

Climate adaptation

How investment can support adaptation for health and healthcare systems

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Introduction



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In brief

- There is increasing evidence to suggest that climate change is a material risk to human health and wellbeing. Health – and healthcare systems – could be affected by global warming in many different ways.
- Climate adaptation is needed to help reduce climate change risks to health, and to help healthcare systems become more resilient by pre-empting climate risks, mitigating health and economic impacts, and better managing the burden of climate change-related ill health.
- Investors have a key role to play in the support and development of climate adaptation solutions across all stages of the healthcare value chain.

The World Health Organization (WHO) describes climate change as the biggest global health threat of the 21st century, impacting society and the economy in the form of air pollution, food and water insecurity, infectious disease, extreme heat, extreme weather events, and more.¹ The negative health effects of climate change will become more severe and less manageable as global temperature rise accelerates. These climate-related health impacts will lead to increased demand for healthcare, which existing healthcare systems may struggle to meet.

At the same time as facing an increased burden of demand from climate change-related ill health, healthcare systems are themselves at risk from climate change. Climate change-related hazards already routinely stress and disrupt healthcare systems and threaten access to healthcare for many.² With greater warming, the entire healthcare system is likely to face increased supply

chain disruption, resource scarcity and infrastructure damage. This is likely to make it significantly more difficult for healthcare providers to cope with the extra demand that will be placed on them.³

The impacts of climate change on health can also lead to wider economic consequences. The WHO estimates that the direct costs to health from climate change – excluding costs to health-determining sectors, such as agriculture, and water and sanitation – will be between USD 2 billion and USD 4 billion per year by 2030.⁴ Economic damage can create greater obstacles to building healthcare system resilience and reduce capacity for adaptation.

In this article, we explore climate change risks to healthcare systems and the healthcare sector. As well as laying out the risks, we discuss adaptation solutions that could make health and healthcare more resilient to climate change impacts. While some climate risks to health are still emerging and may not fully materialise over the investment horizon of today's investors, many negative impacts of climate change on health are already visible (**Exhibit 1**). Looking at healthcare companies through a climate adaptation lens can offer insights into potential climate-related risks and opportunities within investment portfolios.

- ³ Drew, J., Christie, Prof S.D, Rainham, Prof D., Rizan, C., "HealthcareLCA: An Open-Access Living Database of Healthcare Environmental Impact
- Assessments", The Lancet Planetary Health Volume 6, Number 12 e928-e1012 (December 2022). https://doi.org/10.1016/S2542-5196(22)00257-1

⁴ World Health Organization: Climate Change. https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health

¹ Cissé, G., McLeman, R., Adams, H., Aldunce, P., Bowen, K., Campbell-Lendrum, D., Clayton, S., Ebi, K.L., Hess, J., Huang, C., Liu, Q., McGregor, G., Semenza, J., Tirado, M.C, "Health, Wellbeing, and the Changing Structure of Communities" in "Climate Change 2022: Impacts, Adaptation and Vulnerability – Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", pp. 1041–1170, Cambridge University Press (Cambridge, UK and New York, NY, USA, 2022). doi:10.1017/9781009325844.009.

² Crimmins, A.R., Avery, C.W., Easterling, D.R., Kunkel, K.E., Stewart, B.C., Maycock, T.K., (eds.), "Fifth National Climate Assessment", US Global Change Research Program (Washington DC, 2023). https://doi.org/10.7930/NCA5.2023

Exhibit 1: Impacts of climate change on health around the world

The 2018 wildfires in **British Columbia and Alberta** forced 19 healthcare sites to close, necessitating the evacuation of 880 patients and displacing 700 healthcare staff, with an overall cost of USD 2.2 million.³ The health costs of six climate-related events in the **United States** between 2000 and 2009 (ozone pollution, heat waves, hurricanes, outbreaks of infectious diseases, river flooding and wildfires) were estimated at \$14bn, including healthcare costs of \$740 million.¹⁵

After 2012's Superstorm Sandy, USD 3.1 billion was reported in recovery costs by the **New York** healthcare sector.²

US hospitals lost USD 22.3 billion due to cancellations of elective surgeries during COVID-19.¹³ The pandemic exposed the lack of resilience of the healthcare system when confronted with a large, prolonged increase in healthcare needs, so is a good proxy for the potential disruption and financial loss from climate change.¹⁴

A White House study estimated federal annual healthcare costs from the effects of climate change on air quality, Valley fever, southwestern dust and wildfires by 2100 at between \$835m and \$22bn.¹⁰

The deep freeze in **Texas** in 2021 overwhelmed hospitals and emergency departments, seriously disrupted health care operations, and forced the cancellation of elective surgeries. It caused the closure of three major semiconductor plants, exacerbating an already critical shortage of chips needed for many medical devices, and severed important transport links.¹⁶ The 2022 heatwave in the United Kingdom forced almost a fifth of hospitals to cancel operations because facilities were not set up to withstand the extreme high temperatures, with 41% of operating theatres having no means to control ambient temperature.¹ By 2050 the construction sector in **Europe** is projected to suffer a loss of about EUR 4.7 billion from heat-related productivity losses, followed by transport (EUR 2.8 billion) and agriculture (EUR 2.4 billion).⁹

