Singapore's health-care system: key features, challenges, and shifts

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Since Singapore became an independent nation in 1965, the development of its health-care system has been underpinned by an emphasis on personal responsibility for health, and active government intervention to ensure access and affordability through targeted subsidies and to reduce unnecessary costs. Singapore is achieving good health outcomes, with a total health expenditure of 4·47% of gross domestic product in 2016. However, the health-care system is contending with increased stress, as reflected in so-called pain points that have led to public concern, including shortages in acute hospital beds and intermediate and long-term care (ILTC) services, and high out-of-pocket payments. The main drivers of these challenges are the rising prevalence of non-communicable diseases and rapid population ageing, limitations in the delivery and organisation of primary care and ILTC, and financial incentives that might inadvertently impede care integration. To address these challenges, Singapore's Ministry of Health implemented a comprehensive set of reforms in 2012 under its Healthcare 2020 Masterplan. These reforms substantially increased the capacity of public hospital beds and ILTC services in the community, expanded subsidies for primary care and long-term care, and introduced a series of financing health-care reforms to strengthen financial protection and coverage. However, it became clear that these measures alone would not address the underlying drivers of system stress in the long term. Instead, the system requires, and is making, much more fundamental changes to its approach. In 2016, the Ministry of Health encapsulated the required shifts in terms of the so-called Three Beyonds—namely, beyond health care to health, beyond hospital to community, and beyond quality to value.

Lancet 2021; 398: 1091–104

Published Online
September 2, 2021
https://doi.org/10.1016/S0140-6736(21)00252-X

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Introduction

Singapore is a multi-ethnic city state with a total population of 5·7 million people, of which 4·02 million are citizens and permanent residents. As a former British colony, Singapore inherited a health system that provided essentially free services, but introduced patient copayments for outpatient services in 1960 because of concerns that free health care would encourage unnecessary use and would be financially unsustainable.[1] Since Singapore became an independent nation in 1965, the development of its health-care system has been underpinned by a philosophy that emphasises an individual's personal responsibility for health. The 1993 White Paper on affordable health care, which shaped the development of Singapore's current health system, stated that "we owe it to ourselves individually to keep fit and healthy. The health care system needs to be structured to strengthen this sense of personal responsibility. It must give the individual maximum incentive to stay healthy, save for his medical expenses and avoid using more medical services than he absolutely needs".[2] The White Paper also highlighted that, although market forces are needed to keep hospitals efficient, there are market failures in health care that require the government to intervene actively to prevent unnecessary and supplier-induced demand.[2]

Overall, Singapore is achieving good health outcomes, with a total health expenditure of 4·47% of gross domestic product in 2016,[3] of which the government's share was about a third.[4,5] Singapore is rated well in international comparisons of health indicators and systems.[6] However, since 2011, various sources of public concern have emerged in the form of shortages in acute hospital beds and intermediate and long-term care (ILTC) services, as well as the affordability of health care. These so-called pain points are particularly salient indicators of broader stresses across the health-care system, with major drivers including the increasing prevalence of non-communicable diseases (NCDs) and rapid population ageing, limitations in the organisation of primary care and ILTC delivery, and the unintended consequences of some financing approaches. In 2012, Singapore's Ministry of Health launched a set of reforms under its Healthcare 2020 Masterplan, which were targeted at alleviating these pain points.[7,8] However, recognising that these reforms would not be sufficient in the long term, Singapore has also embarked on a systematic effort to understand and address the underlying drivers of system stress and to develop a strategy for a fundamental transformation of the health system.

This Review summarises key aspects of Singapore's health-care system, approach, and health outcomes; explores the motivation to transform the health system; and discusses the factors that underpin Singapore's approach to a positive and sustainable transformation of the health system. Furthermore, this Review briefly covers salient aspects of Singapore's response to the COVID-19 pandemic.

Key aspects of Singapore's health-care system and approach, and current health status

Singapore's health-care services

The main features of Singapore's health-care services have been described previously.[9] In Singapore, the epidemiological transition from infectious diseases to NCDs took place around 1970. At that point, NCDs were responsible for 71% of annual mortality, whereas communicable diseases contributed to 21% of annual

	Public service	Private service
Outpatient or primary care	20 polyclinics serving as one-stop outpatient health-care centres that provide subsidised comprehensive primary care services and manage around 40% of attendances for non-communicable diseases.	2000 private clinics run by general practitioners who manage a larger share of acute ailments than do public services and meet around 80% of the total primary care demand.
Inpatient or tertiary care	16 public hospitals and specialty centres, accounting for 83·8% of total acute hospital beds and 77·8% of total acute hospital inpatient admissions in 2018, run as private companies wholly owned by the government to allow operational autonomy while still being subjected to policy oversight and guidance by the government; within public hospitals, patients have a choice of ward types: class C wards provide 66–80% of subsidies, B2 provide 50–65%, B1 provide 20%, and A provide none.	Private hospitals that offer services with much shorter waiting times than in public hospitals, but with substantially higher overall bills.
Intermediate and long-term care services	In 2017, these services comprised 1600 community hospital beds, 14 900 nursing home beds, 5000 day care places, and 8000 home care places. Community hospitals provide rehabilitation and continuing care, usually after discharge from public acute hospitals. For long-term residential, centre-based, and home-based care, the government builds and owns the facilities but offers the operations to voluntary welfare organisations and private operators.	The government has a portable subsidy scheme for private operators to provide subsidised nursing home and centre-based care services. In 2017, private nursing homes accounted for 25·2% of total nursing home beds.

Table 1: **Organisation of Singapore's health-care services**

mortality.[10] In the 1980s and 1990s, there was substantial expansion and development of public hospitals, a strong focus on increasing subspecialisation, and the establishment of seven national specialist centres that provided care for skin, eye, heart, dental, and neurological disorders, as well as for cancer and infectious diseases.[1,11] Additionally, there was progressive corporatisation of public hospitals, which remained substantially funded by the government but were managed like private institutions to improve the efficiency and quality of health-care delivery.[12] The primary care system also expanded substantially, although largely through the growth of private general practitioner (GP) clinics, supplemented by government-funded polyclinics that provide a comprehensive range of subsidised primary health-care services.[1]

