and bereavement are highly associated with disasters. Lockdowns exacerbate this effect through social isolation, where people may feel as if they are facing hardships alone. During the pandemic, urbanites were confined to small living spaces in densely populated cities, even as they grappled with economic uncertainty. Youth, who experience high onset of mental conditions, lost access to counselors when schools were shut. Rising tensions have spilled over to other household members, with cases of divorce and domestic violence rising across Asia.

While the pandemic's impact has yet to be fully quantified, all indications point to plummeting mental health across the board. In a 2021 poll of 1,000 Singaporeans, one in four said they had considered suicide in the past year.[10] Separate surveys in China reported that a third of respondents from the general public experienced psychological distress,[11] half of health-care workers reported symptoms of depression,[12] and up to seven in 10 of those who had been infected with COVID-19 experienced mental and psychological symptoms.[13] The dean of Beijing University Sixth Hospital warned that COVID-19's impacts on mental health could last up to two decades.

## Shortages of Trained Health Workers

At the same time, scaling the provision of mental health care is already difficult, and made even more challenging by the global pandemic. Training a psychiatrist takes easily more than 10 years—an arduous and expensive journey that few can complete. In 2010, for instance, the Singapore government set a target of increasing its pool of psychiatrists by only 100 in 10 years,[14] underscoring just how time-consuming it is to cultivate a highly skilled health workforce. Meanwhile, Japan's Ministry of Health, Labour and Welfare spends US$900,000 a year training therapists in cognitive behavioral therapy.[15] As seen in Figure 3, most of Asia finds itself short of resources,

even though the numbers for South Korea, Singapore, and China have already doubled from a decade earlier.

Shortages in the workforce, then, result primarily in long waiting times for consultations that are brief and impersonal. This by itself could worsen a patient's condition due to additional stress and anxiety. In 2016, it was reported that psychiatric patients in Hong Kong had to wait up to 166 weeks for a consultation in a public hospital,[16] and the average consultation lasted six minutes.[17] A typical consultation in Japan lasts just 10 minutes,[18] and an interviewee based in China similarly remarked, "Our country only has 40,000 psychiatrists ... so no matter on-site or online, the problem is time." The lack of access is even worse for rural populations.
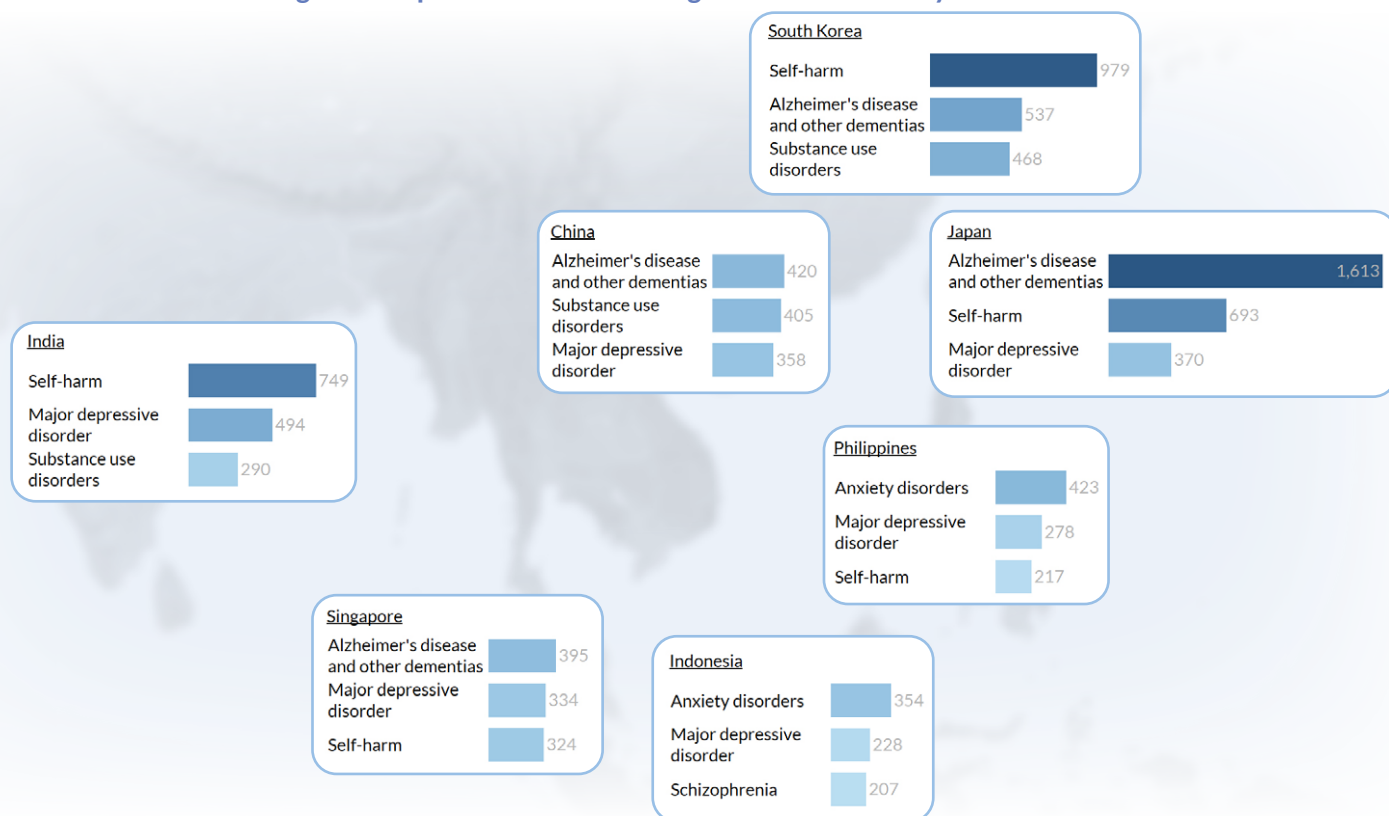
**Figure 3: Shortage of Capacity across Most of Asia (2016)**

| Psychiatrists (per 100,000 pop.) | Country | Beds for Mental Health (per 100,000 pop.) |
|---|---|---|
| 11.9 | Japan | 262.8 |
| 5.8 | South Korea | 110.2 |
| 4.2 | Singapore | 42.5 |
| 2.2 | China | 24.3 |
| 1.1 | Malaysia | 11.1 |
| 0.7 | India | 7.2 |
| 0.3 | Thailand | 6.8 |

WHO recommendation: 10
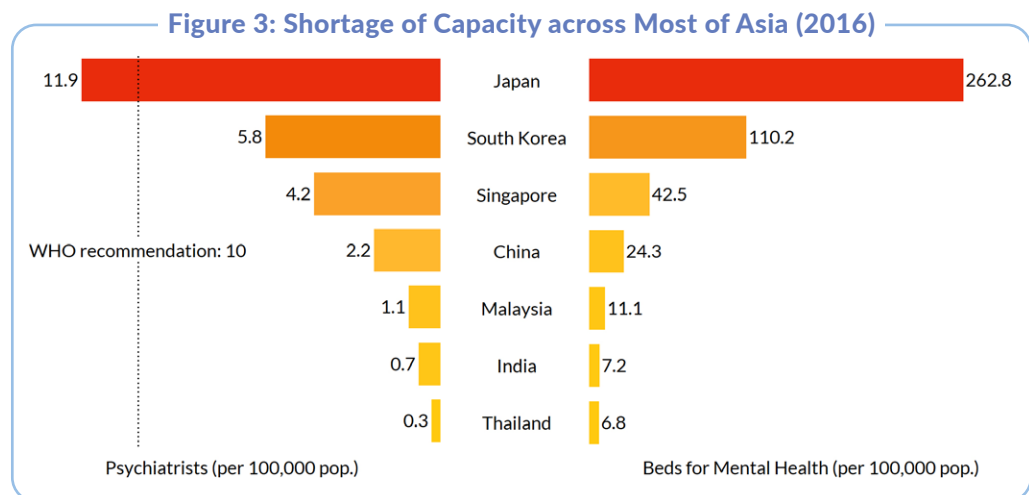
*Source: World Health Organization (2019)*

Looking at Figure 3, one might ask, "What about medical tourism or cross-border teleconsultation?" The significant differences in mental disease burden across Asia make this difficult (see Figure 4). For instance, South Korea and India both see high levels of self-harm, despite differences in size and income. And while countries with a larger aged population tend to see a higher disease burden of dementias, depression pervades the continent regardless of demographics and income. In short, epidemiologic variation further adds to already vast differences in language, culture, politics, regulations, and health-related contexts across Asia, making it difficult to provide cross-border care to the masses. One HealthTech interviewee in China remarked, "This mental health issue is highly culturally sensitive. I cannot take the intervention that we have in China and simply transfer that to Singapore

and some other places and hope it will work." Another, based in Japan, concurred: "It's not so difficult to develop an app. It's difficult to contextualize the app for another country and be successful."

**Figure 4: Top Mental and Neurological Conditions Vary Across Asia**

**South Korea**
| | |
|---|---|
| Self-harm | 979 |
| Alzheimer's disease and other dementias | 537 |
| Substance use disorders | 468 |

**China**
| | |
|---|---|
| Alzheimer's disease and other dementias | 420 |
| Substance use disorders | 405 |
| Major depressive disorder | 358 |

**Japan**
| | |
|---|---|
| Alzheimer's disease and other dementias | 1,613 |
| Self-harm | 693 |
| Major depressive disorder | 370 |

**India**
| | |
|---|---|
| Self-harm | 749 |
| Major depressive disorder | 494 |
| Substance use disorders | 290 |

**Philippines**
| | |
|---|---|
| Anxiety disorders | 423 |
| Major depressive disorder | 278 |
| Self-harm | 217 |

**Singapore**
| | |
|---|---|
| Alzheimer's disease and other dementias | 395 |
| Major depressive disorder | 334 |
| Self-harm | 324 |

**Indonesia**
| | |
|---|---|
| Anxiety disorders | 354 |
| Major depressive disorder | 228 |
| Schizophrenia | 207 |

*Note: Figures are for 2019 and expressed in non-age-standardized, disability-adjusted life years (DALYs) per 100,000 population.*
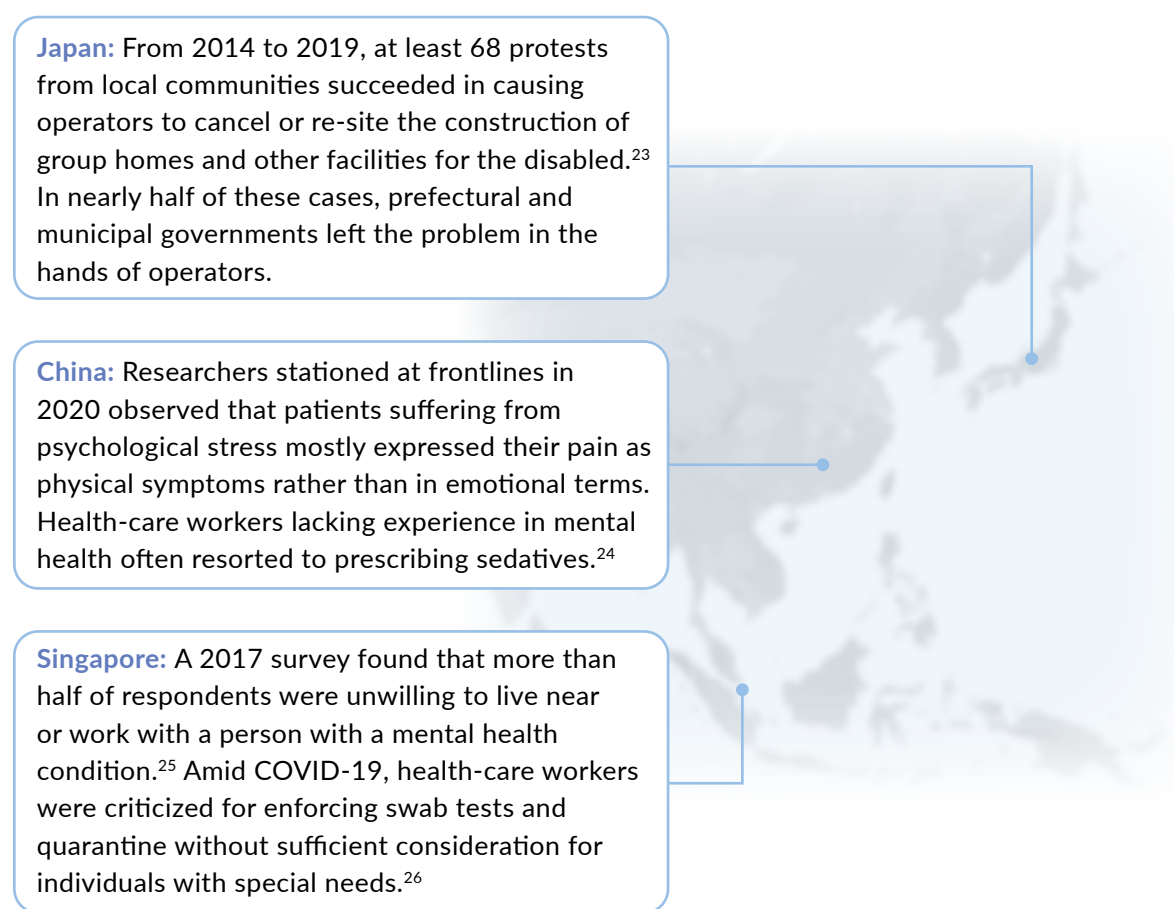*Source: Institute for Health Metrics and Evaluation (2020)*

That is not to say that all case studies and solutions are inapplicable. Above the implementation level, there is typically much inspiration to be drawn from various guidelines and frameworks originating beyond Asia. For instance, one study argued that the Substance Abuse and Mental Health Services Administration in the US contained cross-culturally valid concepts for Chinese service users.[19] Other researchers argued in 2011 that the concept of "recovery" in mental health remained nascent in Asia, and there was not even an official translation of the word in Mandarin.[20] Consequently, they recommended adapting the (foreign) Stages of Recovery Scale to local context.

## Stigma: Worse than the Disease?

Culture, beliefs, and stigma play a large role in mental health, perhaps more so than for other disease categories. Across Asia, different cultures carry different views surrounding mental illness, including familial shame, contagiousness, hereditary transmission, personal weakness, karma, fate, signs of moral "defect," divine punishment, lack of religious piety, and other superstitions.[21]

What complicates matters is variance; different places have different beliefs regarding various mental illnesses. In Singapore, drug- and alcohol-use disorders are commonly viewed as stemming from a lack of morality and discipline, as are nearly all forms of addiction. In Taiwan, survey respondents were more likely to attribute depression to stress but schizophrenia to innate biology. In turn, they were likely to view people with schizophrenia as being punished, possessed, or bearing bad luck.[22]

**Japan:** From 2014 to 2019, at least 68 protests from local communities succeeded in causing operators to cancel or re-site the construction of group homes and other facilities for the disabled.[23] In nearly half of these cases, prefectural and municipal governments left the problem in the hands of operators.

**China:** Researchers stationed at frontlines in 2020 observed that patients suffering from psychological stress mostly expressed their pain as physical symptoms rather than in emotional terms. Health-care workers lacking experience in mental health often resorted to prescribing sedatives.[24]

**Singapore:** A 2017 survey found that more than half of respondents were unwilling to live near or work with a person with a mental health condition.[25] Amid COVID-19, health-care workers were criticized for enforcing swab tests and quarantine without sufficient consideration for individuals with special needs.[26]

Stigma hinders care provision and stifles patient advocacy. Sufferers may avoid seeking help—and worse, health-care workers may avoid the field of mental health altogether. In China, nine in 10 sufferers have never sought treatment,[27] and despite efforts to ramp up mental services during COVID-19, utilization was as low as 3.7 percent.[28] Keeping mental illnesses under wraps further perpetuates a systemic lack of awareness and understanding throughout societies. In Singapore, stigma and the inability to recognize symptoms are the top two reasons for not seeking treatment.[29] Interviews with mental health experts in other Asian countries brought the same challenges to light.

## Overcoming Stigma

Optimistically, researchers in China observed that aversion to mental health interventions among patients and health workers alike lessened when they observed significant improvements in the mental health of other patients.[30] This pattern has been seen previously: Cancer used to be heavily stigmatized as it was perceived as a death sentence. After effective cancer treatments became available, however, people began to speak more freely about their experiences with the disease. For instance, interviewees noted that in Asia, patient advocacy for cancer was much stronger than for mental illnesses. This indicates that evidence-based treatments, when widespread, could help overcome stigma and preconceptions.