Singapore's current health-care delivery model comprises a hybrid of public and private elements (table 1). The hospital sector is dominated by public hospitals, which accounted for 9071 (83·8%) of 10 826 acute hospital beds in total[13] and 455 272 (77·8%) of a total 584 819 acute hospital inpatient admissions in 2018.[14] By contrast, the outpatient sector is dominated by private clinics; approximately 2000 private GP clinics provide for approximately 80% of all primary care attendances. Notably, however, the public polyclinics provide a disproportionate amount of NCD care, particularly for patients with complex needs[15,16] who account for around 40% of total NCD attendances.[15] This situation is largely due to the high levels of subsidy for polyclinic care, as well as the fact that referrals from polyclinics to specialist outpatient clinics in public hospitals are granted subsidised status. Consequently, public polyclinics have faced persistently high patient loads.[17] Care coordination between the private GP-dominant primary care sector and public hospital system is also a challenge. Integration of care from primary to tertiary care and between public and private service providers is crucial, especially because care complexity is increasing as a result of rapid population ageing and rising NCD prevalence. Hence, this area has been targeted for improvement in Singapore's health-care reforms, and several initiatives have been implemented in the past decade to strengthen public–private health provider partnerships.[18]

Health-care financing approach

The key features of Singapore's health-care financing have been described previously and are summarised in the panel.[5,11,18,19] The government's goal is to ensure that good and affordable health care is available to all citizens. One key mechanism is by providing subsidies for charges. Most subsidies are for hospital use because this is associated with the greatest costs. Subsidies are particularly targeted at lower-income groups and can cover up to 80% of hospitalisation charges in public hospitals. Patient copayments are an integral feature of the framework, reflecting the emphasis on personal responsibility for health. Since the 1980s, several schemes have been established to help patients pay for their share of the costs, and to ensure that out-of-pocket costs would not impede access to health-care services, particularly for low-income groups. The first scheme was MediSave, a national medical savings scheme that allows individuals to set aside part of their income for future medical expenditures, supplemented by contributions by their employers. Additionally, the use of these savings can be transferred among family members. In 1990, the government established MediShield to provide insurance coverage for the exceptionally high cost expenditures in hospitals, and the scheme was substantially enhanced in 2015 to form MediShield Life. Individuals can buy

supplementary insurance from private insurers in the form of integrated plans with MediShield Life, which provide additional coverage in public hospitals and private hospitals. In 1993, the government also established an endowment fund, MediFund, to serve as a financial safety net for people who are unable to afford the subsidised hospital bills.

Health outcomes

A systematic analysis of disability-adjusted life-years (DALYs) and health-adjusted life expectancy across 195 countries between 1990 and 2017 found that, in 2017, Singapore had the highest life expectancy at birth for both women (87·6 years) and men (81·9 years) and the highest health-adjusted life expectancy at birth (75·8 years for women and 72·6 years for men).[20] In Singapore, the probability of dying from NCDs between the age of 30 years and 70 years is 10·1%, which is lower than in the UK (11·0%), the USA (13·6%), and Denmark (11·6%).[21] The Global Burden of Diseases, Injuries, and Risk Factors Study 2016 developed indexes of health-related Sustainable Development Goals across countries and over time.[22] Singapore, with an index of 86·8 (95% CI 84·6–88·9), was among the top three of 188 countries.

Table 2 shows selected comparative data for demographics; health status; hospital, physician, and nurse supply; and health-care expenditure for Singapore, the USA, the UK, Austria, Australia, Canada, France, South Korea, Taiwan, Denmark, and Norway.

***Panel*: Three key features of Singapore's health-care financing in addition to government subsidies**

MediSave

- Compulsory individual medical savings account to which Singaporeans contribute around 8·0–10·5% of their wages, alongside contributions from their employers
- Can be used to pay for approved health-care expenses for the individual themselves and immediate family members

MediShield Life

- Mandatory lifelong basic insurance plan that caters for large hospital bills and selected costly outpatient treatments (eg, renal dialysis and cancer chemotherapy)
- Sized for the most highly subsidised treatments in public hospitals to keep premiums low
- Co-insurance and deductible features reflect the individual's responsibility over health care
- Individuals can choose to enhance coverage by purchasing additional Integrated Shield plans from private providers, using MediSave to pay for premiums
- Replaced the original MediShield in November, 2015

MediFund

- Endowment fund set up by the Government as a safety net for Singaporeans who face difficulty to pay medical bills, and built up to S$4·5 billion in 2017
- Income generated is allocated to approved hospitals, nursing homes, and other health-care facilities to support patients in need, within approved guidelines

Singapore's health-care expenditure

Although Singapore's total health-care expenditure in 2016 was lower than that of most other high-income countries (table 2), we are unaware of any published analyses of the contributing factors.[3,27] Four factors commonly cited in the literature as determinants of health-care expenditure are advances in health-care technologies and treatments, rising income levels, population ageing, and institutional characteristics of health systems; however, the relative contributions of these factors vary in different studies.[28]

One potential explanation is that Singapore, despite rapid population ageing, has a younger demographic profile than do most other high-income countries,[29] and health-care use and expenditures on health care per capita are higher among older age groups.[30,31]

However, adjustment for Singapore's younger population profile does not seem to fully explain the difference. We assessed what the health-care expenditure of comparator countries might have been if they each had the age profile of Singapore, and vice versa. For the analysis, we used the National Transfer Accounts database because it provides comparable health expenditure data by single year of age for the populations of numerous countries.[32] Eight high-income countries in this dataset were included using the most recent year for which data were available, ranging from 2010 to 2013. After adjusting for international purchasing power parity based on conversion factors from the World Bank database, we derived the average health expenditure per capita by single year of age, calculated the gross domestic product per capita (data from World Bank), and used this to compare among countries (appendix p 1).

See Online for appendix

If the health-care expenditure of each of the eight comparator countries is adjusted for by applying the population age distribution of Singapore, the health-care expenditure as a percentage of gross domestic product decreases for all eight countries, but to levels that are still higher than that of Singapore (figure 1A, appendix p 2). Conversely, if Singapore's health-care expenditure is adjusted for by applying the population age distribution of each of the eight comparator countries, Singapore's health-care expenditure as a percentage of gross domestic product increases slightly in all cases, but to levels lower than the actual expenditure of the respective comparator country (figure 1B; appendix p 2). These analyses suggest that there are factors beyond Singapore's younger demographic profile that account for its relatively low health-care expenditure.[5]

Challenges and pain points

Since 2011, two salient pain points have emerged that reflect broader stresses to the existing system. First,

	Singapore*	USA	UK	Austria	Australia	Canada	France	South Korea	Taiwan†	Denmark	Norway
Demographics											
Population, millions	4·0	327·1	66·4	8·8	24·9	37·0	66·9	51·6	23·8	5·7	5·3
Proportion of population aged <15 years	15%	19%	18%	14%	19%	16%	18%	13%	13%	16%	18%
Proportion of population aged ≥65 years	13%	16%	18%	19%	16%	17%	20%	14%	15%	20%	17%
Population health											
Life expectancy at birth, years	83	79	81	82	82	82	83	83	81	81	83
Health-adjusted life expectancy at birth, years‡	76·2	68·5	71·9	72·4	73·0	73·2	73·4	73·0	NA	71·8	71·8
Amenable mortality by Health-care Access and Quality index§	89·6	91·5	90·3	93·9	95·9	93·8	91·7	90·3	85·4	90·9	91·6
Proportion of population with overweight or obesity	36·2%	70·1%	62·9%	57·1%	53·6%	63·1%	40·2%	30·0%	44·5%	54·4%	23·1%
Proportion of population who smoke daily	12·0%	12·9%	19·0%	24·3%	13·8%	10·8%	26·9%	19·9%	15·3%	17·0%	20·0%
Hospital, physician, and nurse supply											
Hospital beds per 1000 patients	2·4	2·9	2·8	7·6	3·8	2·7	6·9	12·4	4·3	2·5	3·9
Physicians per 1000 patients	2·4	2·6	2·8	5·1	3·6	2·6	3·2	2·4	1·8	4·5	4·6
Nurses per 1000 patients	7·5	8·6	8·3	8·2	12·7	9·9	9·3	7·0	6·0	10·3	18·1
Health-care expenditure§											
Current health expenditure, % of GDP	4·47%	17·07%	9·76%	10·44%	9·25%	10·53%	11·54%	7·34%	3·96%	10·35%	10·50%
Current health expenditure per capita, US$	2462·39	9868·74	3958·02	4688·28	5002·36	4458·21	4263·36	2043·86	NA	5565·59	7477·90
Current health expenditure per capita, PPP international $	4083·75	9868·74	4177·82	5295·18	4529·89	4718·30	4782·29	2711·74	2715·00	5092·98	6203·45
Current out-of-pocket health expenditure	31·17%	11·09%	15·12%	18·92%	18·94%	14·62%	9·76%	33·31%	NA	13·71%	14·52%

Data taken from World Bank Data (2018), unless otherwise stated. NA=not available. GDP=gross domestic product. PPP=purchasing power parity. *Data are for Singaporean residents (ie, citizens and permanent residents) only, as of June 30, 2019. Data are from the Department of Statistics, Singapore,[23] except for health expenditure, which are from the World Bank dataset. †Data are from the Ministry of Taiwan.[24] ‡Data are from WHO.[25] §Data are from GBD 2015 Healthcare Access and Quality Collaborators (excluding Singapore).[26]

Table 2: **Data for demographics, health status, resources, and health-care expenditure for 11 high-income countries**

between 2011 and 2014, there was major public concern about acute public hospital bed shortages, which were causing high average bed occupancy rates, overstretched medical staff, and long waiting times for available beds for patients admitted to emergency departments.[33]

The affordability of health care emerged as a second public concern during that period. In 2011, overall out-of-pocket expenses comprised approximately 40% of Singapore's total health-care expenditure, compared with the 2015 Organisation for Economic Co-operation and Development average of 20%, which ranged from 37% in Korea to less than 10% in France.[1] Despite how spending on health care in Singapore contributed to an average of 4·5% of monthly household expenditure, it was growing at 3·7% per annum.[34] Although MediSave has a role in alleviating the burden of out-of-pocket payments, in 2015, the scheme was mainly approved for hospital treatment. With the growing prevalence of NCDs, outpatient care costs in the long term became more important and MediSave's effect on affordability diminished.[1] MediSave's role for low-income earners and people who are unemployed is limited because the scheme is based on savings from work-related income.[35] For older individuals who worked when wage levels in Singapore were generally low, only around 40% of those who turned 55 years old from 2010 to 2014 had accumulated the MediSave Minimum Sum, which is the minimum expected amount needed to support health-care expenses in later life for themselves and their dependents.[36] Before the major reform in 2015, MediShield, the next level of protection, had features such as exclusion of pre-existing conditions, claim limits, and an age limit of 90 years, which contributed to around 7% of the population not being covered.[5]

Factors driving pain points

These challenges reflect broader stresses to the health-care system, which are driven by several factors that also interact together (figure 2).

Population ageing and the rising burden of NCDs

Singapore is one of the fastest ageing societies in the world, and the proportion of the population aged

65 years and older is projected to double over the next 17 years.[37] Compared with individuals younger than 65 years, the risk of hospitalisation for those aged 65 years and older is higher (337·8 cases per 1000 residents *vs* 85·0 cases per 1000 residents) and is associated with a longer average length of stay.[38,39] Modelling by Chen and colleagues[40] suggested that, by 2050, one in six older people in Singapore would have at least one disability affecting activity of daily living (up from one in twelve in 2014). Furthermore, these authors projected a 30·2% higher lifetime spending on hospitalisation for individuals with disabilities than for those without.

It is forecasted that 25% of Singaporean residents (ie, >900 000 individuals) will be older than 65 years in 2030.[41] Given that NCDs are more common with increasing age, the changing age profile will be associated with a further rise in NCDs in Singapore.[42] For example, the prevalence of diabetes among Singaporean residents aged 18–69 years was 8·6% in 2017.[43] Accounting for ageing, diabetes prevalence is projected to rise from 7·3% in 1990 to 15·0% in 2050.[44] In 2017, NCDs contributed to 80·3% of total DALYs in Singapore, with the largest burdens due to cardiovascular diseases (14·2% of total DALYs), cancers (13·4%), musculoskeletal disorders (12·6%), and mental health disorders (10·2%).[45]

Therefore, on the basis of increased medical needs associated with ageing, Singapore saw a growth in hospital admissions that was disproportionate to the growth of the general population. Chia and Loh[30] reported that, although total annual hospital admissions grew by 23% between 2006 and 2015, public sector admissions for patients aged 65 years and older increased from 28·6% in 2006 to 33·4% in 2013. Furthermore, the average length of stay for older patients increased from 7·8 days in 2010 to 8·2 days in 2013.

Other factors have exacerbated the effects that ageing alone has had on acute hospital service demand. Unmet primary care needs and a relative shortage of ILTC capacity tend to increase acute hospital use by promoting an increased number of admissions and inhibiting discharges as hospital-based services become responsible for health and health-related social needs.[46] In addition, some subsidy formulas have unintentionally reduced the relative attractiveness of private GPs for patients with complex needs.