# High Costs of Care

The widespread treatment of mental illnesses, then, hinges primarily on costs. In Asia, a large proportion of health spending is already shouldered by the individual. Some countries also see high dependence on mental health institutions. For instance, a 2017 survey found that at least 1,773 mental health patients across Japan had been hospitalized for longer than 50 years.[31] In 2011, the average hospital stays for psychiatric patients in South Korea and Japan were 3.8 months and almost 10 months, respectively.[32] This is staggeringly high compared to the Organisation for Economic Co-operation and Development (OECD) countries' average of 0.9 months.[33] Moreover, patients' conditions may deteriorate after they leave clinically controlled hospital environments and re-enter the community.

Unfortunately, it is difficult for hospitals to change their care practices and abandon revenue streams. This challenge prolongs the shift away from hospital care. For instance, although community rehabilitation centers in South Korea have proliferated since 2001, an estimated 14 percent of mental health patients used services in mental hospitals in 2014. In contrast, fewer than 0.7 percent used services in community residential facilities in 2016.[34] Psychiatric treatment is also expensive. Inpatient bills for major affective disorders in Singapore, for instance, are markedly higher than for most other diagnoses, even after government subsidies.[35]

Total out-of-pocket payments accounted for 40 percent of mental health expenditure in Southeast Asia in 2017,[36] and the burden looks likely to worsen. Real out-of-pocket spending by 2050 is projected to grow by several multiples in many countries,[37] and surveyed health insurers expect mental and behavioral disorders to be among the top three conditions in terms of increasing costs by 2022.[38] Moreover, dollar costs may be just the tip of the iceberg. Studies have found that mental health patients in China, Singapore, and South Korea experienced trouble finding employment and insurance.[39] Although the studies for Singapore are dated, local interviewees believed that employees still do not trust their employers with personal mental issues, and one interviewee estimated that "1 to 4 percent at best" use employer-provided solutions for mental health. Taken together, these factors impel many individuals to forgo treatment, thus weakening detection by the health system.

# Existing Initiatives for Mental Health

The challenges of under-provision, debilitating stigma, and exorbitant costs have not gone unmet. Many countries across Asia have initiated a slew of countermeasures, including increased public funding, a shift toward community-based care, adoption of employee wellness plans, and various efforts to raise awareness and destigmatize mental illnesses. However, most initiatives remain nascent, and the tide has yet to turn.

## Government Funding and Community-Based Care

Governments across Asia have recognized the urgency of tackling mental illnesses and are increasingly dedicating resources to plug supply gaps. A common strategy among countries is not only to increase spending on mental health but also to shift care into the community, where it is less costly.

- South Korea introduced the Mental Health Act in 1995 to shift mental health services from hospitalization towards rehabilitation and reintegration into the community.[40] The government's first Five Year Plan for National Mental Health Promotion was established in 1998 to enable planning of mental health care at the national level, and updated every five years thereafter. From 2001 to 2015, community facilities increased fivefold.[41] In 2017, the Mental Health Act was revised to focus on mental health promotion for the general public and to strengthen patient rights. Amid COVID-19, counseling services were offered to those severely affected, with nearly 370,000 counseled in the first half of 2020 alone.[42]

- Japan enacted the Mental Health Law in 1987 to protect patient rights and promote community services. The legislation was revised in 1996 to build rehabilitation facilities nationwide,[43] and reimbursement was expanded in the 1990s to help outpatient psychiatric clinics sustain themselves financially. In 2006, reimbursement was increased for shorter hospital stays and decreased for longer stays. The 2013 Regional Health Care Strategic Plan designated mental disorders as one of five priority diseases, delegating prefectures to implement and evaluate mental health services.[44] This was one of the earliest instances of placing mental health services under regional control.

- China launched the National Continuing Management and Intervention Program for Psychoses (Program 686) in 2004. Program 686 represented the official inclusion of mental health services within public health and was aimed to integrate hospital and community care. Experts from the US and Australia conducted workshops on recovery-oriented services, helping care teams develop ways to leapfrog older models of symptom management.[45] In 2015, 29 provinces were asked to select one city to implement the program, integrate service delivery, and keep out-of-pocket costs under 10 percent.[46] By the end of 2016, 5.4 million patients were registered, with more than 88 percent receiving community services.[47] Mental health was further emphasized as a strategic priority in China's latest five-year plan (2021–2025).

- Singapore began focusing on primary prevention since the 2006 National Mental Health Blueprint, with initiatives subsequently continued under the Community Mental Health Masterplan. Since 2017, 50 community outreach teams have been set up, reaching out to more than 350,000 individuals with mental health needs.[48] The government also launched the Caregiver Support Plan in 2019 and formed a Mental Wellness Taskforce in 2020 to coordinate a national response to mental health. Moreover, the Youth Mental Well-being Network was formed in 2020 as a partnership linking the government, private sector, and community, and has shortlisted 24 projects focusing on strengthening emotional resilience and support systems for youth.[49]

While these governments should certainly be lauded for taking the plunge amid stigma and taboo, such efforts must be evaluated, strengthened, and accelerated. For instance, it is not easy to find updated mental health budgets, and the outdated statistics available tended to fall below 5 percent of health budgets, a ballpark figure experts recommend.[50] In Singapore, mental health made up 3 percent of total health expenditure in 2017,[51] and supplementary COVID-19 budgets in 2020 did not allocate resources toward mental health support or research.[52] Likewise, mental health occupied 3.8 percent of South Korea's government health budget in 2016.[53] Consequently, the same studies describing countries' shift toward community services also pointed out that local capacity was lacking. This partly explains why mental care remains highly hospital-centric in Japan and South Korea, despite decades of efforts.

Moreover, as many initiatives have just begun to accumulate momentum, policies can understandably conflict with one another. A common theme observed across all four countries above is that public reimbursement provides good coverage for hospital treatments but less for in-community services such as counseling.

**South Korea:** Medical Aid reimburses psychiatric inpatient care on a per-day basis (unlike other conditions), with no co-payments from patients.[54] This incentivizes extended hospitalizations. While outpatient psychiatric care is also reimbursed on a per-day basis, the rate is a tenth of average inpatient expenses.

**Japan:** The National Health Insurance covers psychiatric services but not counseling. A 50-minute counseling session can cost ¥5,000 (US$45),[55] whereas counseling in English can cost up to four times more. That said, some clinics vary fees according to clients' incomes.

**China:** A 2018 update to the Mental Health Law barred psychological counselors from offering psychotherapy; further restrictions vary based on region.[56] While these regulations are meant to protect patients, they inadvertently restrict access to psychotherapy.[57] The next alternative is counseling, which can cost individual patients as much as CNY1,200 (US$185) per session[58] and may still involve long waits.

**Singapore:** Citizens can withdraw only S$500 (US$368) annually from mandatory savings (MediSave) for outpatient treatment,[59] whereas public insurance (MediShield Life) recently extended its per-day coverage of inpatient psychiatric treatment from 35 days to 60 days per year.[60] Moreover, psychological services were classified as a "nonessential" service during lockdown, which cut off physical consultations for most patients.[61]

## Community-Based Care versus Local Understanding

It should not be assumed that providing care within the community automatically promotes local understanding. Local communities from Singapore to Taiwan to Japan have protested the construction of various care facilities in the community, and there is no reason to assume such attitudes will soften after construction is completed. In one study, among Taiwanese respondents who believed patients with depression to be dangerous, residents of areas with a higher volume of rehabilitation services maintained greater distances between themselves and patients.[62] Community-based services are but one plank of holistic mental health programs, which must also include sustained public awareness and educational campaigns.

## Private Insurance Coverage

Unfortunately, societies cannot bank entirely on public reimbursement to make mental care affordable. Governments worldwide resorted to high fiscal outlays amid COVID-19 and are consequently left with high debt at a time when interest rates are poised to rise. Asia is no exception, which leaves little room for expansions in mental health reimbursement.
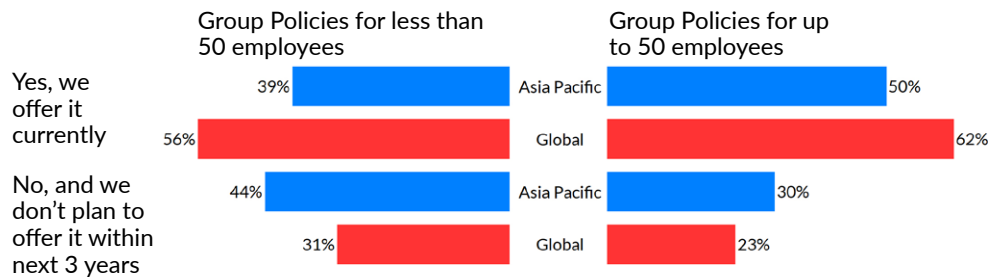
Taking a positive view, private insurance and InsurTech companies are paying increasing attention to mental health. A Swiss Re Institute report, for example, described mental health in the report title itself as an evolving market with "long-term promise for insurers."[63] Similarly, BCC Research estimates the Asia Pacific (APAC) corporate wellness market will grow from US$8.2 billion in 2020 to US$12.2 billion in 2026.[64] Insurer AIA has pioneered mental health coverage in Singapore and Malaysia. Corporate interest in wellness initiatives is also growing, with Aviva, NTUC Income, and Prudential Singapore offering psychiatric coverage. Moreover, according to CB Insights, the number of InsurTechs has steadily increased in China, India, Singapore, and Japan, looking to digitalize wellness programs extensively and optimize costs and benefits.

However, the results to date remain mixed. Pre-COVID surveys have shown that insurers in APAC are some of the least willing to insure mental health compared to other regions of the world (see Figure 5). In 2019, many insurers in APAC did not cover mental health and had no intention of doing so.[65] It would thus seem that the positive examples mentioned earlier are the exceptions to the rule, and it remains unclear whether COVID-19 has shifted priorities. Coverage is also poorer for smaller firms, which provide the bulk of jobs in Asia. Moreover, although private insurance has grown rapidly in Asia, it remains limited to higher-income segments and, again, does not necessarily include mental health. The same survey, for instance, found that while 84 percent of insurers in APAC provided wellness initiatives,[66] these were mostly focused on physical health. Most worrying is that some insurers who offered mental health coverage found to their surprise that uptake was very poor.

**Figure 5: Low Coverage of Mental Health in APAC**

Do you offer any mental health coverage, specifically related to managing behavioral health, stress and substance use?

| | Group Policies for less than 50 employees | | Group Policies for up to 50 employees |
|---|---|---|---|
| Yes, we offer it currently | 39% (Asia Pacific) | Asia Pacific | 50% |
| | 56% (Global) | Global | 62% |
| No, and we don't plan to offer it within next 3 years | 44% (Asia Pacific) | Asia Pacific | 30% |
| | 31% (Global) | Global | 23% |

*Source: Willis Towers Watson (2019)*

It is possible that most individuals do not (or prefer not to) think of themselves as being at risk for a mental condition. Interviewees also recounted that worries about the impact on employment and insurance have driven individuals to pay entirely out of pocket, to minimize any indications of mental illness on their medical records. What complicates matters is that insurers may have very little influence over stigmas. One interviewee in Singapore observed growing interest among clinicians and enterprises in coverage for mental illness after COVID-19, but consumer demand had yet to materialize. There is thus little immediate value in offering coverage and building partnerships if patients shun treatment, health practitioners avoid mental-health referrals, and employees do not trust their employers to be accepting of mental-health issues.

# Unique Initiatives to Destigmatize Mental Illnesses

Recognizing the challenge of stigma, many ground-up initiatives have employed unique ways to promote mental wellness and spread awareness. In Japan, the pop-up Restaurant of Mistaken Orders was created in 2017, staffed entirely by people with dementia. Thirty-seven percent of orders are generally wrong, a major selling point that reduces stigma and raises awareness.[67] The Korean online drama It's Okay To Not Be Okay centers on the romance between an author with autism and a caregiver. In 2020, the show topped the romance genre in Netflix Korea and was the most widely discussed drama online for eight consecutive weeks.[68] The Mental Health Innovation Network is a global community of donors, health practitioners, policymakers, and advocates who share innovative resources and ideas for improving mental health. Interactions with celebrity dogs famous on social media[69] and the use of AI-powered robots programmed to react to human speech[70] are also gaining traction.

Ground-up efforts play an indispensable role in spreading mental-health awareness. Using communication modalities that are highly attuned to local culture, their messages are agreeable and convenient. Many people in South Korea, for example, are already in the habit of paying to watch K-dramas, which means that a well-executed drama on mental health fits seamlessly into viewers' lifestyles while educating and prompting soul-searching (with the bonus of being financially self-sustaining). This serves as an important supplement to awareness programs produced by governments and the medical community, which, although factual, may lack in accessibility, virality, and audience engagement.

However, ground-up efforts usually occupy an isolated, piecemeal part of mental health, lacking integration with any node of the formal health system. This perhaps occurs naturally—due to patients' preference to form an intimate community of like-minded individuals or the fact that efforts are limited by the availability of volunteers' time. Most initiatives lack outreach and financial sustainability, and evidence of clinical efficacy is out of the question. Thus, important as these initiatives are, there is no easy way to include such efforts systematically in partnerships with government, insurers, employers, or the health system.

Given each of these limitations, current efforts are likely to be inadequate in sustaining mental health. What is positive, however, is that these disparate efforts have all contributed to the rising awareness of mental health across Asia (see Figure 6). This is crucial in spurring further action and innovation that can overcome

traditional constraints to deliver effective outcomes. The rest of this paper will focus on digital mental health—how HealthTechs are tackling mental illnesses in completely different ways through novel technologies and how various markets are setting them up for success.

**Figure 6: Rising Awareness of Mental Health**
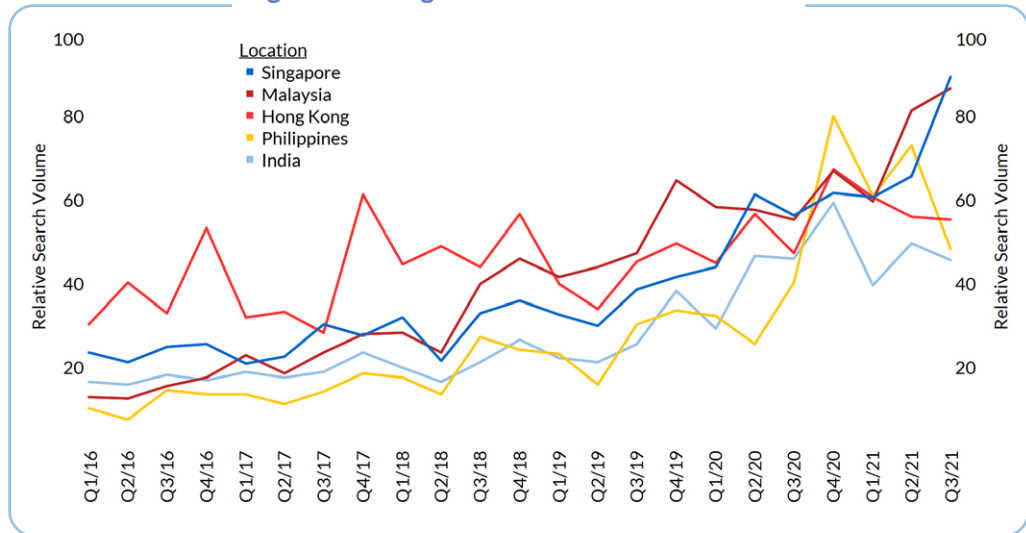


Note: Search volumes for "mental health" cannot be compared across locations as they are rescaled (between zero and 100) relative to the historical proportion of searches within each location. For visual clarity, monthly data were aggregated into quarters by simple averaging. As Google Trends only takes samples, different searches will return different numbers (though each location invariably has an upward trend).
Source: Google Trends (2021), Milken Institute staff calculations

# Technologies in Digital Mental Health

Modern medical technologic capabilities have advanced beyond Zoom-calling a doctor. Telemedicine platforms are linked to an ever-growing suite of services, including prescriptions, insurance, and delivery of care. Apps are promulgating health information to underserved populations and community health workers across Asia, particularly in rural areas. Machine-learning algorithms now assist with notetaking, triage, and diagnoses, while smartphones and internet-of-things devices facilitate long-term monitoring. This section gives a brief overview of seven areas of innovation in digital mental health: digital phenotyping, virtual reality, neurostimulation, social media analytics, apps and platforms, games, and chatbots.