Unmet primary care needs

The rising prevalence of NCDs and rapid population ageing will require longitudinal and holistic care that focuses on health promotion, disease prevention, and patient empowerment, which is more efficiently and cost-effectively provided by a strong primary care sector.[47] However, the primary care system in Singapore has faced various challenges in relation to the management of NCDs.[16] Additionally, in the 2010 National Health Survey, more than 60% of patients did not have a regular primary care physician.[48]

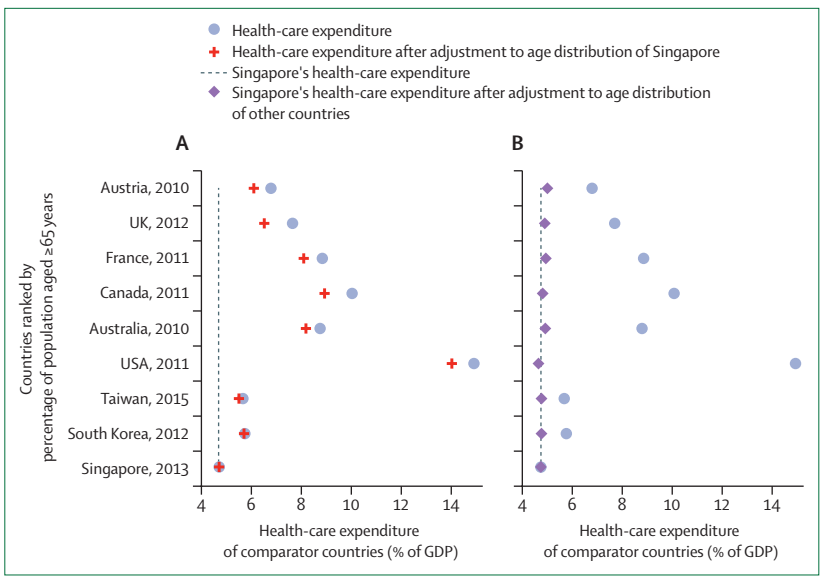

Figure 1: **Health-care expenditure of Singapore and comparator countries**
(A) Health-care expenditure of comparator countries as a percentage of GDP, if each country had the population age distribution of Singapore. (B) Singapore's health-care expenditure as a percentage of GDP, if Singapore had the population age distribution of each of the comparator countries. GDP=gross domestic product.

Primary care in Singapore is mainly delivered by private GP clinics; however, around 85% of these are single or small group practices,[15,49] many of which do not have the scale or resources required for the management of patients with complex needs. Public polyclinics are staffed and equipped to provide a comprehensive range of primary care services, as well as diagnostic and imaging tests, at highly subsidised rates. Polyclinics manage approximately 41% of attendances by patients with chronic disease while employing around 22% of the primary care physicians in Singapore.[15] In large part, for patients who require long-term management, polyclinics are a considerably cheaper option than are private GP clinics, particularly accounting for medication costs. However, this option is not tenable in the long term as the number of patients with NCDs rises exponentially, because more polyclinics would need to be built while GP capacity is not sufficiently used.[44]

Primary care is also not well integrated into the care of patients who are admitted to hospitals, despite targeted initiatives.[18] Patients' clinical data are accessible across the entire health system through the national electronic health records. Although private GP clinics can readily view these health records for the purposes of managing patients, many GP clinics are not equipped with efficient electronic medical record systems. Thus, there are persistent difficulties with sharing information between health providers and between health and social service providers, impeding holistic care and disease prevention in the long term.

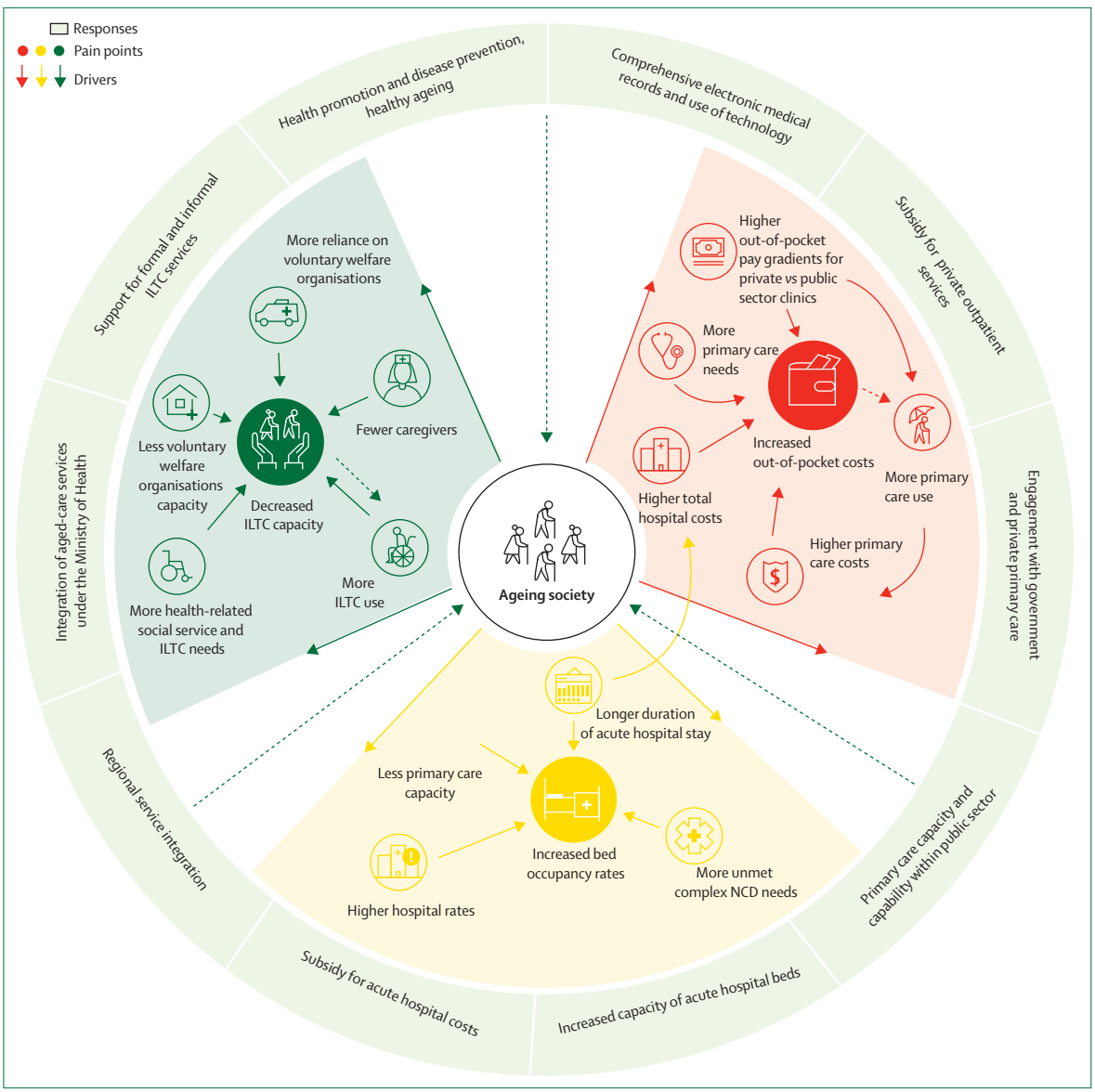

Figure 2: **Key pain points and drivers of stress within Singapore's health-care system**
ILTC=intermediate and long-term care. NCD=non-communicable disease.

Insufficient ILTC capacity from voluntary welfare organisations and families

Historically, Singapore has taken a collaborative, cross-sectoral approach in developing the ILTC sector.[50] Care would generally rely on the family as the first line, supported by voluntary welfare organisations or charities that comprise an estimated two-thirds of ILTC providers.[51] Such an approach promotes active community participation in ILTC; however, many organisations are relatively small and their numbers increase the difficulty of care coordination.[52] Informal caregivers are essential, but the pool of these individuals within families is decreasing due to a reduction in total fertility rates, nuclearisation of families, a decrease in marriage rates, an increase in divorce rates, and an increase in the number of women in employment.[53] The high costs of ILTC make it difficult for voluntary welfare organisations to scale capacity, even with funding assistance from the government. A 2018 report noted that ILTC capacity lagged demand; for example, in 2015, there were 7800 referrals for day-care services when only 3500 places were available.[51,53] ILTC financing in Singapore has incorporated copayments, the targeting of government subsidies to low-income residents through means testing, and the institution of ElderShield in 2002 as a basic, long-term care insurance scheme for people with severe disability, especially during later life. In 2015, ILTC expenditure among older Singaporeans was

primarily from out-of-pocket costs (40%) and government spending (42%), with the remainder covered by charitable donations (9%) and private long-term care service insurance (9%). For individuals who did not use existing services, a prominent consideration was perceived affordability.[54]

Out-of-pocket payment gradients and incentives

Although Singapore's approach of targeted subsidies has made inpatient care in public hospitals and primary care in public polyclinics affordable, particularly for low-income citizens, it has had the unintended effect of creating out-of-pocket payment gradients that favour patients choosing to have care in polyclinics. Consequently, these clinics have to manage a disproportionate number of patients with NCDs. Chin and Phua[50] described how, in 2011, some subsidy policies in Singapore created unintended financial incentives for people with primarily ILTC needs to seek hospitalisation, especially when these individuals came from middle-income families that were eligible for low or no ILTC subsidies.

Immediate responses to pain points: the Ministry of Health's Healthcare 2020 Masterplan

To address the emerging stresses in the health system, in 2012, the Ministry of Health announced the Healthcare 2020 Masterplan to increase health-care capacity and to enhance health-care affordability and financial protection.[55]

Increasing health-care capacity

The Healthcare 2020 Masterplan included plans and targets for substantial increases in the number of acute and community hospital beds, as well as nursing home beds and community-based services. Implementation has been on track (table 3), and further capacity will be added with the opening of the Outram Community Hospital with 550 beds in 2020 and the Woodlands Health Campus with 1400 acute hospital beds and 400 community hospital beds in 2022. Health-care professional personnel was also increased by raising the annual intakes of local degree programmes, stepping up recruitment, and enhancing career progression and compensation packages. By 2018, personnel had increased by 36% since 2011;[56] however, it will be increasingly difficult to maintain the projected rate of growth on the current trajectory.

In 2012, eligibility for government subsidies for ILTC was extended to cover around 80% of households, and the amount of support was also raised for home and community-based services, with low-income families qualifying for 80% of costs to be covered by subsidies.[57] A 2018 study reported that home-based and centre-based day-care services had overtaken nursing homes as the main form of ILTC.[51] The number of individuals using these subsidised services had increased from 12 000 in 2016 to 14 000 in 2017, whereas subsidised nursing home residents remained at around 10 000 over the same period.

	2011	2012	2015	2017	2018	2020
Acute hospital beds	8304	8725	9844	10 340	10 826	11 545
Community hospital beds	800	842	1464	1663	1778	2069
Nursing home beds	9690	9721	12 185	14 918	15 205	16 221
Community-based services						
Day-care places	2100	2250	3500	5000	6200	NA
Home care places	3800	4500	6900	8000	9200	NA

NA=not applicable.

Table 3: **Progress of health-care 2020 targets**

In 2019, the Ministry of Health initiated a Caregiver Support Action Plan to improve care navigation, workplace support, caregiver respite services, caregiver training, and financial support. This initiative is important because families and caregivers are an essential complement to the expansion of formal ILTC facilities and services, which might not be well used otherwise.[58] The plan includes a new S$200 monthly Home Caregiving Grant to help caregivers defray the costs of home and community-based long-term caregiving of individuals with permanent moderate disability.[56]

Enhancing affordability and financial protection

Since 2012, several measures have been implemented to improve health-care affordability and financial protection. The government committed to increase its share of total health-care expenditure from 30% to 40%, largely through substantial increases in health-care subsidies, which raised government health-care expenditure from S$3·86 billion in 2010 to $8·71 billion in 2015.[4,59]

In addition, subsidy schemes were created for citizens born before 1950 (ie, the Pioneer Generation Package in 2014) and for those born between 1950 and 1960 (ie, the Merdeka Generation Package in 2018), which were given regardless of financial status.[5,60] These schemes assisted cohorts of older citizens who, in the early years of Singapore's development, had accumulated lower MediSave balances and retirement savings than had individuals born after 1960. For example, the S$9 billion Pioneer Generation Package provided additional subsidies for outpatient care, MediShield Life premiums, and long-term care to the 450 000 Singaporeans born before 1950.[61]

The role of insurance has also been expanded to provide stronger universal protection against high-cost treatments. MediShield Life, introduced as a mandatory programme in 2015, addressed gaps in its predecessor scheme in that it has no exclusions for pre-existing conditions, no lifetime claim limits, and no age limits, thus providing lifelong coverage with increased payouts.[5,62,63] Close to S$4 billion in subsidies has been provided by the government in the

first 5 years of the MediShield Life scheme to ensure that premiums remain affordable for low-income and middle-income households. Similarly, CareShield Life, introduced in 2020, has substantially augmented long-term disability care insurance.[64,65]

With these measures, out-of-pocket expenses decreased from 48·5% of total health-care expenditure in 2003 to 32·1% in 2017.[4,59,66] In 2017, 89·8% of bills for inpatient treatments required less than S$500 out-of-pocket expenditure after subsidies, MediSave, and MediShield Life.[67] Nevertheless, out-of-pocket payments for health care will remain a challenge. The rate at which the government's health-care spending is increasing is not sustainable in the long term, particularly with the anticipated impact of population ageing and NCDs on the health-care system.[68] The growing number of new yet expensive treatments and rising public expectations will further raise demand for health-care services and costs. A key question is whether Singapore can return to a more moderate and sustainable rate of increase in health-care expenditure while maintaining access to, and quality of, care.