## Digital Phenotyping

Passively generated data from personal devices such as mobile phones can be used to predict various disorders or relapses (see Figure 7). This can be particularly useful as a safety net when there are long gaps between consultations. In Australia and Singapore, HealthTech Cogniant uses phone sensors to detect symptomatic changes in behavior, helping to catch relapses in mental health conditions before they are manifest.[71] Early detection and prevention can be very useful in saving costs and improving brain health, especially because not all conditions have treatments, and some medications, such as for psychosis, can produce serious side effects. Moreover, the ability to monitor data passively can help shift care out of hospitals into the community setting, and the minimal effort required of patients could help mitigate high attrition in mental health studies (further elaborated in Section 7). Used perceptively, digital phenotyping could supply novel insights for the development of mental health solutions, such as digital therapeutics.

**Figure 7: Aberrations in Physiology and Behavior that Can Be Detected by Smartphones and Wearables**

| Illness/Measure | Accelerometry | Heart Rate | GPS | Calls and SMS |
|---|---|---|---|---|
| Stress and depression | Disruptions in circadian rhythm and sleep | Emotion mediates vagal tone, which manifests as altered heart rate variability | Irregular travel routine | Decreased social interactions |
| Bipolar disorder | Disruptions in circadian rhythm and sleep, locomotor agitation during manic episode | Autonomic nervous system dysfunction via heart rate variability measures | Irregular travel routine | Decreased or increased social interactions |

| Illness/Measure | Accelerometry | Heart Rate | GPS | Calls and SMS |
|---|---|---|---|---|
| Schizophrenia | Disruptions in circadian rhythm and sleep, locomotor agitation or catatonia, diminished overall activity | Autonomic nervous system dysfunction via heart rate variability measures | Irregular travel routine | Decreased social interactions |
| PTSD | Inconclusive evidence | Autonomic nervous system dysfunction via heart rate variability measures | Inconclusive evidence | Decreased social interactions |
| Dementia | Dementia, disruptions in circadian rhythm and sleep, diminished locomotor activity | Inconclusive evidence | Wandering away from home | Decreased social interactions |
| Parkinson's disease | Gait impairment, ataxia, dyskinesia | Autonomic nervous system dysfunction via heart rate variability measures | Inconclusive evidence | Voice features can indicate vocal impairment |

*Source: Reinertsen and Clifford (2018)*

# Virtual Reality

Virtual reality (VR) is uniquely able to capture the senses by using highly immersive and interactive environments, which makes it an effective tool for modulating attention.[72] Moreover, new environments can be constructed and disseminated just as easily as any software update. Research over the past three decades suggests that this redirection of attention may play a key role in the management of serious conditions such as pain and anxiety. VR today is also increasingly undergoing trials in other areas.

For example, Cedars-Sinai Medical Center in Los Angeles has seen clinical

successes in using VR to alleviate pain and addiction, and is expanding into anxiety and depression.[73] In China and the US, the HealthTech Cognitive Leap uses VR to track children's cognition, emotional regulation, and behavior, which assists doctors in diagnosing ADHD.[74] Rehabilitation centers in Shanghai use VR and eye-movement tracking to measure and treat addiction,[75] while Shanghai Invision Digital Technology uses VR to help children with autism improve their communication skills.[76] In light of patients' reluctance to leave their homes, various institutions in Singapore are codeveloping a VR therapist bot to bring treatment to patients via mobile devices synchronized to the hospital's system.[77]

## Neuromodulation
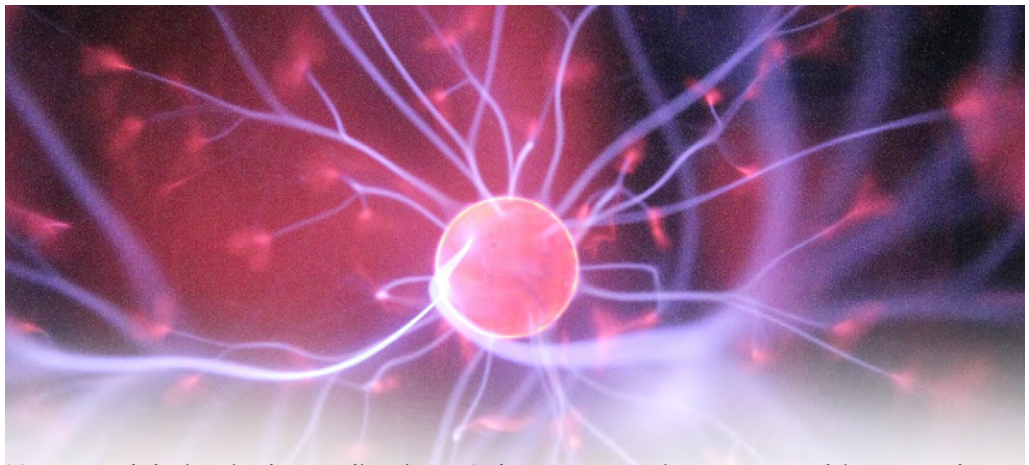


Neuromodulation is the application of electromagnetic energy to drive neural function. It can be invasive or noninvasive. With the advances made over the past half-century, neurostimulation therapies have emerged as an effective treatment for a growing number of medically resistant neurologic and neuropsychiatric disorders.[78]

Neuromodulation has also proved its cost-effectiveness in early treatment, with its capacity to reduce hospitalizations, surgical procedures, and misuse of opioid medications.[79] An additional benefit is user-centricity: Patients can first try it for themselves to assess its effectiveness before committing to an implant.[80] Ybrain in South Korea is one of the many HealthTechs bringing neurostimulation to the mental health market. The company created an electrical stimulation headband to improve major depressive disorders and symptoms; it received the green light from domestic regulators in 2021.[81] Ybrain is currently applying for regulatory approval in the US.

## Social Media

The explosion of social media use over the past decade, concurrent with breakthrough advances in natural language-processing algorithms, means that posts on social platforms can be scanned with increasing accuracy for signs of mental illness. Twitter posts and Instagram photos of sufferers have been found to be indicative of major depression, while suicidality, schizophrenia, and the severity of eating disorders can also be diagnosed or predicted by social media indicators.[82] Studies are also expanding into the detection of signs and symptoms, such as self-harm and stress. For example, a study analyzing posts on Reddit found that language used in nonclinical channels (Subreddits) could be used to distinguish mental illnesses and predict future postings to clinical Subreddits.[83]

From 2013 to 2018, there were at least 75 solutions monitoring messages posted on public social media forums worldwide to predict mental disorders.[84] For instance, Tree Holes Rescue in China is a team of volunteers who use machine learning to monitor messages posted on Weibo. The algorithm sounds warnings when the risk of suicide is deemed to be high.[85] Although the monitoring capacity is limited to 3,000 posts a day, the team saved more than 1,000 people from July 2018 to November 2019,[86] averaging out to one to two people daily.

## Apps and Platforms

Worldwide, there are around 20,000 mental health apps ranging from education to diagnostics and treatment (see Figure 8).[87] In Asia, the scarcity of mental health workers means that apps could be distressed individuals' only channel for help, especially in rural areas. Strong stigmas also suggest that individuals may prefer to use apps and the internet, rather than friends and family, for information and support. On the positive side, multiple meta-analyses have found that apps are moderately efficacious in aiding with depression and anxiety.[88] In parallel, one public provider in Singapore noted that high education levels in the city-state raise the prospects for self-care aided by apps.



**Figure 8: Approaches Used by Mental Health Apps**
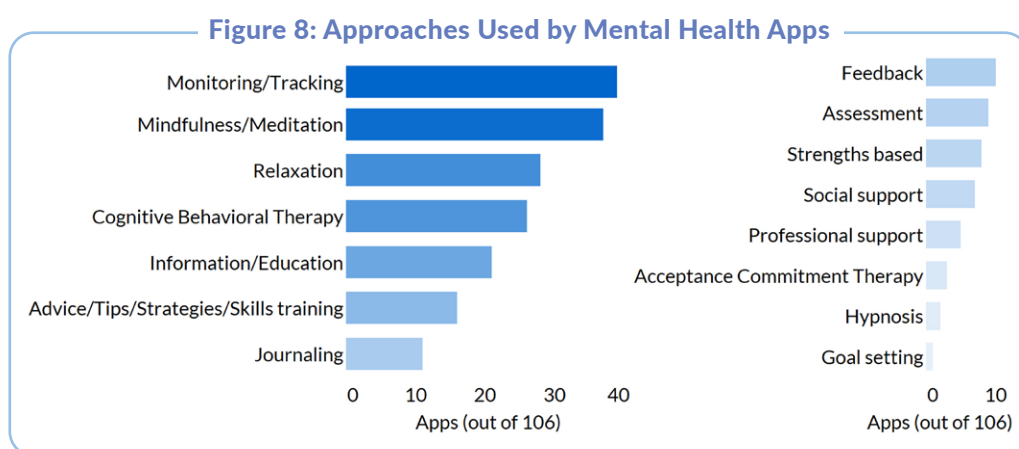
*Source: Alqahtani and Orgi (2020)*

China in particular is witnessing a growing digital psychotherapy landscape, including online platforms such as Hao Xin Qing, Song Guo Qing Su, and Jian Dan Xin Li. iiMedia Consulting expects online psychotherapy users to increase to 66.1 million in 2020, from just 3.2 million in 2016.[89] A white paper in 2019 further quantified the benefits of remote over physical consultations in China.[90] While internet-based treatments for mental disorders had direct treatment costs comparable to those of physical consultations, indirect treatment costs (such as the loss of productivity due to time spent) were three times lower, thereby halving the overall (direct plus indirect) costs of treatment. This has further benefits for medication adherence. For instance, while half of patients with depression typically stop taking medication after four months, user retention on the Hao Xin Qing platform stood at 74 percent a year after the initial consultation.

# Games

Mental HealthTechs are branching increasingly into the use of games. For example, Shah et al. report the positive outcomes of 24 studies employing digital intervention games in a wide range of mental disorders.[91] In Asia, Japan's Hikari Labs employs a video game called SPARX—a role-playing game that treats depression using cognitive behavioral therapy. In a trial in New Zealand, SPARX demonstrated significantly higher remission rates for adolescents with moderate depressive symptoms, in contrast to face-to-face counseling.[92] For all other outcomes measured, it did not underperform counseling.



HealthTechs using games as interventions can face some doubts in uptake, as older generations in Asia tend to view gaming with disdain. But whether or not Asia's elderly will admit it, many of them temporarily discarded their criticisms of gaming during the introduction of Pokémon GO, a free-to-play, location-based mobile game relying on augmented reality. Crowds of seniors hit the streets in force, with a zeal that left even Gen Z bewildered. Studies have found that step counts among 55 to 64-year-olds remained elevated even seven months after they were introduced to the game,[93] a track record many wellness programs can only dream of.

Pokémon GO bears two key lessons for mental HealthTech and digital therapeutics. First is the need for games to be fun. This is far easier said than done; the gaming industry is brutally competitive and, often, unseasoned companies put out underwhelming games that users quickly abandon. Second is the importance of identifying the unique value that non-health-care players can bring and, paradoxically, knowing when strategically to let health take a back seat to achieve better health outcomes. Imagine how differently Pokémon GO would have turned out had its focus been on encouraging exercise!

## Chatbots

Modern advances in natural language processing have also enabled the creation of chatbots that mimic human conversations. Trained specifically for mental health, chatbots such as Woebot and Wysa can function as virtual therapists accessible 24/7. Studies have shown that they are better at reducing symptoms of depression when compared to just providing online information. In addition, people express themselves more freely with a chatbot than with a human therapist.[94]

Huge sensitivities around mental health have brought contradictory accounts to the surface. Psychiatrists interviewed insisted on the sanctity of trust between patients and providers. However, results of studies,[95] entrepreneurs,[96] and survey findings have demonstrated that most people prefer speaking with a robot instead of a live interlocutor. For instance, a global survey found 82 percent of respondents opined that robots could support their mental health better than humans,[97] as they believed that robots would not judge, were unbiased, and provided real-time answers to questions.

A possible reason for these contradictions is the difference in target audiences. Severe cases require more personalized, sophisticated treatment, where patient-provider trust is a prerequisite. A failure to establish trust can dissuade patients from follow-ups, leading psychiatrists to conclude the importance of trust once again. However, most cases of mental disequilibrium are mild and, when coupled with stigmas, understanding that the condition is relatively mild leads people to seek solutions that give answers fast, pass no judgment, and demand minimal time commitment. This squares poorly with the long waits for short consultations currently observed in Asia's under-resourced mental health systems. For example, Jo Aggarwal, the cofounder of the chatbot Wysa, said that Wysa's AI takes as little as 15 minutes to deliver a cognitive behavioral therapy-based breakthrough with a user. In contrast, therapists typically require three sessions to achieve such a development.[98]

This is not to say that chatbots will replace doctors. Studies have found that mental health chatbots sometimes give "template" answers or misunderstand patients, and are best suited for mild cases, where individuals remain unsure whether to commit.[99] Telling a psychiatrist that one wishes to discontinue treatment can cause discomfort, but people have no compunction in ignoring a chatbot's messages, knowing that the robot will remain available and non-begrudging, as always. Conversely, serious cases remain the specialty of human professionals. In particular, some Asian cultures prefer to leave uncomfortable topics unsaid, counting on skilled listeners to draw inferences from their understanding of the domain and local context. It is these very conditions under which chatbots suffer, as language algorithms perform best when all relevant information is stated explicitly, precisely, and succinctly. Chatbots can thus help alleviate mild symptoms and provide basic information to the masses. Psychiatrists can then focus their attention on severe cases and perhaps have chatbots conduct regular check-ins between consultations.

A final point is that many of these innovations are built on external technological platforms and hence continuously undergo exogenous improvements. Social media platforms are developed independently of organizations that monitor social media for mental illnesses, with the latter enjoying increases in target population at no extra cost. Research on machine-learning architectures, and the training of massive language models, are performed and expensed at universities and technology companies, which chatbot developers can cheaply tap into. Similarly, advances in smartphone sensors will continue to improve the prospects of digital phenotyping, without mental HealthTechs having to invest their own R&D. HealthTechs can leverage external improvements as a multiplier while they focus specifically on developing better mental health products and services.

# Mental HealthTech Investment and Innovation

Technological capability is one thing, but demand is another. The fundamental need for health digitalization differs across markets in both form and magnitude. In massive developing countries, such as China and India, the need for HealthTech is almost existential: Services, staff, and facilities are simply unavailable, while the traditional development pathway takes too long and costs too much. These conditions create a demand for HealthTech that is both massive and long-lasting, especially in China, which is experiencing rapid population aging and slowing population growth. For instance, leaders of the largest HealthTechs in China, already considered highly successful by global standards, often remark that there remains so much to be done domestically that there is little focus on international expansion. Aided by large populations, the sheer magnitude of demand in China and India has translated into staggering volumes of HealthTech innovations. That said, problems of fragmentation and interoperability also tend to be significantly larger, and most patients remain frugal, suppressing profit margins. In addition, the development of offline health capacity, which HealthTechs rely on, remains challenging as ever.

The need for HealthTech is undoubtedly less urgent in mature markets, where economic growth and cost-cutting form the main imperatives for innovation. Japan and South Korea count on innovation as a key (and perhaps only) economic pillar amid slowing growth. Demographically, rapid aging, lengthening lifespans, and rising societal expectations drive long-term demand for health- and disease-management solutions. Having well-established health systems comes with both pros and cons. Strong public health gives mature markets the space to focus on mental health and a strong pipeline of offline solutions primed for digitalization, although it reduces the urgency for change. Ubiquitous access to high-quality education creates robust talent pools and better awareness but also raises salary expectations and intersectoral competition for labor. High incomes and wide-ranging health services make for strong market revenues that catalyze innovations, but also higher prices, which the industry guards jealously.

Singapore shares the demographic trends and dependence on innovation of mature markets, while its small population size acts as a double-edged sword. Market size and talent pool remain limited on one hand, but on the other, attaining OECD levels of health-worker ratios may be neither possible nor desirable, given the labor demands of other sectors. This creates a permanent demand for health digitalization and automation, on top of an international mindset not always seen in large countries. Longstanding priorities on cost control have kept health spending low, but this also suppresses revenues needed to finance innovation and reduces room for risk-taking.