Promoting long-term transformational change

Simply expanding existing structures and approaches will not be sufficient to address the underlying drivers of system stress in the long term. In 2016, the Ministry of Health articulated three fundamental shifts that would guide the long-term transformation of the health-care system. These shifts were encapsulated in terms of the so-called Three Beyonds—namely, beyond health care to health, beyond hospital to community, and beyond quality to value. Underlying these shifts is an understanding that Singapore's future health-care system must address the drivers of system stress in ways that also attend to the broader health and health-related social needs of individuals across their lifecourse. The framework for transformation reaffirms the role of personal responsibility not only as a mechanism to constrain use of government resources but also by recognising that, in many cases, individuals, families, and communities can meet needs most effectively in concert with the health-care system (figure 2).

Beyond health care to health

A key pillar of Singapore's health transformation efforts is the effective promotion of health and prevention of disease in its population. In 2017, S$1465 million was allocated to fund preventive efforts such as screening, immunisation, health promotion, and education, which is double the allocation of $723 million in 2014.[68]

The Ministry of Health's Health Promotion Board, established in 2001, has the primary responsibility of driving health promotion in Singapore. Traditionally, promotion was focused on school-based programmes, mass public health education campaigns, and tobacco control. In 2013, the Healthy Living Masterplan was launched with the aim of making healthy living "accessible, natural and effortless for all Singaporeans through a '3P Strategy', namely Place—a conducive environment for healthy living; People—a socially inclusive community; and Price—affordable options for healthy living".[69]

The strategy is being implemented through several programmes aimed at mass participation and influencing commercial partners. The Health Promotion Board's National Steps Challenge provides free step trackers, as well as financial and other incentives, to encourage participants to walk more. 1·7 million individuals have joined since its first season in 2015. Of these people, 38 000 participated in all four seasons and recorded an average improvement of 3950 steps per day by the fourth season, compared with the first season (8495 steps in fourth season *vs* 4545 steps in first season). The Health Promotion Board's food strategy aims to promote healthy eating through a multifaceted approach. Regulations were implemented to limit the availability of high-sugar and deep-fried foods in school canteens. Since 2017, food served at governmental events and training courses, as well as cookhouses for uniformed personnel, have been required to conform to government guidelines on healthy options. To target the general population, the Health Promotion Board has partnered with commercial food and beverage stalls and outlets through the Healthier Dining programme. Together with the Healthier Ingredient Development Scheme for food suppliers, this programme provides subsidies to incentivise the private sector to introduce meals cooked with oil containing a reduced saturated fat content, brown rice, and wholegrain noodles.[70] By end of March, 2021, 40% of food and beverage stalls and outlets, including those in hawker centres (ie, local open-air cooked food centres) and food courts, had joined the Healthier Dining Programme, up from 4% in 2015.

Although good progress is being made to extend the reach of these programmes, a major limitation is that data on their effectiveness have not yet been published. Broad data on health behaviours from regular surveys are available; however, it is difficult to ascertain what the main drivers of the reported changes are from these surveys.

In the 2019–20 National Health Survey of Singaporean residents aged 18–69 years, 77% of respondents reported meeting the recommended 150 min per week of physical activity, compared with 60% in the 2010 survey.[43,48] These figures are higher than those reported in a WHO study of population-based surveys of physical activity across 168 countries,[71] which noted that 34% of men and 39% of women in Singapore did not do 150 min of moderate activity per week or 75 min of vigorous activity per week. This study also found that, of the 65 countries with data for trends over time, Singapore was among the five countries with the largest increases (>15%) of insufficient physical activity between 2001 and 2016.

National Nutrition Surveys suggest that, overall, consumption patterns in Singapore appear to be shifting modestly towards healthier options. Between 2010 and 2018, consumption of unrefined carbohydrates among Singaporean residents aged 18–69 years increased from 14% to 17% of the diet, while consumption of saturated fats decreased from 38% to 36%. Mean daily energy intake decreased from 2600 kcal in 2010 to 2470 kcal in 2018.[72] The 2019–20 National Population Health Survey[43] found that, between 2010 and 2020, the prevalence of obesity had decreased from 10·8% to 10·5% and that of overweight (including obesity) had decreased from 40·1% to 39·1%.

These survey data indicate that, besides intensifying existing programmes, novel approaches are needed to transform the promotion of health and prevention of disease in the general population. Accordingly, Singapore is developing and piloting new approaches to engage with individuals who are hard to reach, such as low-income families living in rental housing, through precinct-based programmes and grassroots community initiatives. The Health Promotion Board has initiated these programmes and is partnering with global technology companies to use digital technologies, data analytics, and behavioural nudges to better promote and sustain positive lifestyle changes in participants who have given their consent.[73] In addition, there will be a particular focus on strengthening the promotion of mental wellness and health, given that treatment gaps for individuals with mental health disorders remain high in Singapore.[74,75] The Health Promotion Board and the Ministry of Health's Office for Healthcare Transformation are investigating whether the use of a web app that provides self-assessment and self-help resources could address the stigma that discourages individuals from seeking help for mental health problems, and if digital phenotyping could assist with the identification of individuals at risk of a mental health condition or its deterioration.[76]

Beyond hospital to community

Healthy ageing

Given Singapore's rapidly ageing population, in 2014, the interagency Ministerial Committee on Ageing sought inputs from more than 4000 Singaporeans to develop the Action Plan for Successful Ageing. The resultant plan has 70 initiatives within 12 themes—namely, health and wellness, learning opportunities, volunteerism, workplace longevity, retirement adequacy, social inclusion, protection of vulnerable older people, health care and aged care, senior-friendly housing, senior-friendly transportation, senior-friendly public spaces, and research into ageing.[77]

Since 2015, several of these initiatives have been either implemented nationally or piloted and are in the process of being scaled up. In 2017, the re-employment age was raised from 65 years to 67 years, with plans to raise this further to 70 years by 2030. Between 2016 and 2018, 1750 companies used a grant scheme that provided up to S$300 000 to modify or create jobs that are safe and less physically demanding for older workers. As part of the National Seniors' Health Programme, over 550 000 seniors have participated in health talks and exercise programmes across the community. To strengthen community befriending, between 2015 and 2019, over 800 older volunteers served 5000 vulnerable older individuals across 87 neighbourhoods. Additionally, nine co-located childcare and aged care sites have been operationalised to promote intergenerational interactions. To improve senior-friendly transportation in Singapore, 100% of bus services and 97% of bus stops have been made accessible for wheelchairs, 200 km of sheltered walkways have been constructed, and 1008 Green Man Plus pedestrian crossings have been completed, which allow older people or individuals with disabilities more time to cross the road when they tap their cards on the card reader at the crossing. Research funding of S$200 million was committed for a National Innovation Challenge on Active and Confident Ageing to catalyse translational research related to ageing.[78]

In 2018, the Ministry of Health took over the responsibility of key aged-care functions from the Ministry of Social and Family Development to improve integrated planning, policy formulation, and development of health and social support services for older people.[79] The resultant substantial expansion of the Ministry of Health's Agency for Integrated Care has put the department into a better position to lead programmes, such as Community Networks for Seniors and Senior Activity Centres, which connect different stakeholders across the community (eg, voluntary welfare organisations, grassroots organisations, health-care providers, public agencies) to promote active ageing, befriend older people living alone, and coordinate local support.[80]

Strengthening and transforming primary care

Recognising that a substantial portion of acute medical services could be provided outside of hospitals, several initiatives have been implemented to strengthen the capacity and capability of the primary care sector, and to enhance public–private partnerships.

First, public primary care services were substantially expanded with two new public polyclinics added in 2017, and six more to be built by 2023. Second, to encourage patients to use private GPs for an increased range of services, the Ministry of Health introduced a subsidy programme, the Community Health Assist Scheme. Subsidies were initially targeted at patients from low-to-middle-income households; however, in 2018, they were expanded to provide coverage for all eligible citizens.[5] The Community Health Assist Scheme currently covers 1·3 million users and 1650 clinics. Third, a new Primary Care Network programme was started in 2017 to promote enhanced capabilities of GP clinics. Through this programme, GP clinics are provided funding, as well

For more on the **Community Health Assist Scheme** see https://www.chas.sg

as clinical and administrative support, to organise themselves into networks with stronger capabilities to improve the management of patients with NCDs.[81] The support includes funding for nurse counsellors and care coordinators, and chronic disease registries that enable care delivery by multidisciplinary teams. As of May, 2021, there were ten Primary Care Networks with a total of 604 clinics.[82]

To further improve the capacity and capability of primary care, the Ministry of Health's Office for Healthcare Transformation is driving the development of home-based, technology-enabled self-management of NCDs at scale. The necessary system for monitoring vital signs, data and information technology platforms, and clinical change management processes was developed in 2019, and scaling of telehealth for hypertension began across the entire public sector in July, 2020. Concurrently, pilot programmes have started to evaluate the benefits of home glycated haemoglobin testing and coaching for patients with poorly controlled diabetes as part of the preparatory work to incorporate diabetes into the telehealth scaling programme.

Beyond quality to value

Value-based health-care initiatives in acute hospitals

As a key driver of health-care cost, acute hospitals have been an early focus for initiatives to improve cost management while improving treatment and patient outcomes. In 2016, the National University Hospital used methodology learned from the University of Utah Health Care (Salt Lake City, UT, USA)[83] to measure the quality and cost of care for each patient encounter in defined clinical conditions. These data are used by clinical teams to initiate, implement, and monitor improvement plans. By use of this approach in 2019, the National University Hospital had 27 of 34 conditions that showed an improvement in either quality or cost, and 14 that showed an improvement in both quality and cost, compared with 2018.[84] In 2018, the Ministry of Health initiated the national Value-Based Healthcare programme to adopt the same approach in all public hospitals, starting with 17 selected conditions in 2018.

Promoting value-based care through whole-system integration

To achieve value-based care, Singapore is moving progressively towards a population health approach based on geographical region. To enable improved integration of primary care with hospital and health-related social services, in 2017, Singapore's public health-care system was reorganised into three regional integrated clusters. Each cluster encompasses health-care providers from primary care polyclinics to community and acute hospitals, and national specialty centres. Each cluster is putting in place the governance and programmes needed to better integrate primary care with hospital care and ILTC and community services. For example, the clusters have added three community hospitals that are physically co-located with acute hospitals. Integrated clinical care pathways are being developed to allow patients to be transferred more promptly from acute hospitals to community hospitals for continuing clinical care and rehabilitation. The polyclinics within the clusters have also started to build stronger clinical linkages with the private GP Primary Care Network. In the long term, such linkages could potentially expand to include establishing payment arrangements that promote improved integration with the private sector, consistent with the goal of value-based care.

Whole-system integration will require new ways of assessing which services are of particular value to which individuals, and to measure value not in terms of volume of care, but the degree to which the whole system (including the individual, family, and community) is meeting health and social service needs that affect health and wellbeing.[85]

Singapore's experience with COVID-19

As has been the case globally, the COVID-19 pandemic has been a major test for Singapore and its health-care system. Since the severe acute respiratory syndrome epidemic of 2003, Singapore has systematically raised its preparedness levels by expanding the physical infrastructure to manage outbreaks in health facilities; constructing a new purpose-built National Centre for Infectious Diseases; stockpiling personal protective equipment, medical supplies, and ventilators; and maintaining an efficient contact-tracing capability.[86]

When the first wave of SARS-CoV-2 infections started on Jan 23, 2020, triggered by tourists from Wuhan, China, public health response measures were instituted promptly, with successful containment of the outbreak. However, in the second half of March, 2020, with many Singaporeans returning from overseas, on-arrival quarantine requirements were imposed only on those coming back from particular countries. This situation resulted in a surge of imported cases, which in turn sparked infection clusters within the community. Such clusters included outbreaks among migrant workers living in dormitories, where the density of accommodation and close proximity of social and professional interactions resulted in rapid transmission. Singapore had to impose a partial lockdown or so-called circuit breaker from April 7 to June 1, 2020.[87] While working to contain the outbreak during this period, Singapore also used the time to increase its testing capacity to 70 000 RT-PCR tests per day and to introduce digital apps to enable faster and more efficient contact tracing.