According to the HealthTech venture tracker Galen Growth, there were nearly 130 mental HealthTechs in APAC as of August 2021, which have cumulatively raised more than US$410 million in investment funding. Unsurprisingly, mental health occupies a small portion of the broader APAC HealthTech market, given the challenges described in Section 2. From 2016 to the first half of 2021, digital mental health formed less than 5 percent of HealthTech ventures in APAC and accounted for less than 4 percent of HealthTech investment funding. Most mental HealthTech ventures, including those using digital therapeutics, remain in the early stages of funding and development (see Figure 9). Nearly a quarter of APAC's mental HealthTechs have received regulatory approval, mostly in the areas of medical imaging and diagnostic tools.



Figure 9: Nascent Mental HealthTech Venture Ecosystem in APAC
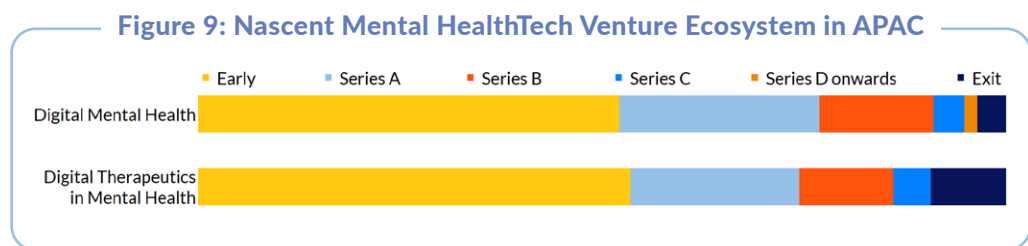
*Source: Galen Growth (2021)*

The mental HealthTech ecosystem in APAC looked highly promising until 2020, but it tanked unexpectedly in 2021 (see Figure 10). While it remains too early to understand the drop fully, for now, it seems that 2020 was an anomalous year. Dario Heymann, the chief research officer of Galen Growth, shared that most mental HealthTechs remain centered around telecounseling and Employee Assistance Programs. Such specialization requires high volumes of customer usage and a deep network of local providers for profitability. However, the high costs of acquiring both users and counselors, coupled with the challenges described in Section 2, can push mental HealthTechs beyond the levels of risk that investors are willing to tolerate.
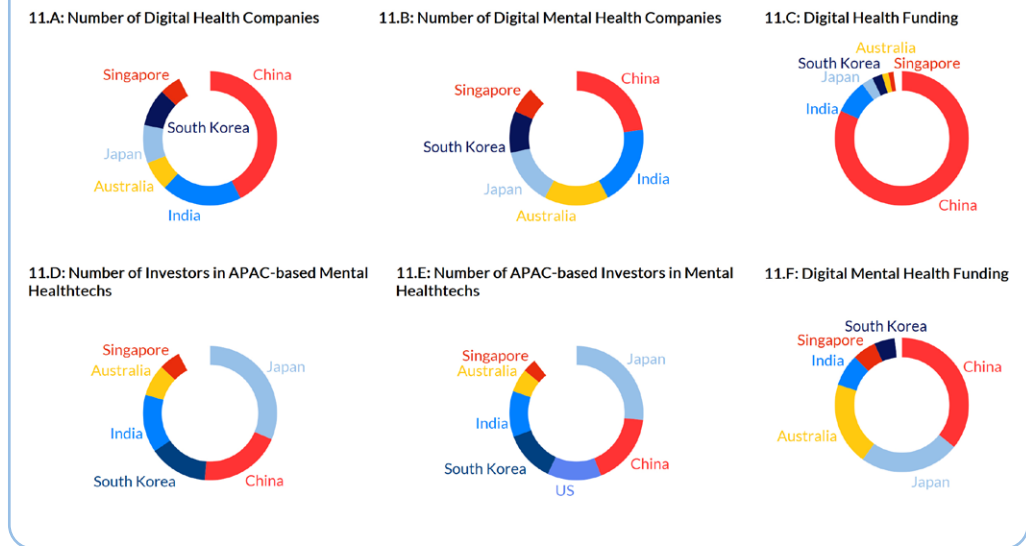
**Figure 10: APAC Mental HealthTech Funding and Deals since 2016**
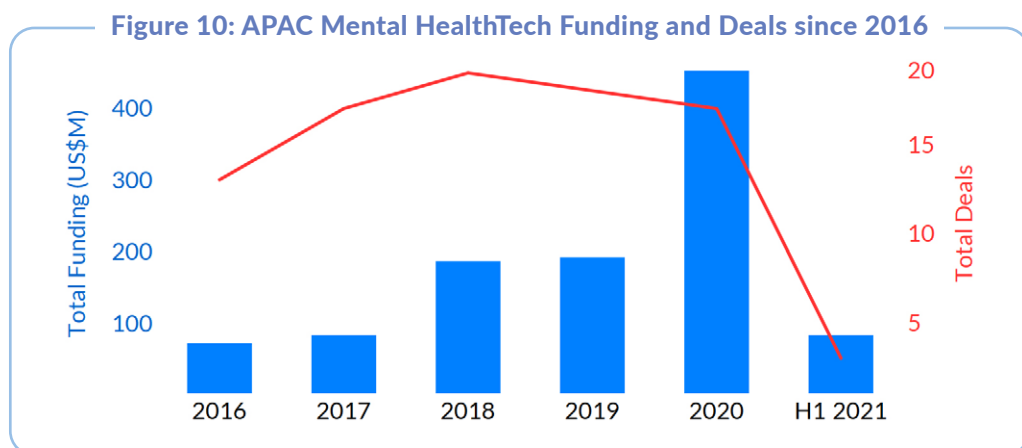


*Source: Galen Growth (2021)*

A further possibility is that many investors expect COVID-19 to trigger a wave of mental illnesses and thus sought to gain limited exposure to a sector with which they are less familiar. This could have led to disparate, one-off investments in mental HealthTech with no underlying momentum. Suggestively, data from the venture tracker CB Insights show that among the APAC-based investors who have invested in mental HealthTechs, less than 7 percent have invested in more than one.

In contrast to trends over time, the geographic distribution of ventures and investors in both HealthTech and mental HealthTech yields more consistent patterns. Australia, China, India, Japan, Singapore, and South Korea collectively represent between 88 percent and 99 percent of the APAC market, with China consistently taking the lead (Figure 11.A, B, C, and F). These six countries also account for the majority of APAC-based investors in mental HealthTechs worldwide (Figure 11.D). That said, when the global investors that have invested in APAC-based mental HealthTechs are counted, US-based investors form a significant share behind Japan and China (Figure 11.E).

**Figure 11: Share of Digital Health Companies and Funding in Asia (2016—August 2021)**

11.A: Number of Digital Health Companies

11.B: Number of Digital Mental Health Companies

11.C: Digital Health Funding

11.D: Number of Investors in APAC-based Mental Healthtechs

11.E: Number of APAC-based Investors in Mental Healthtechs
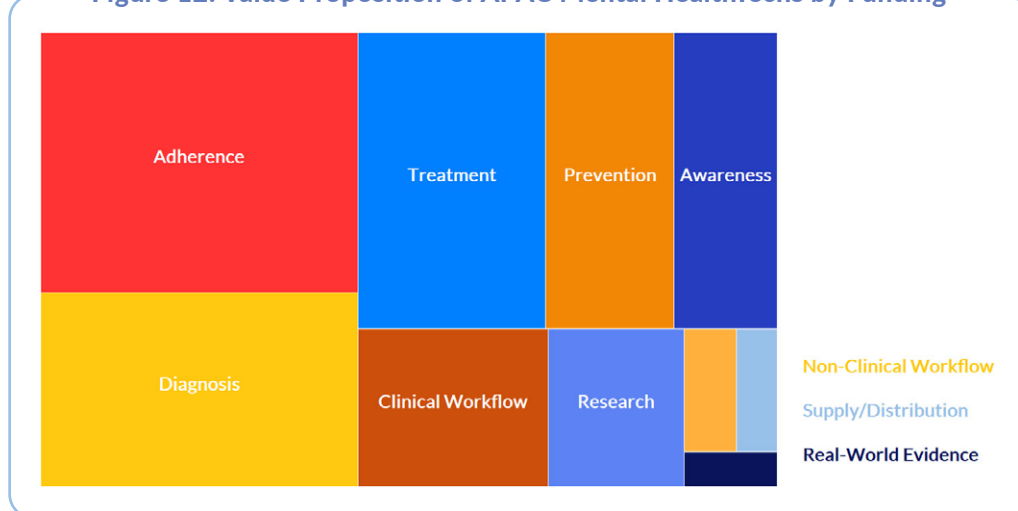
11.F: Digital Mental Health Funding

*Source: CB Insights (2021), Milken Institute staff calculations*

According to Galen Growth, most mental HealthTechs in APAC were focused on adherence followed by diagnosis, treatment, prevention, and awareness (see Figure 12). Specifically for digital therapeutics in mental health (which can cut across these categories), Japan, Australia, China, India, and South Korea are currently leading in APAC, with one venture each in Australia, Japan, and South Korea having secured regulatory approval. CB Insights data further indicate that Japan and South Korea lead in the number of investors in digital therapeutics (for all diseases), and their funded ventures are mostly based in APAC as well. That said, as digital therapeutics remains at a very early stage of development in Asia, frontrunners have not solidified their lead.

**Figure 12: Value Proposition of APAC Mental HealthTechs by Funding**

Adherence

Treatment

Prevention

Awareness

Diagnosis

Clinical Workflow

Research

Non-Clinical Workflow
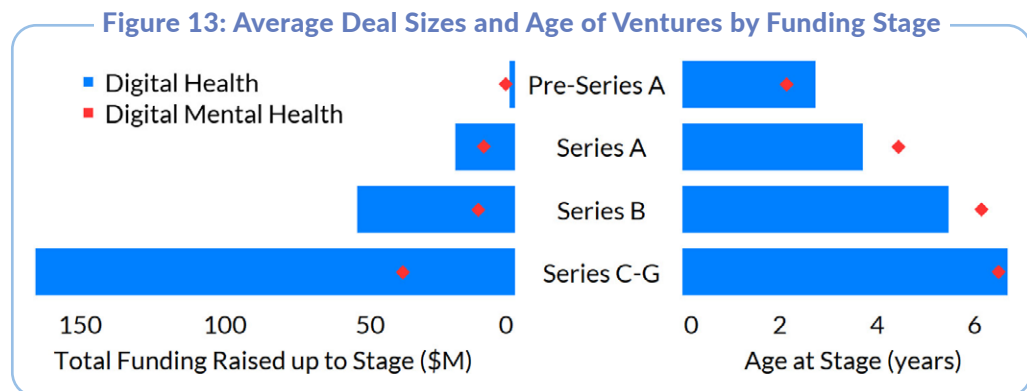
Supply/Distribution

Real-World Evidence

*Source: Galen Growth (2021)*

HealthTech interviewees throughout Asia pointed out that there was still some way to go in investor education, as many investors remain unfamiliar with digital mental health and uncomfortable with the longer timelines. One HealthTech further shared that much wealth in Asia remains in the hands of the older generations, where stigmas against mental illnesses tend to be strongest. However, knowing the relevant figures for APAC may help to assuage some investor concerns.

Historically, mental HealthTechs in APAC see considerably cheaper funding rounds across most funding stages compared to broader HealthTech. As seen in Figure 13, for mental HealthTechs that attained Series B stages and above, their average cumulative funding raised up to that point sits at a fifth to a quarter of their counterparts in digital health. Most mental HealthTechs are at the pre-Series-A stage, and they attained this juncture at an earlier age than general HealthTech ventures. On average, the mental HealthTechs that progressed to Series C onwards reached that milestone before the seven-year mark.

Note, however, that the data in Figure 13 are averaged among ventures that have succeeded in reaching the respective funding stage. Not all HealthTechs can accomplish this, and some HealthTechs exit before reaching the later stages. It does not mean that all mental HealthTechs will require similar funding to get to the same stage in the same time.

**Figure 13: Average Deal Sizes and Age of Ventures by Funding Stage**

- Digital Health
- Digital Mental Health

Pre-Series A
Series A
Series B
Series C-G

Total Funding Raised up to Stage ($M)

Age at Stage (years)

*Note: Ventures included in later stages are excluded from earlier stages. For instance, for a venture included in Series C onwards, its earlier funding rounds are excluded from calculations for Series B, Series A, and so on.*
*Source: CB Insights (2021), Milken Institute staff calculations*

While digital therapeutics in mental health is young and has minimal representation in Figure 13, there are indications that timelines could be even shorter. For instance, the Korea Evaluation Institute of Industrial Technology estimated that the development of a digital therapeutic can cost as little as US$8.5 million, 300 times less than the development of a drug.[100] And while the development of a drug typically takes more than a decade, digital therapies can be completed in four years.
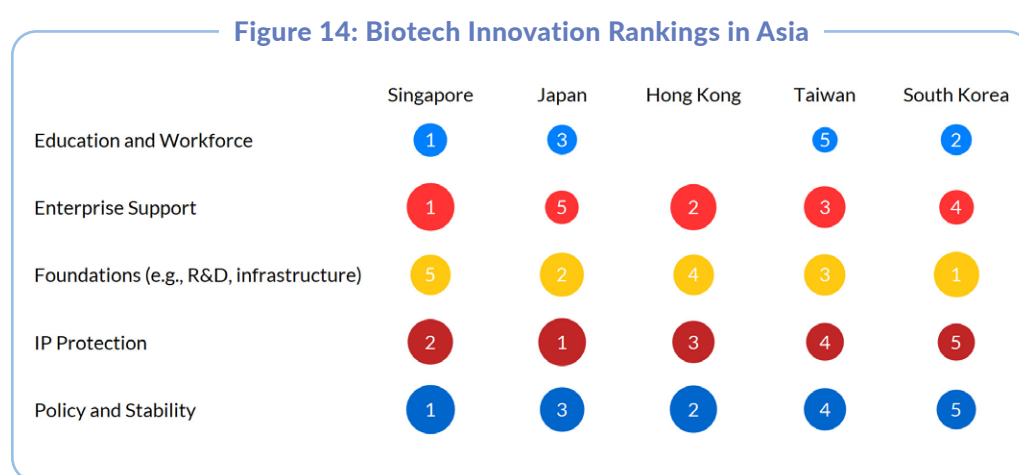
## Research and Development

Venture formation and tracking offer interesting insights, but the relatively primitive stage of this area means that few trends have solidified over the past few years. It is thus useful to look specifically at indicators relevant to mental HealthTech innovation. One noteworthy report is Scientific American Worldview's biotechnology innovation rankings (the Global Digital Health Index is highly relevant to this area, but at the time of writing, it does not include the main markets for HealthTech investment and innovation in Asia). Although focused on biotechnology rather than mental HealthTech, it has a good selection of markets in Asia, and most of its indicators—such as R&D funding, postgraduates in science, intellectual property protections, and support for enterprises[101]—are also highly relevant to digital mental health, making it a useful proxy. As shown in Figure 14, mature markets take the top five rankings for virtually all selected metrics. In other words, although developed health systems lack the demand that drives innovation in China and India, they

compensate through high-quality infrastructure and ecosystem development. This also extends to regulations and policy support for innovation, which will be covered in Section 6.

Unsurprisingly, different markets have different strengths. Singapore does well worldwide in terms of support for enterprises and the stability of its policy environment, which reduces the political risk for innovators and investors alike. Japan's strong intellectual property protections give investors confidence that innovations can be defended, and South Korea's strong history of R&D funding has helped to cultivate a deep private R&D ecosystem across various fields, filling funding gaps between innovation and commercialization.