As of Oct 10, 2020, Singapore had 57 866 COVID-19 cases with a total of 27 deaths attributable to the infection and an additional 15 deaths from other causes in patients who had previously tested positive for SARS-CoV-2 infection.[88] Several factors are likely to have contributed to the relatively low overall mortality rate. Migrant workers

living in dormitories accounted for nearly 95% of all cases. The patients were young, with a median age of 31 years, and because they were mostly detected through systematic mass screening, most individuals had few or no symptoms. All patients were managed either in dedicated Community Care Facilities, with remote vital signs and pulse oximetry monitoring, or in hospitals. The rapid set up of more than 10 000 community care facility beds meant that hospital capacity was not overburdened and, although the surge capacity in intensive care unit beds was activated as a precaution, the highest ever daily number of patients in an intensive care unit was 30.

With the benefit of hindsight, Singapore might have been able to reduce the number of cases if it had imposed on-arrival quarantine requirements on returnees from many more countries to reduce the importation of cases; suppressed the outbreaks in the migrant worker dormitories early on; and mandated compulsory mask wearing sooner.

With these lessons in mind, Singapore is focusing on four major areas as it continues to progressively resume social, economic, and travel activities. First, the city state is establishing and maintaining a level of physical distancing measures that is sustainable yet likely to reduce the risk of large infection clusters or super-spreading events from happening. Second, regular rostered testing is being offered to high-risk groups with the objective of detecting and isolating individuals with asymptomatic infection as soon as possible. These groups include individuals at high risk of severe illness if infected with SARS-CoV-2, such as those in nursing homes, as well as people who have a high likelihood of acquiring and transmitting the infection, such as health-care workers, and workers in dormitories and high-risk workplaces (eg, construction sites). Third, the gradual resumption of air travel is being managed carefully. Travel was initially resumed to countries with a low incidence of COVID-19 and will be gradually extended to countries with a higher incidence, using testing and on-arrival quarantine to mitigate the risks of imported cases. Finally, Singapore has actively worked to gain early access to therapeutics and vaccines as safe and effective agents become available.

From October, 2020, daily new COVID-19 cases remained well below 30 until early March, 2021, when Singapore experienced a new infection wave associated with the delta SARS-CoV-2 (B.1.617.2) variant, which is much more transmissible. Public health containment actions were substantially stepped up with aggressive testing, contact tracing and isolation of infected patients and exposed individuals, and tightened physical distancing measures, and the number of new infections has fallen to below 100 per day in August, 2021. Singapore commenced COVID-19 vaccination with the Pfizer–BioNTech (BNT162b2) vaccine in December, 2020, and the addition of the Moderna vaccine (mRNA-1273) in February, 2021. As of Aug 5, 2021, Singapore had a total of 65 410 confirmed COVID-19 cases and 39 deaths, 65% of the population had completed the full vaccination regimen, and an additional 13% of the population had received the first dose of the vaccine.

Conclusion

Singapore has been able to achieve good health outcomes at relatively low health-care expenditure levels. However, its health-care system is contending with stresses driven by rapid population ageing and the rising prevalence of NCDs, exacerbated by characteristics of the primary care system and the ILTC sector that limit their ability to respond to these, as well as fragmentation across sectors. As an immediate response, in 2012, Singapore embarked on a comprehensive series of initiatives under the Ministry of Health's Healthcare 2020 Masterplan, which have increased health-care capacity and enhanced health-care affordability and financial protection. As part of the long-term transformation of the health system, efforts have been redoubled to drive health promotion and disease prevention of the general population, and to promote healthy ageing for older people within the community. In addition, concerted measures are in place to strengthen and transform the primary care sector, and to create the foundation for integration across health-care sectors. These measures require the engagement of not only traditional health-care entities but also the whole of society, including public education, housing, transportation, and social services. The COVID-19 pandemic has provided a huge impetus for many of these efforts; it has speeded up the integration and use of disparate datasets for health purposes, considerably increased the deployment and uptake of telehealth, and emphasised the importance of mental health and illness within the community. As with many other countries, Singapore hopes to maintain this momentum for positive change as a long-term driver for its health-care transformation efforts. At the same time, Singapore is committed to maintaining the ethos of personal responsibility, not merely through out-of-pocket cost requirements to constrain health-care use and general health-care cost inflation at the societal level, but because the individual level, family level, and community level are often the most appropriate entities to direct the delivery of health care that is effective and affordable, and promotes a greater sense of wellbeing.[89]

Contributors

All authors have critically reviewed and contributed to the intellectual content of the manuscript. CCT, CSPL, YKZ, and JELW were involved with the conception of the study, initial drafting and, with DBM, subsequent revisions of the manuscript, with overall guidance and final synthesis by CCT. All authors have read and approved the final version of the manuscript, and had final responsibility for the decision to submit for publication.

Declaration of interests

CCT reports personal fees from Verily Life Sciences, as a member of its advisory board. CSPL is supported by a Clinician Scientist Award from

the National Medical Research Council of Singapore and has received research support from Boston Scientific, Bayer, Roche Diagnostics, AstraZeneca, Medtronic, and Vifor Pharma. CSPL has also served as consultant or on the advisory board, steering committee, or executive committee for Abbott Diagnostics, Amgen, Applied Therapeutics, AstraZeneca, Bayer, Biofourmis, Boehringer Ingelheim, Boston Scientific, Corvia Medical, Cytokinetics, Darma, Eko.ai Pte, JanaCare, Janssen Research & Development, Medtronic, Menarini Group, Merck, MyoKardia, Novartis, Novo Nordisk, Radcliffe Group, Roche Diagnostics, Sanofi, Stealth BioTherapeutics, The Corpus, Vifor Pharma, and WebMD Global; and serves as co-founder & non-executive director of EKo.ai Pte. DBM has received fees from the Lundbeck International Neuroscience Foundation (Denmark) as a faculty, and has received grants from Novartis and Pfizer–Upjohn for health services research outside of Singapore. JELW reports personal fees from Sidra Medicine as a member of its board of governors. YKZ declares no competing interests.

Acknowledgments

The contributions of Tiew-Hwa Katherine Teng, Vasuki Utravathy, Weili Kerk, Timotius Marvin Tan, Chew Ling, and Kelvin Bryan Tan are gratefully acknowledged.

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