**Figure 14: Biotech Innovation Rankings in Asia**

| | Singapore | Japan | Hong Kong | Taiwan | South Korea |
|---|---|---|---|---|---|
| Education and Workforce | 1 | 3 | | 5 | 2 |
| Enterprise Support | 1 | 5 | 2 | 3 | 4 |
| Foundations (e.g., R&D, infrastructure) | 5 | 2 | 4 | 3 | 1 |
| IP Protection | 2 | 1 | 3 | 4 | 5 |
| Policy and Stability | 1 | 3 | 2 | 4 | 5 |

*Note: The numbers reflect each market's rankings in the selected metrics, while the size of the bubble reflects the absolute score from zero to 10*
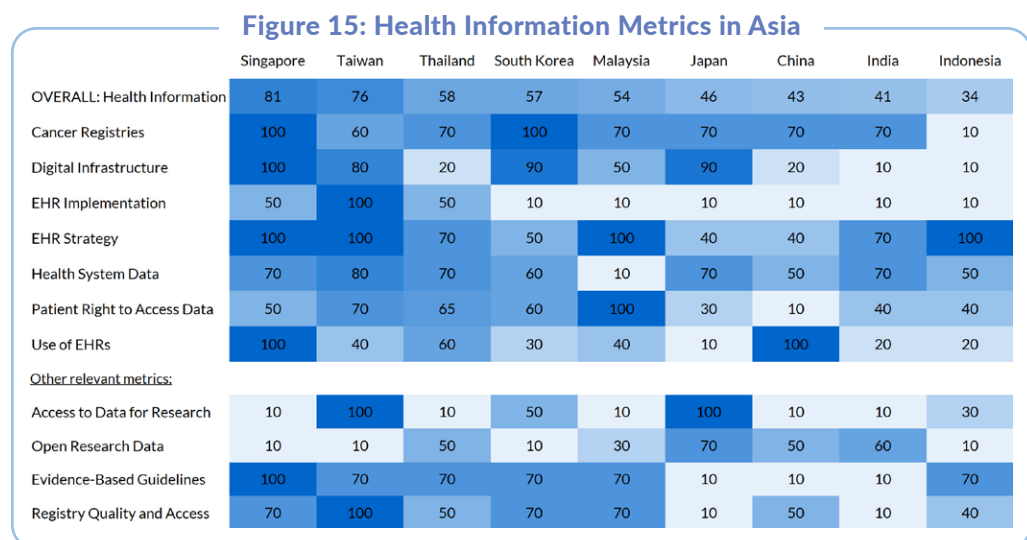*Source: Select indicators from thinkBiotech LLC (2021)*

In addition to innovation metrics, the field of health care uniquely requires hard evidence for innovations to flourish, especially for HealthTechs lacking deep connections and networks in their market. One HealthTech interviewee shared that employers often asked: "How do I know whether this works, and what is the return on investment?" Similarly, the AI chatbot Wysa was able to expand across the UK, US, and Singapore[102] only after it had established clinical validity, met the National Health Service UK's DCB 0129 Standard of Clinical Safety,[103] and had been estimated to save at least $300 million a year in costs.[104] Three indicators can be used to assess evidence generation: health information systems, academic publications, and patents.

# Health Information Systems

Hard data on clinical efficacy are needed to secure regulatory approval. In turn, the ability to access high-quality data, and combine them with data from other domains to generate unique insights, depends on the quality of health information systems and disease registries, and the level of access. In partnership with Roche, the Copenhagen Institute for Future Studies published a Personalised Health Index for Asia-Pacific in 2021.[105] The index was based on the input of 16 local experts across the region, and, helpfully, one of the key indicators in the study was health information. Other metrics from the study, which were related to data access but not classified under health information, were also included.

As seen in Figure 15, Singapore and Taiwan perform best in terms of health information. Singapore scored high on its advanced digital infrastructure and use of electronic health records, whereas Taiwan excelled in the quality of and access to its disease registries. Japan scored relatively low under health information but outperformed most other geographies in digital infrastructure and data access.

## Figure 15: Health Information Metrics in Asia

| | Singapore | Taiwan | Thailand | South Korea | Malaysia | Japan | China | India | Indonesia |
|---|---|---|---|---|---|---|---|---|---|
| OVERALL: Health Information | 81 | 76 | 58 | 57 | 54 | 46 | 43 | 41 | 34 |
| Cancer Registries | 100 | 60 | 70 | 100 | 70 | 70 | 70 | 70 | 10 |
| Digital Infrastructure | 100 | 80 | 20 | 90 | 50 | 90 | 20 | 10 | 10 |
| EHR Implementation | 50 | 100 | 50 | 10 | 10 | 10 | 10 | 10 | 10 |
| EHR Strategy | 100 | 100 | 70 | 50 | 100 | 40 | 40 | 70 | 100 |
| Health System Data | 70 | 80 | 70 | 60 | 10 | 70 | 50 | 70 | 50 |
| Patient Right to Access Data | 50 | 70 | 65 | 60 | 100 | 30 | 10 | 40 | 40 |
| Use of EHRs | 100 | 40 | 60 | 30 | 40 | 10 | 100 | 20 | 20 |
| Other relevant metrics: | | | | | | | | | |
| Access to Data for Research | 10 | 100 | 10 | 50 | 10 | 100 | 10 | 10 | 30 |
| Open Research Data | 10 | 10 | 50 | 10 | 30 | 70 | 50 | 60 | 10 |
| Evidence-Based Guidelines | 100 | 70 | 70 | 70 | 70 | 10 | 10 | 10 | 70 |
| Registry Quality and Access | 70 | 100 | 50 | 70 | 70 | 10 | 50 | 10 | 40 |

*Note: Each metric is scored from 0 to 100. Some of the underlying data were collected before the onset of COVID-19, when health digitalization accelerated in many locations.*
*Source: FutureProofing Healthcare (2021)*

## Academic Publications

Interviews with stakeholders revealed that much of Asia's innovation in digital mental health remains driven by the academic sector. Academic publications are thus a useful indicator for evidence generation in mental health. The "H-index" is the chosen measure for quality, expressing the number of articles (H) that have received at least H citations. For example, Japan's H-index for neuroscience was 365, meaning it has 365 articles that were cited at least 365 times. Compared to measures such as citations per document (which Singapore and Japan top), the H-index incorporates the quantity of publications. This means geographies with fewer publications will naturally have a smaller H-index. This is appropriate because it is intended as a proxy for the prevalence of evidence for mental health, not its concentration. Clinical evidence studies similarly require the number of participants to attain a certain size for statistical confidence; thus, incorporating absolute scale is important.

Figure 16 plots the H-index for publications in neuroscience and psychology across Asia from 1996 to 2020.[106] Japan and China lead in the quality of publications in neuroscience and psychology. A secondary research cluster comprises India, Hong Kong, Singapore, South Korea, and Taiwan, distinct from the rest of Asia. Developed markets saw a stable growth rate in publications over the last two decades, while publications from China and India grew exponentially. For instance, China had a number of neuroscience publications similar to South Korea and Taiwan in 1996, and it surpassed Japan in 2011.



**Figure 16: H-Index of Mental Health-Related Publications in Asia (1996–2020)**
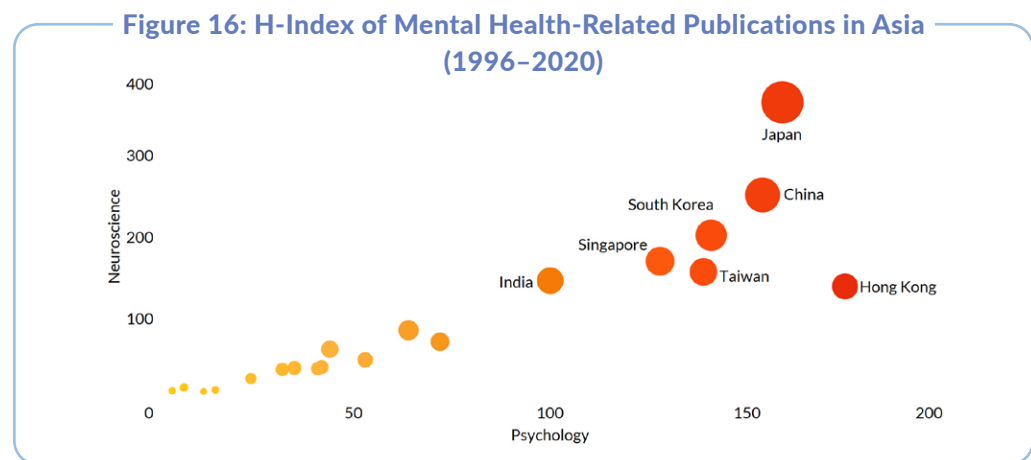
*Note: The list of journals included can be found on the SCImago website.*
*Source: SCImago Journal & Country Rank (2021)*

# Patents

Patents are a widely used measure of innovation and are key in defending innovations and securing funding. Mental HealthTech interviewees shared, for instance, that patents are a prerequisite to government grants in Singapore. Figure 17 shows the total patents for six proxies of mental HealthTech: digital communication, computer technology, analysis of biological materials, medical technology, biotechnology, and pharmaceuticals. These geographies represent the applicant's origin, not where the patent application was filed, because the patents granted internationally are a better measure of quality. Japan, China, and South Korea dwarf the rest of Asia for patents granted in these six categories. China recently overtook Japan in granting digital communication and pharmaceutical patents, though Japan currently maintains its lead for the rest. Further noteworthy is China's vast progress in recent years, with nearly half of its patents in the past two decades obtained in the past three years alone.



Figure 17: Patents Granted by Applicant's Origin
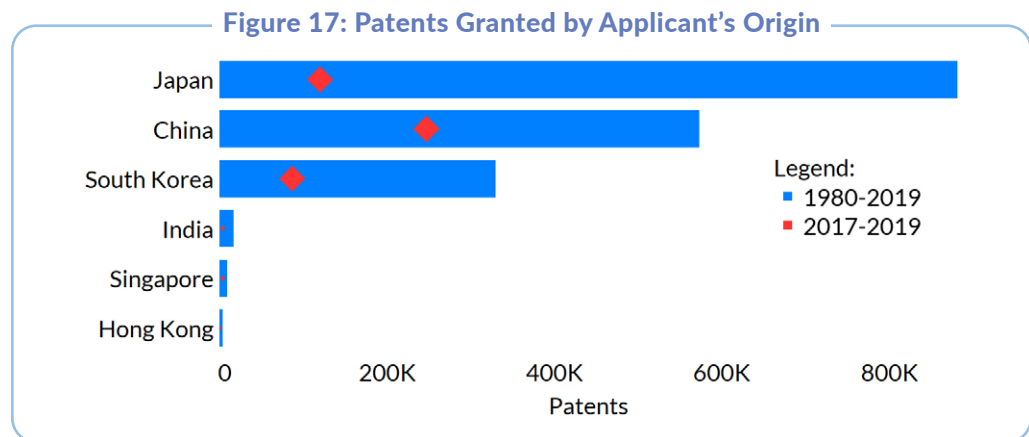
*Source: World Intellectual Property Organization (2021)*

## Data Quantity versus Quality

While these three metrics offer useful shorthands, they ultimately provide a limited snapshot of the broader environment in which real-world evidence is generated, particularly with regard to data quality. A market's reputation for high-quality clinical trials, for instance, can play an important role in the credibility of studies. Concerns with data bias are also increasing. A Singapore-based practitioner commented, "The problem is a lot of the therapeutic products today are English-based." Ensuring a diversity of patient mix can be one way to improve the quality of the rising number of databanks being curated across Asia, for example, thereby establishing confidence that clinical interventions will be applicable to broader swaths of Asia, not just local ethnicities.[107] Similarly, Singapore-based Holmusk secured its entry into the US market partly by acquiring the rights to MindLinc, an industry leader in behavioral health management solutions developed at Duke University.[108]

## Service Integration

Integrated health systems assist the assimilation of innovations by the broader population. Mental HealthTechs can embed themselves into existing platforms or incorporate an increasing range of services to bridge the patient journey, improve quality of care and, ultimately, build trust and loyalty. For example, Omada Health was a pioneer in digital therapeutics in the US, focusing initially on interventions for people with pre-diabetes. Today, it has expanded into a "constellation of hyper-personalized care pathways," employing physicians, social workers, diabetes educators, and digital health coaches.[109] Similarly, due partly to the expansion of its diagnosis and treatment services, China's Hao Xin Qing platform saw average monthly expenditures increase from CNY83 in 2016 to CNY666.5 in 2019.[110] As mental HealthTechs gain users, they may find themselves incorporating multiple therapeutic solutions and even combining them with social, employment, and housing services.

Integration itself further enables innovation by allowing data to be combined across multiple domains to generate unique insights. For instance, the Malaysia-based digital therapeutics startup Naluri initially engaged with disinterested employers and insurers through chronic diseases, pivoting to mental health after demonstrating a link between both areas.[111] Similarly, Singapore's Holmusk originally started in chronic disease management with its GlycoLeap program before shifting towards building a real-world evidence platform in mental health. Data it had previously collected on chronic diseases could subsequently be integrated with mental-health data to uncover additional insights.

Two studies in APAC are relevant to user-centricity and service integration. The first is the aforementioned Personalised Health Index, which assesses the maturity of health information systems, user-centricity of services, and deployment and reimbursement of wearables, as well as various partnerships and policy frameworks to facilitate personalized care. The second is a 2016 Mental Health Integration Index by the Economist Intelligence Unit, evaluating the integration of mental health into the community.[112] The index assesses health systems in four main areas: (1) factors enabling a stable home and family life, including secure housing and financial support; (2) factors enabling access to health care and social services, including outreach and awareness programs; (3) employment opportunities; and (4) policies to combat stigma and protect human rights.

As seen in Figure 18, health systems that scored highly in one also scored highly in the other. Unsurprisingly, developed health systems performed the best in both. Singapore and Taiwan both leveraged technology extensively to capture integrated medical records, uncover insights, and push health and care towards greater quality and cost efficiency. Taiwan, South Korea, and Japan have well-established public insurance programs that reimburse a wide range of health services for their entire populations, with relatively high financial coverage. Having broadly ensured health access and equity, these health systems concentrated more efforts and resources into developing patient-centered, integrated care. This in turn provides wider opportunities for the integration of digital mental health solutions.



**Figure 18: User-Centricity and Service Integration in Asia**
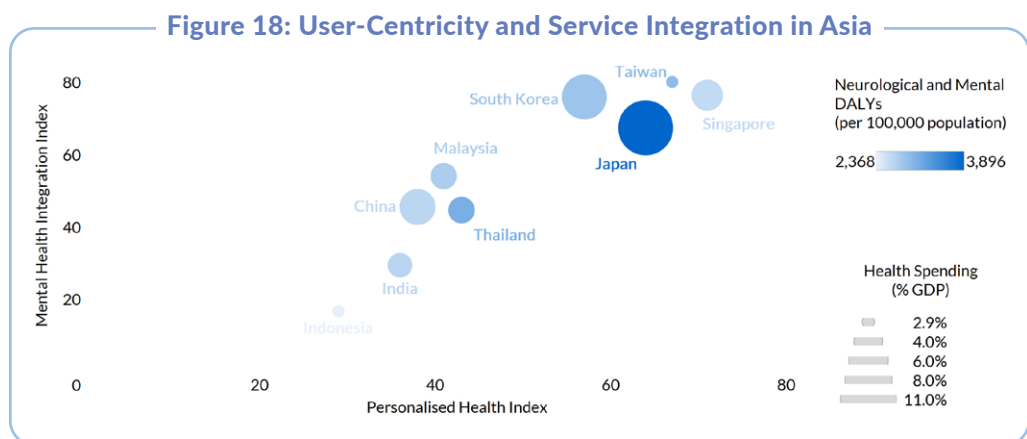
*Sources: FutureProofing Healthcare (2021), Economist Intelligence Unit (2016), Institute for Health Metrics and Evaluation (2020), World Health Organization (2018)*

# Policies Supporting Innovation

Governments have a dominant role to play in supporting science, technology, and innovation. In Asia, this naturally extends to health care and digital health, given governments' extensive involvement in health care and their focus on cost-efficient public health. This section assesses existing government efforts that have a bearing on digital mental health, including innovation funding, data protection, regulations, and reimbursement.

## Supporting Young Startups

Various markets have implemented multiple programs to catalyze ideas and innovation in HealthTech and build networks and connections linking multiple sectors together.

In 2016, Kobe city in Japan partnered with a US-based accelerator, 500 Startups, to launch the 500 Startups Kobe Accelerator. The program pairs shortlisted startups (from Kobe and worldwide) with experienced entrepreneurs and professionals from innovation centers such as Silicon Valley for two-month mentorships and culminates in a pitch event for potential investors. By 2020, the program had raised US$110 million in funding for 71 startups. The 2019 and 2020 editions also had HealthTech-specific themes, during which half the shortlisted applicants were HealthTech related.[113]

The South Korean government organized the K-Startup Grand Challenge 2021 to attract 60 overseas startups for a three-and-a-half-month residency program in Pangyo Techno Valley, a tech hub near Seoul.[114] Sponsors of the initiative include national conglomerates Samsung, Hyundai, SK, LG, Shinhan, and Lotte Group, and the program has seen US$1.25 billion in investments.[115] Similarly, the Korea Trade-Investment Promotion Agency has cohosted the Grants4Apps accelerator program since 2017 with Bayer Korea. The latter offers mentorship and coworking spaces for three shortlisted startups each year, culminating in a pitch and networking session.[116]

Singapore established the National Health Innovation Center in 2014 to provide the clinical research sector with translational funding and strategic guidance to accelerate health-care innovation. Further, it launched the Singapore Health

Technologies Consortium in 2019 to pool together industry-academia collaborations nationwide. The government also partnered with Sydney-based BlueChilli[117] and US-based Nex Cubed[118] to launch HealthTech-focused accelerator programs. This complements private initiatives such as the yearly HealthTech Cohort program initiated by Singapore-based Galen Growth. Galen Growth's 2021 cohort features 25 HealthTech startups (17 based in Asia) and will receive support from companies such as Amazon Web Services, Baker McKenzie, Hubspot, and Found8.[119]

Interviewees based in China shared that while there are no major sources of national funding for startups, local governments, particularly in medium-sized cities, were viewed as very supportive and are known to give startups many privileges, such as tax relief.

## Establishing Data Protection and Privacy

Developing trust is also vital if mental health solutions are to gain traction. As explained above, stigma and the impacts on unemployment and insurance coverage are some of the consequences people with mental health issues will have to live with should their data be shared without their permission. Singapore-based mental HealthTech Safe Space, for example, does not share individual information even with payers, unless users provide explicit consent.[120] Cognitive Leap even has an in-house legal counsel to train staff on data security. More broadly, a key route by which governments can help develop such trust is the formulation of regulations ensuring data security.

- South Korean data regulations that apply to the health sector include the Personal Information Protection Act (PIPA) of 2011 and the Guidelines for the De-identification of Personal Information of 2016. For clinical research, the Bioethics and Safety Act law requires written consent and review by an institutional committee before sharing data with third parties.[121]

- Japan's Act on the Protection of Personal Information was passed in 2003, and amendments in 2015 required it to be updated every three years.[122] A 2020 update raised penalties for noncompliance, expanded the right of individuals to demand the erasure of their data, required mandatory reporting of breaches in certain cases, and restricted the transfer of data across borders.[123]

- Singapore's Personal Data Protection Act (PDPA) was established in 2012 and amended in 2020[124] to govern the collection, use, disclosure, and care of personal data by the private sector. Public agencies are exempt from the PDPA and are governed instead under the 2018 Public Sector (Governance) Act. In 2019, the government further enacted an overhaul of data security measures in public agencies, which is due for completion in 2023.[125] Researchers are often required to be on-site to access data in health facilities.

- China has no single, comprehensive personal data protection law,[126] although provisions exist in several pieces of legislation, such as the 2016 Cybersecurity Law.[127] In 2018, the National Health Commission issued the Administrative Measures on the Standards, Security and Service of National Health and Medical Big Data (Trial), requiring organizations to ensure data security and backup mechanisms, and restrict data access and usage.[128] The Data Security Law will become effective in 2021, regulating data processing activities[129]; the draft Personal Information Protection Law,[130] which will clarify personal information processing rules, data subject rights, and the obligations of personal information processors, is under consideration.

## Data Privacy versus Data Protections

Technically speaking, data privacy and protections are distinct. To paraphrase the data-storage company Cloudian, data protection addresses policies defining who has access to data, whereas data privacy addresses mechanisms to implement such policy restrictions.[131] Users control privacy whereas companies ensure protection. Both are needed—guidelines alone do not bar access by unauthorized users and, likewise, one can restrict access in some areas while still leaving sensitive data vulnerable.

Several indexes can be used to assess data privacy and protections across the region. The law firm DLA Piper assesses the availability of data protections, including looking beyond formal laws and agencies that are primarily tasked with data protection.[132] This is important: That formal laws and agencies do not yet exist in developing Asia does not mean data protections are nonexistent, as seen in the case of China. Complementing this, One Trust DataGuidance assesses data privacy through its Privacy Index,[133] evaluating aspects such as data processing, marketing, third-party management, security controls, subject rights, and impact assessments. Finally, ground

sentiment is also an important measure of how these policies and mechanisms are perceived. GlobalWebIndex's Data Confidence Index,[134] a 2018 survey, compared data confidence across several countries in Asia.

Figure 19 displays the assessments of all three indexes. The darker the color, the higher the level of protections, privacy, or confidence. That said, higher is not always better: Data restrictions incur trade-offs, as discussed in Section 7. While there is some correlation between data protection and privacy, notable exceptions emphasize that these are two separate concepts. For instance, although Hong Kong was categorized as having heavy data protections, data privacy is deemed weak. Only Singapore and South Korea scored in the top categories for both data protection and privacy. How protections and privacy relate to confidence is even more confounding. As pointed out in the Data Confidence Index, data confidence is inevitably influenced by data literacy and, more importantly, cultural and political factors that may not be at all related to recent digitalization. As such, this is not to say that low data confidence is due to poor protections. If anything, protections tend to stem from privacy concerns. The fact that markets with the heaviest data protections are middling in data confidence (rather than at the bottom) suggests that privacy mechanisms assuage concerns to some extent.

**Figure 19: Data Protections and Confidence**
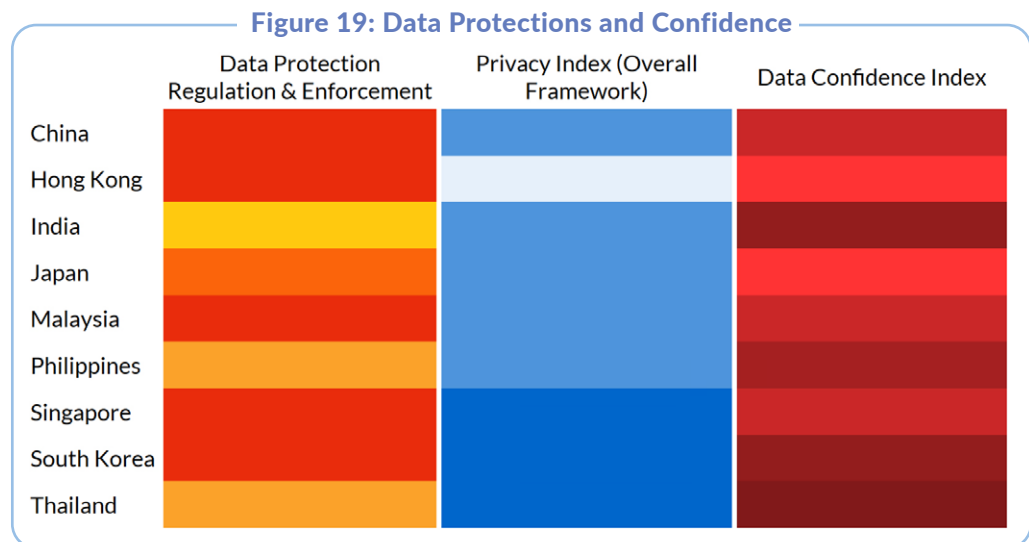


Sources: DLA Piper (2021), One Trust DataGuidance (2021), GlobalWebIndex (2019)

Notably, data protections have come up relatively late in Asia and are not always focused on health care. Asia's HealthTechs commonly state first and foremost that they are "HIPAA compliant," then append local regulations in the latter half of their sentence. This is in reference to privacy and security rules under the US 1996 Health Insurance Portability and Accountability Act. The same can be said for standards in securing regulatory approval, as discussed next.

## Regulatory Approval

Frequently raised during interviews was the need for regulations to give innovators certainty but also the lack of regulations specific to digital mental health. A HealthTech interviewee in Japan shared that pharmaceutical companies could certainly finance a clinical trial, as gaming app trials cost only US$5 million to 6 million. However, regulatory uncertainty makes the companies hesitant to do so. In parallel, both APACMed[135] and the Center of Regulatory Excellence (CoRE) at Duke-NUS Medical School[136] state that risk classifications across Asia do not yet adhere to best practices. And while parts of developed Asia have regulations for software as a medical device, HealthTech interviewees shared that guidelines by the US Food and Drug Administration (FDA) remain much more comprehensive. Consequently, they mostly follow FDA regulations instead. While this may create additional costs upfront, it has at least three benefits. First, the US is by far the most lucrative health market in the world, and securing FDA approval at least opens the possibility of entry into the market. Second, by being compliant with the highest standards, mental HealthTechs become more resilient to changing regulatory environments in their domestic markets. Third, securing FDA approval has a "branding" effect. Several regulators, such as Singapore's Health Sciences Authority, recognize approvals from other reputable regulators and grant expedited pathways.[137]

That said, according to CoRE, regulations worldwide, even in the FDA, lack clarity in newer areas such as digitally enabled decentralized clinical trials and the use of novel endpoints for HealthTech.[138] For instance, the use of cloud-based systems for regulatory submissions in the US remains conceptual for now.[139] Conversely, there are also signs of development in newer areas such as digital therapeutics. For instance, Japan, Singapore, and South Korea are among the eight countries worldwide with regulatory pathways encompassing digital therapeutics.[140] Both Japan[141] and Singapore[142] approved digital therapeutics solutions for addiction in 2020, and South Korea approved its first clinical trial for digital therapeutics in 2019.[143]

**The Association of Southeast Asian Nations** has some harmonization in place for regulating medical devices. The Common Submission Dossier Template was introduced in 2015 to "minimize the preparation of multiple dossiers … with essentially the same contents" and is "intended to apply to all medical devices".[155]

**South Korea:** South Korea issued guidelines for medical AI software in 2017,[144] and guidelines for cybersecurity, artificial intelligence, and big data-based medical devices,[145] and digital therapeutics[146] were published in 2020. The Medical Device Industry Growth and Innovative Medical Device Support Act came into force in 2020 to support swift reviews of innovative medical devices, whereas the 2020 Digital New Deal is intended to distribute internet-of-things sensors and speakers using AI[147] for disease monitoring and management. However, the Korea Medical Association continues to oppose telemedicine,[148] and other regulations have been deemed overly stringent. Of the 13 therapeutic games that proved effective in local clinical trials, none have been submitted for approval due to arduous approval processes.[149] Developers were asked to submit 13 to 21 categories of data, including "somewhat irrelevant" categories such as whether the game is free of radiation and how it is played by foreigners.

**Japan:** There is no clear definition of "digital health,"[150] which makes it challenging to identify the appropriate regulations to follow. HealthTech interviewees said the easiest way to commercialize was to have their product approved as a medical device. Interviewees further shared that each app update requires a new clinical trial, which is unrealistic given that software updates typically occur every few weeks. Recognizing this, the 2014 Pharmaceuticals and Medical Devices Act was amended in 2020 to simplify access to market for medical software, with additional provisions for implementation through 2023.[151]

**China:** Regulators issued the "Guiding Principles for the Technical Review of Mobile Medical Device Registration" in 2017 and "Medical Device Production Quality Management Specifications" in 2019 to strengthen supervision of independent software medical devices.[152] Nonetheless, innovations using AI, robotics, and augmented reality are yet to be tangibly reflected in existing guidance,[153] and regulations are also lacking for mental health apps.[154] Interviewees welcomed the government's move in 2020 to allow hospitals to develop online services, but believed that the special permissions required to provide online therapy could hinder the growth of businesses.

**Singapore:** Regulators have issued the Regulatory Guidelines for both Software Medical Devices and Telehealth Products,[156] and adopted a "product lifecycle" approach for software medical devices, where regulatory controls span from product registration to postmarket surveillance. Moreover, a telemedicine sandbox was launched in 2018[157] for startups and regulators to work closely, fine-tuning the balance between consumer protection and innovation. The sandbox is being retired, with new regulations to be introduced in 2022.

## Approval Pathways under the US FDA

In 2017, the FDA introduced the Software Precertification Pilot Program, which assesses first the developer, then the product.[158] Developers "who have demonstrated a robust culture of quality and organizational excellence, and who are committed to monitoring real-world performance of their products once they reach the US market" enjoy expedited reviews for all their lower-risk products. The FDA is also developing a "Total Product Lifecycle" approach that continues to monitor safety and effectiveness post-approval and post-market. Finally, the FDA has also stated that during the pandemic, it will not enforce certain requirements, especially in digital therapeutics for mental health.[159] In 2020, Pear Therapeutics' prescription digital therapeutic for chronic insomnia, Somryst, was the first therapeutic to have simultaneously cleared both the traditional 510(k) review and the Pre-Cert Program.[160] The latter was completed in eight months.[161]

The FDA also has its Breakthrough Therapies[162] and Breakthrough Medical Devices Program[163] to expedite the approval of therapies and devices that demonstrate substantial improvement over existing alternatives. Breakthrough designation conveys "all of the fast track program features ... more intensive FDA guidance on an efficient drug development program, an organizational commitment involving senior managers, and eligibility for rolling review and priority review." For instance, Woebot Health, an investigational digital therapeutic that also includes the Woebot chatbot mentioned in Section 4, was granted breakthrough designation in 2021 for postpartum depression.[164] PhotoPharmics, another designation, uses a noninvasive specialized phototherapy device to help people with Parkinson's disease improve overall function.[165]

## Reimbursing Innovation

One of China's early lessons during the COVID-19 pandemic was that without public insurance, the adoption of telemedicine will languish.[166] For all forms of digital health, reimbursement coverage could be used to supplement regulatory approvals, not just for greater patient affordability but also as a source of revenue that sustains health innovations in the market.

However, the reimbursement landscape for digital health in Asia is nearly nonexistent, and much existing coverage was hastily enacted after the onset of COVID-19.

This is due partly to political philosophy and how health systems are financed. Philosophically, Asia's governments do not necessarily view the subsidization of private HealthTech services as their responsibility. While better health confers positive externalities, productivity gains, and cost savings, which governments desire and benefit from, technology can also drive costs. In 2020, 71 percent of insurers in Asia said medical technology was the largest cost-driver beyond the control of providers and employers,[167] an 11 percent increase from 2019.[168]

In terms of health-system financing, public reimbursement forms an important path towards market viability in single-payer systems, such as South Korea and Japan. But this can also be a double-edged sword: The failure to secure reimbursement means that HealthTechs may have to resort to out-of-pocket payments as their main source of revenue. Consequently, South Korea often sees calls for public reimbursement to be expanded for health innovations.[169] Conversely, most other health systems in Asia are not single-payer models and, hence, the possibility and primacy of public reimbursement as a revenue stream has been less pronounced. HealthTechs in China and Singapore are accustomed to obtaining revenue from multiple sources and do not necessarily focus on public reimbursement.

Helpfully, APACMed, a medical technology association, has compiled a database of digital health reimbursement policies in APAC. Their findings are combined with other sources below:

**South Korea:** Telemedicine was allowed only after the onset of COVID-19, with the National Health Insurance Corporation reimbursing 80 percent of fees for online care and prescriptions for all diseases.[170] For specific diseases (not directly related to mental health), there is also reimbursement coverage for limited solutions regarding remote monitoring, machine learning, 3D printing, software as a medical device, and robotic surgery.

Before COVID-19, however, several hurdles had been reported. Reimbursement decisions took about a year, and officials did not intend to promote HealthTech through reimbursement.[171] As of early 2021, none of the more than 60 approved medical AI solutions were covered.[172] It thus remains unclear whether provisions made during COVID-19 will last. Positively, the government's New Health Technology Assessment system of 2020 seeks to classify technologies that are safe, effective, new, and not currently covered.[173]  Technologies that meet all criteria may be reimbursable.

**Japan:** Telemedicine was allowed only after the onset of COVID-19, with the National Health Insurance reimbursing 70 percent of fees for online care and prescriptions, mostly for chronic diseases.[174] Some remote monitoring solutions are also covered. In 2020, Cure App SC was the first digital therapeutic to receive both regulatory approval and reimbursement coverage, targeting nicotine addiction.[175] The Senshin Iryou pathway also gives special coverage to newer technologies.[176] However, although cognitive behavioral therapy is covered, requirements for psychiatrists to deliver up to 16 30-minute sessions have been deemed almost impossible.[177] The expansion of coverage to psychologists is hoped to alleviate this issue.

**China:** After the onset of COVID-19, the health ministry mandated that internet-based medical services be given "full pay" to diagnose and treat patients.[178] Many telemedicine platforms, such as Ping An Good Doctor and Tencent Trusted Doctors, were already offering consultations free or at vast discounts.[179] Smart infusion pumps are publicly reimbursed in Liaoning province and Chongqing city, but most HealthTech innovations are not publicly covered.

**Singapore:** After COVID-19 onset, public insurance was temporarily expanded to cover video consultations for seven chronic conditions.[180] In normal times, public insurance pays specified rates for inpatient treatment procedures, without explicit reference to the technologies used.[181] Public payments for digital health are more indirect. For instance, polyclinics and public hospitals, which are run and subsidized by the government, are using telemedicine amid the pandemic, while also collaborating with private digital-health providers on various services.[182] The government prefers targeted subsidies over reimbursement for supporting patients, and one-off startup grant funding over rolling coverage for supporting innovation. Coverage and payment for digital health services tend to come from insurers, employers, hospitals, or patients themselves.

Though not adopted extensively in Asia, public reimbursement schedules have the unique benefit of being highly transparent, which facilitates certainty in revenue streams. This can help to minimize risk in HealthTech innovation, accelerate its diffusion, and attract private capital for investment. It thus remains useful to keep an eye on reimbursement as an innovation pathway, since advanced health systems in Asia already use health technology assessment to keep costs down.

# Reimbursement Pathways for Innovations

Outside Asia, some multipayer health systems are using public reimbursement pathways to accelerate HealthTech innovation further. The US Centers for Medicare & Medicaid Services (CMS) proposed the Medicare Coverage of Innovative Technology program, a new interagency arrangement allowing manufacturers of medical devices to obtain public reimbursement for devices that receive the aforementioned Breakthrough Medical Device designation.[183] Medicare coverage is intended to take effect on the same day as FDA approval and to last for an initial four years. This bridges the gap between regulation and reimbursement, on top of the expedited approval that breakthrough devices receive. While implementation has been delayed due to a high volume of public comments, the program may commence as early as the end of 2021. This could substantially increase market access, in light of the nearly 300 designations allowed as of mid-2020.[184]

Similarly, Germany's Federal Institute for Drugs and Medical Devices introduced a fast-track program in 2019 to provide a "structured, rapid path to reimbursement."[185] Health apps are evaluated for approval within three months of application,[186] after which they typically have 12 months to demonstrate health benefits through real-world evidence. In that time, these apps can be prescribed to more than 72 million German citizens and be reimbursed by statutory health insurers.[187] As of March 2021, 11 of 56 applications had been approved, some of which focus on mental conditions such as depression, panic disorders, social phobias, and anxiety disorders. That most apps saw an increase in usage after approval[188] indicates the potential of public reimbursement as a market entry pathway, and observers believed this could further facilitate entry into the rest of Europe. Moreover, the same act encompassing the fast-track program allowed statutory health insurers to invest up to 2 percent of fund reserves into venture capital firms to fund promising European HealthTechs.[189]

Reimbursement strategies have also been applied to diagnosis-related groups, which are common in South Korea and Singapore. The US CMS introduced the New Technology Add-on Payment mechanism in 2003, which increases the total bundled payment to hospitals that use new technologies for the treatment at issue.[190] Technologies must meet the following criteria: (1) Be new, (2) be inadequately covered under the existing bundled payments, and (3) demonstrate significant improvement to clinical outcomes. Devices with "breakthrough" designation need only meet criterion (2). Increases in reimbursement last up to three years, for up to 75 percent of the cost of the technology.[191]  In 2020, the CMS approved nine out of 18 applications and, because of COVID-19, has proposed extending added fees beyond three years for some approved technologies.[192]  Observers in South Korea have proposed that the Korean government use CMS rates as a benchmark.[193]

# Challenges to Digital Mental Health

Developing a mental HealthTech ecosystem has its benefits but also comes with many challenges, as previously alluded to. This section reflects the key barriers that interviewees saw as priorities to be addressed, namely: quality control, data protection and security, and equitable access.

## Quality Control

In a field as litigious as health care, the adoption of HealthTech is highly contingent on quality. Interviewees raised quality issues in two key areas: studies and apps.

### Attrition and Applicability of Studies

From Singapore to Hong Kong, researchers interviewed pointed out that they can do little to prevent subjects from leaving studies midway and, even in the best scenarios, attrition can reach as high as 70 percent. For instance, in one study of 59 mental health apps intended for long-term use, user retention rates plummeted to 10 percent just six days after installation.[194] This makes it difficult to evaluate real-world efficacy because results are plagued by attrition bias and lack the capacity to demonstrate long-term effectiveness.[195] A leading researcher in Singapore stated pointedly, "If you are going to have people just dropping out and only very few people following up, I don't believe in that kind of data." The lack of high-quality and longer-term evidence, then, makes it difficult to convince psychiatrists to try new technologies or governments to consider reimbursement. Moreover, the largely academic setting of mental HealthTech innovation in Asia means that real-world impact may be less than stellar, as highly controlled academic settings can be challenging to replicate in the real world. The upshot is that many pilots can be hard to scale even though they are digital.

This is not to say that existing studies should be thrown out. Researchers are now assessing whether longitudinal, passively collected data under digital phenotyping can provide useful data to help alleviate problems of attrition. This would significantly reduce effort on users' part.[196]

### Usability, Churn, and Accuracy of Apps

There is also increasing recognition of the importance of user engagement. One study analyzed 13,549 user reviews over 106 apps and found that users overwhelmingly prioritized user-friendliness.[197] Usability was the most frequent reason for liking an app

and the most requested quality that apps should have, whereas complaints about usability issues outnumbered all other complaints combined. The same can be said for health information websites and clinician-facing technologies. For the former, simply agglomerating chunks of text online is no longer adequate amid rising competition for attention. Websites without user traffic will never show up on search engines, let alone have any impact. For the latter, having minimal learning curves is crucial to smooth the adoption process for clinicians, who have limited spare time and may be skeptical about technology. This has led investors, such as Singapore-based Verge HealthTech Fund, to scrutinize user-friendliness when deciding whether to invest.[198]

What complicates matters is that user experience is a skillset in which researchers may not be interested, let alone possess any knowhow. Nonetheless, mental health practitioners should be familiar with the need for interdisciplinary solutions and, at least in theory, academic researchers should be able to recruit students from their institutions across various disciplines to help with UI/UX design.

Beyond user interfaces lie problems of efficacy, privacy, and security, which are not always correlated with downloads or user ratings.[199] A study by Larsen et al. of 73 mental health apps worldwide found that only two stated the direct evidence associated with the app.[200] By the same token, Nicholas et al. found that apps providing information covered only a fraction of core psychoeducation principles and best-practice guidelines.[201] Most symptom-monitoring apps failed to monitor critical information (e.g., medication), while most self-assessment apps did not use validated screening measures. A study of 63 apps in China by Shang et al. found that self-rating scales were often directly translated from English into Chinese, resulting in misunderstanding and misinterpretation. Moreover, all 63 apps circumvented the public health service system, rather than seeking integration.[202] Further unhelpful is that half of mental health search results in app stores are replaced with new results every 100 to 200 days.[203] Interviewees agreed that volatility and fragmentation are also experienced in Asia: App updates are rare, and apps tend to lack integration with the formal health system or patient journey, let alone be reimbursable.

As mentioned in Section 4, there are estimated to be 20,000 mental health apps worldwide and, with rising awareness of mental health (see Figure 6), more are likely to follow. This sheer volume is beyond the capacity of regulators to oversee. For instance, the FDA regulates only the small subset of apps that "pose a risk to a patient's safety" if the app stops working.[204] Positively, other organizations have stepped in to help ascertain the quality of apps. These include One Mind PsyberGuide in the US, ORCHA in the UK, GGZ-APPWIJZER in the Netherlands, Israel-US collaboration MindTools.io, Health Navigator NZ in New Zealand, App Advisor by the American Psychiatric Association, and AppScript by IQVIA.

## ORCHA

ORCHA reviews and accredits digital health solutions against more than 350 measures and standards, from privacy and security to medical device regulations.[205] The reviews are then collated in a paid app library.[206] As of end-2020, ORCHA had evaluated nearly 600 apps.[207] Amid COVID-19, ORCHA saw a 6,500 percent increase in app recommendations from health and care professionals.[208]

## GGZ-APPWIJZER

In partnership with ORCHA, MIND, and The Netherlands, GGZ launched the National Mental Health App Guide (GGZ-APPWIJZER). The government-funded project has a library of ORCHA-shortlisted apps focused specifically on mental health.[209] On top of ORCHA, GGZ-APPWIJZER evaluates usability and attrition.[210] As of end-2020, 13 apps had been tested by a panel of providers and caregivers.

## Health Navigator NZ

Health Navigator NZ has a health app library that gives health apps a simple clinical score.[211] Reviews are performed by the not-for-profit Health Navigator NZ team and independent health professionals. As of June 10, 2021, the website had reviewed 222 apps worldwide.

Even so, the breakneck rates of app churn mean that even these organizations find it hard to keep pace. For some reviewing organizations, the average number of days since the last review was close to two years, and different rating frameworks often arrived at conflicting assessments of the same app.[212] Consequently, some academics have called for developers to self-certify their apps, with regulators conducting random audits.[213]

## Security versus Innovation

Health-care and cybersecurity companies alike have reported a surge in cyberattacks since the onset of COVID-19,[214] and a remarkable 87 percent of surveyed health-care organizations in APAC ranked IT security and data privacy as a priority in 2021.[215] While conversations on health cybersecurity are not new, the recent proliferation of apps and internet-of-things medical devices is rapidly extending the "attack surface" in digital health ecosystems.

Unfortunately, privacy and security concerns around mental health apps are well founded. Robillard et al.'s study of 319 mental health apps found that only 18 percent of iOS apps and 4 percent of Android apps had privacy policies.[216] Even fewer had terms of agreement informing users of the potential risks and limits of a digital mental health product. Most privacy policies also stated that user information might be shared with third parties. O'Loughlin et al. found that among 116 apps for depression, only five had privacy policies providing sufficient information regarding data handling procedures, while 105 did not provide privacy policies before the information was collected.[217] Wu et al. found that encryption and password protection were available for only one in four apps.[218] Stakeholder interviewees agreed, with one researcher based in China expressing concern about the vast amount of private information being transmitted to private tech companies and the lack of credentialing of health-care providers.

Negative experiences can sour impressions and build their own momentum. Many doctors in South Korea are opposed to health digitalization because of experiences of poor data management and foreign cyberattacks on medical institutions.[219] Such negative experiences can hinder the integration of mental HealthTech into the health system, resulting in fragmented landscapes unable to bridge the patient journey and deterring uptake among patients and clinicians.

Complicating matters is the trade-off among privacy, security, and innovation. Overly restricting data access can compromise the ability of researchers to gather new clinical insights and evaluate innovative treatments. With the impacts of privacy on innovation difficult to quantify, it is hard to pin down the exact level of risk that should be tolerated. Regulators thus have some incentive to err on the safe side, knowing that any level of protection is likely to cause discontent.

Some observers have noted that South Korea's PIPA is one of the strictest privacy regimes in the world,[220] whereas guidelines on deidentification may be complicated

yet vague.[221] For instance, the third-party use of patient data collected post-PIPA requires explicit prior consent for stated purposes, while third-party use of data collected pre-PIPA is barred. This has sparked criticism for stifling innovation, and the Moon administration has pledged deregulation. The PIPA was recently amended to allow the use of pseudonymized data without obtaining consent to produce statistics, scientific research, and archiving for the public interest.[222]

In parallel, cyberattacks and data leaks in Singapore's public health sector have swung the balance towards security.[223] In 2021, a quarter of surveyed health-care leaders said concerns related to data privacy and security were among the top barriers to HealthTech adoption.[224] Public researchers shared in interviews that they spend weeks convincing relevant parties that studies do not fall under the Human Biomedical Research Act or that data are already deidentified. Interviewees further shared that the need for a witness when obtaining patient consent is impractical and prohibitive to larger-scale studies, and overly complex processes can scare off trial participants. Mental HealthTech interviewees found it difficult to obtain patient data for severe cases and were optimistic that a better balance between innovation and security could be struck, pointing out that institutional review boards in Australia take just 45 days to approve studies. With the rising recognition of the costs of restrictions, there is ongoing work in tiering data access according to the sensitivity of the data.[225]

## Digital Divide

A benefit frequently attributed to digital health is that it can be scaled with ease to broader populations. Ping An Good Doctor, for instance, was able to accommodate a 10-fold increase in new users when COVID-19 hit.[226] That said, the willingness and ability of various demographics to use HealthTech solutions require attention. Connectivity and internet speeds are still shaky in rural areas, while uptake among several demographics remains low. For example, a Chinese government report found that despite China's rapidly aging population, people aged 60 and older formed only 6.6 percent of netizens in 2018, whereas nearly two-thirds of rural residents do not use the internet (at times by choice).[227] Observers have subsequently warned that internet-based health-care provision could generate a digital divide in China.[228] For mental HealthTech solutions to be truly effective, they must be inclusive.

Digital health literacy is key to inclusive digital mental health. One prominent measure of digital health literacy is the eHealth Literacy Scale, which has been explored in China, Japan, Singapore, and South Korea. Demographically, men,[229] the elderly,[230] those with lower income and education levels,[231] and infrequent internet users[232] tended to score lower in digital health literacy. Individuals lacking eHealth literacy also tended to live less healthy lifestyles.[233] User statistics by the online psychotherapy platform Hao Xin Qing confirm almost all of these research findings.[234] People living in lower-income areas were less willing to use online mental health services, as were older age groups. And in 2019, only two in five users were men.

In recognition of inequity, some countries have attempted to raise digital literacy among the elderly. In Singapore, seniors can attend training sessions for government health apps, thus empowering themselves to make appointments, view their medical records, and access health-related content.[235] The city-state even subsidizes smartphones and mobile plans for low-income seniors.[236] But, ultimately, staff working in elderly outreach programs expect only modest progress, partly because outreach itself is very labor-intensive. Moreover, across Asia, large numbers of seniors remain unable to read or write because access to education was poor in the mid-1900s.

There are reasons to be simultaneously optimistic yet worried. Positively, stories abound of patients being forced to try telemedicine amid COVID-19, then realizing that they preferred it to the hours spent waiting in traffic and hospitals. Also encouraging is the fact that while internet penetration is lower in developing countries, consumers in China, India, and Indonesia indicate a much higher willingness to adopt HealthTech compared to consumers in mature markets.[237] Ninety-one percent of respondents in both China and India were more open to talking with a robot than with their manager.[238] The main barrier for these survey demographics is affordability rather than aversion, and, arguably, the former is easier to tackle.

Conversely, the risks of a digital divide in health remain salient. Telemedicine providers across Asia do not expect user levels during COVID-19 to be sustained in the medium term (though they expect increases relative to pre-COVID levels). Moreover, as many countries in Asia age rapidly, in the medium term, the number of seniors unfamiliar with technology may continue to rise beyond the rate at which they can be persuaded to learn. This could restrict the user population for digital innovations, limit potential improvements to mental health, and stymie the development of mental HealthTech.

# Scaling through Collaborations and Partnerships

Scaling access is often where collaborations and partnerships come into play. While mental HealthTechs are focused on developing innovative solutions, they may lack the resources, distribution channels, provider networks, or market information to scale across their markets efficiently. Market players, governments, and even philanthropists each can play an important role in this regard. This section briefly elaborates on six channels of collaboration: pharmaceuticals, insurers and employers, corporations and big tech, public-private partnerships, social impact bonds, and philanthropy.

### Pharmaceutical Firms

Previous Milken Institute research has already highlighted the role of pharmaceutical firms in commercializing innovations.[239] Pharmaceutical firms attract high-quality, later-stage talent, capital, and technology, and collaborate with experienced investors to guide innovators toward the areas of research that have the greatest commercial potential. Moreover, because they are the ones conducting the final stages of trials, pharmaceutical firms are the linchpin in developing new cures and treatments, and producing economic value. Indicatively, HealthTechs such as Biofourmis and Holmusk are collaborating with pharmaceutical companies Chugai and Otsuka, respectively, among many others. Venture tracking reports on HealthTech also often point out the key role pharmaceutical firms play in funding later-stage HealthTechs.[240] This gives established pharmaceutical R&D markets, such as China, Japan, Singapore, and South Korea, an added edge.

One such company is Janssen, a leading player among the few pharmaceutical companies active in digital mental health in Asia. This pharmaceutical arm of Johnson & Johnson commissioned the aforementioned Mental Health Integration Index and launched its Healthy Minds Program in 2014 to educate the public about mental health disorders and push for innovation, education, and advocacy.[241]  In Japan, Janssen collaborated with the HealthTech company Welby to develop Aozora, a mobile app designed to strengthen medication adherence by individuals with ADHD.[242] Aozora was then distributed to patients who had been prescribed medication for ADHD. Moreover, in 2019, Janssen partnered with Holmusk to develop novel and scalable mental health solutions in China using Holmusk's real-world evidence platform.[243]

### Insurers and Employers

Stakeholders interviewed believed that insurers formed a direct node in propagating access to mental health innovations, by distributing solutions to their large networks of providers and employers, and lowering the costs of treatment through coverage. For instance, Oxford VR, a HealthTech that treats common mental conditions through virtual reality, launched its product in Hong Kong in partnership with AXA and the Chinese University of Hong Kong.[244] Similarly, in 2020, the insurer Swiss Re jointly led a US$230 million Series D investment in the mutual aid company Shui Di.[245] That said, the insurer-employer channel works best in health systems where private insurance is widely purchased—plus, where corporate insurance is strong and most workers are employed in the formal economy. High-income Asia tends to perform best in this regard, while developing Asia, which sees very high proportions of informal workers, may see fewer benefits in the medium-term.

However, as mentioned in Section 2, employees remain reluctant to seek treatment due to fears of workplace discrimination, and insurers that took the leap to provide mental illness coverage have not always seen successful uptake. Separate interviewees also mentioned that therapeutics and care management in mental health tend to be "completely outside [insurers'] comfort zone." Still, they remained convinced that insurance coverage is ultimately crucial for both provider adoption and the financial sustainability of mental HealthTechs. One interviewee remarked: "Insurers [are] going to employers to encourage them to create a mentally well workforce. Insurers that we have spoken to are interested and although there are no significant financial contributions at this point, it is in the exploratory stage."

### Corporations and Big Tech

From 2020 to mid-2021, Facebook, Amazon, Microsoft, Google, and Apple invested in health-care deals worth a total of $6.8 billion—a sampling of the many attempts technology giants have made to enter the health-care market.[246] While also eyeing the health-care market, technology companies in Asia tend to play down notions of industry-wide disruption (at least rhetorically), choosing instead to focus on collaboration in very specific areas of health. A stakeholder-based in China did not view internet giants as competing with startups for two reasons. First, big tech companies tend to focus on light-touch interventions on a very large scale, whereas HealthTechs create in-depth interventions requiring deep expertise. Second, internet giants have accumulated vast numbers of users and can play a unique role in awareness and destigmatization. Similarly, a HealthTech based in Singapore observed growing interest from corporations in partnering with mental HealthTechs.

Tech companies in China play a big part in partnering and funding digital health. Galen Growth named Tencent Holdings and Baidu Ventures among APAC's most active corporate investors in HealthTech in 2020, chalking up 75 deals, 13 of which were in APAC.[247] Partnerships specific to digital mental health are also sprouting in recent years. In 2020, the Barcelona-based digital therapeutics company Braingaze partnered with China's Ping An Group and the eye-tracking innovator 7invensun to diagnose ADHD in children. Beyond mental health, Ping An Good Doctor also has partnerships with Bangkok Dusit Medical Services[248] (Thailand's largest private medical group) and the ride-hailing firm, Grab, in Indonesia.[249] London-based Huma Therapeutics (formerly Medopad) signed a deal with Tencent Holdings to develop AI-based solutions, particularly for the diagnosis of Parkinson's disease.[250]

In 2019, the KT Corporation, South Korea's largest telecommunications service provider, announced a partnership with the Samsung Medical Center for a 5G-medical center in Seoul. The partnership intends to use augmented and virtual reality for real-time education and digital pathological analysis.[251] KT Corp also established the Digital & Bio-Health Organization in 2020, collaborating with US-based NeuroSigma to develop digital therapeutic solutions for ADHD.[252] In 2021, Japan launched the Healthcare AI Platform Collaborative Innovation Partnership (HAIP), attracting tech partners including Nihon Unisys, Hitachi, IBM Japan, Softbank, and Mitsui.[253] HAIP is a nonprofit, mutual-benefit corporation established to develop health-care AI services in areas such as integrated care, cybersecurity, application programming interfaces, 5G, and electronic medical records.

However, the fact that not all collaborations between corporates and startups go smoothly requires greater attention. In particular, multiple stakeholders remarked that discrepancies in size between corporates and startups can make collaborations very lopsided. Many large corporates seemed to lack the true spirit of collaboration, concerned with extracting maximum benefits from startups.

### Public-Private Partnerships

The HAIP in Japan also indicates the importance of public-private partnerships (PPPs). While big private-sector players play a key role in catalyzing health innovation, it is difficult for market-based solutions to emerge in low-profit areas. There are some indications that this may be the case for mental health in Asia, in light of low treatment-seeking and affordability (as explained in Section 2). Coupled with the already high involvement of some Asian governments in health care, PPPs can be useful to spur health innovation and reduce costs. For example, one report on health

care PPPs in Hong Kong recommended a public-private integrated care model for mental health provision in the community as an answer to workforce shortages and limited government resources.[254] In addition, PPPs have long been adopted in vaccine development and have more recently surfaced in cloud computing for genomic research.[255]

Some countries in Asia are pushing ahead with HealthTech-centric PPPs. In 2018, the Singapore government solicited proposals from international health-care and technology companies on ways to enrich population health and well-being. This culminated in 2020 with LumiHealth—an app codesigned by Apple and Singapore's Health Promotion Board.[256] The app encourages exercise, healthy diets, better sleeping habits, mindfulness, and screenings through reminders, challenges, and—most importantly—the ability to earn up to S$380 in rewards over two years. Just five months after launch, the app had been downloaded more than 100,000 times.[257] In addition, Holmusk signed a memorandum of understanding in 2021 with Singapore's National Health Group and Institute of Mental Health to codevelop various digital therapeutics tools (starting with major depressive disorder) and solutions enabling early detection and intervention.[258] This includes identifying and validating novel digital biomarkers through integrated data from clinical records and smartphones.

### Social Impact Bonds

Social impact bonds (SIBs) are a special kind of PPP that have gained increasing attention in the past decade. These are typically contracts between issuers (usually, but not always, governments) and investors (usually nongovernment), whereby investors provide upfront capital to fund a social service. If they succeed, the issuer benefits from better social outcomes and passes some savings back to investors. With some exceptions, SIBs are usually not bonds, as repayment and returns are contingent upon achieving predetermined social outcomes. Otherwise, investors lose their principal and receive zero returns.

Typically, the benefits of the social outcomes targeted should have some degree of irreversibility and robustness. In New Zealand, for example, a pilot SIB on recidivism saw some difficulties in agreeing on outcomes, given that the benefits of reducing youth recidivism typically accrued much later in life.[259] This made the modeling of financial benefits and payments much more complex.

## Social Impact Bonds Are Distinct from …

1) … **impact investing and venture philanthropy** in that SIB returns are typically earned only for achieving predetermined social outcomes, not financial return.
2) … **outcomes-based payments** in that SIBs typically target broader social outcomes as measures of success, instead of specific health outcomes in individuals.
3) … **government-funded programs** in that SIBs shift risk to private investors, in turn incentivizing their due diligence and focusing on efficient service delivery.

Should a private or nonprofit organization be willing and able to fund innovative services to achieve social outcomes, there is technically no need for government involvement or SIBs. That said, because such projects typically have no clear link to profitability, private investors choose to use SIBs to recoup some return on their initial investment or attract co-investors.

With the proviso that mental health SIBs thus far have been pilots, their results have been mixed:

1) In 2012, the UK piloted drug and alcohol recovery SIBs in eight locations. Although individuals who completed the program saw improvements in measures of abstinence and relapses, the pilots generally failed to improve treatment-seeking and adherence in the target population.[260] And while costs associated with emergency department visits for poisonings fell, treatment costs and hospital admissions for substance-related behavioral problems increased in pilot areas. Low familiarity with outcomes-based payments also led to uncertainty and difficulty in forecasting and planning operations, which deterred some providers. After the conclusion of the pilots, the government was eager to continue adapting SIBs, but providers were less enthusiastic.

2) In Australia, the Resolve Social Benefit Bond was implemented in 2017, mobilizing A\$7 million of investor capital.[261] The service provider Flourish Australia was tasked with reducing service utilization and reaping cost savings (while improving mental health) in a two-year program for two local health districts in New South Wales. Uniquely, the Resolve bond paid investors a 2 percent coupon for the first four years and nine months, with outcomes-based payments only in the final three years. Unfortunately, after it was found that service utilization had increased,

the program currently faces early termination. This was due partly to barriers to service provision during COVID-19 and the high bar set by existing programs (against which Resolve was compared). That said, investors had already received 6.5 percent of their invested capital from fixed coupon payments, and remaining assets stood at 91 percent of investor capital.

3) New Zealand piloted its first SIB in 2017, focusing on the employment of individuals with mental health issues.[262] NZ$1.5 million was invested as upfront capital,[263] while forecast gains in income taxes formed the cost savings that the government expects to reap (see Figure 20). The pilot is currently underway after several initial hurdles. Notably, the sheer complexity of designing SIBs, coupled with the government's inexperience, saw many bureaucratic challenges during procurement. For instance, the pilot commenced only four years after the government issued a call for SIB proposals, due partly to the withdrawal of the original parties amid negotiations.

**Figure 20: Estimated Returns to Investors for SIB Pilot 1 in New Zealand**

| Illness/Measure | Class A Capital (lower risk): NZ$1.2 Million | Class B Capital (higher risk): NZ$300,000 |
|---|---|---|
| Base Case: 43% placed in employment | 7% | 13% |
| Maximum potential yield (government keeps surplus) | 9% | 17% |
| Threshold for early termination | 3% yield | −19% yield |

*Source: The Treasury, New Zealand (2017)*

4) Pilot SIBs for mental health are also gradually diffusing into Asia. In Singapore, the social enterprise Tri-Sector Associates partnered with a private corporation in 2020 to design a mental health social impact bond, targeting the treatment gap faced by high-risk youths.[264] The enterprise put out a call for service providers to submit proposals in mid-2020 and, as of August 2021, was "quite close" to completing the development of the SIB.

The pilots initiated so far have demonstrated the challenges and complexities involved in designing and implementing SIBs. High transaction costs and long negotiating processes among multiple parties typically require that SIBs be

implemented for large-scale projects to be worthwhile. Paradoxically, it is large-scale projects that private investors are unwilling to fund, due to the high risks they bear. But these mixed results do not invalidate SIBs because, as explained by the Stanford Social Innovation Review, the utility of SIBs is not necessarily limited to predetermined social outcomes.[265] In the UK, for instance, many SIBs place less emphasis on impact, focusing instead on innovation, co-creation, and cost cutting. SIBs were used to facilitate public-sector reform in Finland, shifting the focus from inputs towards impact. In the US, SIBs focused on moving risk to investors and accelerating social innovation. Other commentators have argued that SIBs can cultivate a culture of co-creation among Asia's governments, particularly governments already at the frontier of policy innovation.[266] Perhaps vindicating the potential of SIBs is the fact that Japan, Singapore, Hong Kong,[267] and South Korea[268] have all adopted and adapted SIBs in various areas of public policy innovation.

### Philanthropy

While PPPs and SIBs remain useful tools, aligning interests and negotiating contracts can be time consuming. Some entrepreneurs interviewed also remarked that funding tends to be most available at the later stages of innovation, when the hardest work has long been completed. Conversely, building a proof of concept and early-stage product development entail higher risk and lower funding. Moreover, in Asia, this area tends to be funded predominantly by governments, in contrast to the US, where philanthropists play a significant role. This means that the ability and willingness to fund early-stage research may depend on fiscal room (which is in short supply amid COVID-19) and government priorities, and innovations that fail to attract government funding have few alternatives for recourse.

The Milken Institute has long advocated the outsize role philanthropy can play in accelerating early-stage research, including biomedical R&D[269] and digital solutions[270] for mental health. Facing no urgent deadlines or pressures to deliver a financial return, philanthropy can play the unique role of "patient capital," catalyzing efforts in areas of high potential that have long timelines, high risk, and poor funding; mandating interdisciplinary scientific collaboration; and making research findings publicly available for future research to build on. Others have also argued that the multifaceted nature of holistic mental health management is ripe for philanthropic involvement, given philanthropy's flexibility and deep expertise in social areas such as criminal justice, education, and workforce development,[271] to which health systems may not be attuned.

In the US, the philanthropist Garen Staglin cofounded One Mind, a leading nonprofit organization focused on ameliorating brain health by funding R&D, scaling services, and combating stigma. One Mind launched the Rising Star Research Awards in 2005 to support early-career researchers in brain health, with award winners receiving $300,000 over three years through a competitive grant process. To date, 36 awards have been presented,[272] as part of a total of $480 million raised and leveraged to support brain health research.[273] Staglin is also the cochair of the Healthy Brains Global Initiative, a collaboration among global leaders in neuroscience, policy, and finance seeking to leverage innovative investment approaches to mobilize US$10 billion for mental health.[274] Representatives from Singapore's Ministry of Health and the University of New South Wales have joined as members of the interim board, with a formal launch planned for 2021.

In Asia, philanthropic capital is increasingly deployed strategically to catalyze longer-term initiatives. For instance, as of July 2021, 116 of the 413 active deals on the Asia Venture Philanthropy Network were related to health.[275] According to their descriptions on the website, six were directly concerned with mental health, spanning remote diagnosis and counseling, rehabilitation for dementia, and caregiver support. This indicates some existing appetite for a philanthropic role in mental health. Should social investments in this area continue to grow and potentially expand into scientific research, philanthropy could make an increasing contribution to diversifying the investment landscape and providing innovators with greater funding choices.

With that in mind, at least two issues can complicate matters. First, some Asian philanthropists prefer to avoid the limelight. Depending on the region and the individual, "showing off" may be deemed cheapening to the spirit of true generosity, where the giver should expect neither return nor recognition. This is manifest in Asia's diverse philanthropic landscape, peopled with membership networks such as the Asian Venture Philanthropy Network and Asia Philanthropy Circle; enabling organizations such as the China Global Philanthropy Institute and Centre for Asian Philanthropy and Society; and fundraising platforms such as GIVE.asia. It is not always easy to trace giving to any individual or family—by intention. For instance, Singapore's wealthy initially received flak in 2020 for apparently failing to contribute to the fight against COVID-19; in fact, many low-key donations had gone unnoticed.[276] In parallel, countries such as China, Japan, and South Korea tend to score very poorly in surveys asking if respondents have made donations,[277] even though examples of giving are common.[278] This makes it difficult to identify philanthropic champions of mental health in the region, while those identified may

not welcome publicity. This is in some ways suboptimal because it is important to share lessons learned with the rest of the ecosystem to raise the efficiency of philanthropic funding.

Second, while free capital flows in developed Western countries allow nimble deployment of philanthropic capital, this is not always the case for cross-border philanthropy in Asia. Restrictions on outbound capital flows can completely obstruct philanthropic deployment or necessitate repackaging, which is unwieldy and time-consuming.

# Conclusion

There is no vaccine for mental illnesses, which Asia is even less prepared to address than COVID-19. Health systems and societies across the continent need to double down on their efforts and recognize that given the sheer scale of the problem, "copying and pasting" existing offline services into the digital realm will not be sufficient. There must be more innovation by, for, and from the region.

Regulations need to be developed further, specifically for digital mental health, while data protections must be better balanced with ease of (proper) access. Innovators need to prioritize evidence of efficacy and return on investment, while corporates and investors need to allocate funding to mental health. Philanthropists should recognize the outsize role they can play in this whitespace, while mental health practitioners must explore collaborations in an increasing range of fields.

For its part, the Milken Institute has long been developing resources relating to various aspects of mental health, from philanthropic guides for neurologic R&D to the prioritization of mental health and wellness in its public health and aging programs. For instance, the Milken Institute's Alliance to Improve Dementia Care released six recommendations in May 2021 to improve the detection and diagnosis of dementia, and in April 2021, the Milken Institute's Center for Strategic Philanthropy and the Baszucki Brain Research Fund launched a dedicated grant program aimed at advancing therapeutic discovery for bipolar disorder. Multiple centers across the Institute have included mental health sessions in our various convenings, and the Institute will continue to use its platform as a catalyst for progress.

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