Spain recorded over 4,600 deaths attributable to extreme heat between June and August 2022.⁴



Loss of labour due to heat stress wiped out the equivalent of **4.1%** of Africa's GDP in 2022, mainly from losses in the agricultural sector.¹² Air pollution is estimated to cost **India** 3% of its GDP while the country's income loss from exposure to higher temperatures and resulting reduction of working hours has been estimated at 5.4% of GDP.⁶ A recent study found a link between inhaling polluted air containing PM2.5 particles and developing type 2 diabetes.⁷

For references see page 16.

More than **100** diverse microorganisms in Siberia's deep permafrost have been found to be antibiotic resistant. As the permafrost thaws, there is potential for these bacteria to mix with meltwater and create new antibiotic-resistant strains.¹¹

> In 2023, the number of high-temperature days in **China** reached the highest level since 1961. Compared to the average level from 1986 to 2005, the average number of heatwave days per person in China increased by 7.85 days, resulting in an additional 13,185 heat-related deaths. Economically, the potential loss of 33 billion working hours related to high temperatures led to a 1.68% reduction in GDP in 2021.⁸

> > The 2019-2020 wildfire season in **Australia** resulted in around AUD 2 billion of costs from smoke-related premature deaths and hospitalisations alone.⁵

How climate change affects health, healthcare systems and the wider economy

Climate change affects health in many different ways, both directly and indirectly (**Exhibit 2**).⁵ It exacerbates existing health challenges at the same time as creating new ones, with outcomes typically worse in more vulnerable and marginalised populations.

By increasing exposure to health risks, climate change also increases the burden on healthcare systems.6 At the same time, climate change threatens the functioning of healthcare facilities and increases the risk that they will fail to deliver effective care.7 A recent asset-level physical risk analysis of hospital infrastructure globally found that on our current warming trajectory, by 21001 in 12 hospitals will likely be at high risk of total or partial shutdown from extreme weather events - a total of 16,245 hospitals, with India, China and Japan as the top three countries in terms of number of hospitals at risk.⁸ In this way, climate change could cause interruptions to normal operations and care patterns, leading to worsened health outcomes and higher costs for treatment down the line. The resulting losses could further undermine investment in efforts to adapt to climate change, creating a vicious circle. According to a survey in the 2023 report of the Lancet Countdown, a major annual study on health and climate change, 27% of global cities surveyed were concerned that their health systems could be overwhelmed by the impacts of climate change.9 This risk is particularly acute where adaptation measures are lacking.

Climate change's effects on health can also indirectly impact the wider economy. To date, the economic impact has been most obvious through the fallout from extreme heat, which has led to lower productivity and lost working hours. In 2023, a record-high 512 billion potential labour hours were lost globally due to extreme heat exposure according to the Lancet Countdown – 49% above the 1990-1999 average. This loss of potential labour hours was associated with potential income losses of USD 835 billion.¹⁰ These economic losses would only be expected to increase with hotter temperatures.

Ultimately, it is difficult to anticipate all the potential impacts of climate change on health, the healthcare sector and the broader economy. What is clear is that climate change can result in significant financial and social impacts to individuals, companies and countries. However, with proactive and timely adaptation, many of the risks to human health, healthcare systems and the healthcare sector could be reduced, and some risks potentially avoided.

⁶ Romanello, M., Di Napoli, C., Green, C. Kennard, H., Lampard, P., Scamman, D., et al. "The 2023 Report of the Lancet Countdown on Health and Climate Change: The Imperative for a Health-Centred Response in a World Facing Irreversible Harms", The Lancet Countdown (November 2023). https://doi. org/10.1016/S0140-6736(23)01859-7

⁶ Cisse, G., et al., "Health, Wellbeing, and the Changing Structure of Communities", in IPCC Sixth Assessment Report, pp.1041-1170 (2022).

⁷ Al-Marwani, S., "Climate Change Impact on the Healthcare Provided to Patients", Bull Natl Res Cent 47, 51 (2023). https://doi.org/10.1186/s42269-023-01026-9

⁸ XDI, "2023 XDI Global Hospital Infrastructure Physical Risk Report" (December 2023)

⁹ Romanello, M., et al., "The 2023 Report of the Lancet Countdown on Health and Climate Change", (November 2023).

¹⁰ Ibid.

Exhibit 2: Climate change impacts on health and healthcare systems



• 2024 is on track to be the hottest year on record, with temperatures between January and September temporarily reaching 1.5C above pre-industrial level.¹ Extreme heat can have direct effects such as heat stress, heat exhaustion or dehydration. Almost half the population and more than 1 billion workers are already exposed to extreme heat.2 • Extreme heat is particularly dangerous to vulnerable populations: heat-related mortality in people over 65 increased by a record-breaking 167% in 2013-2023 compared with 1991-2000.3 • There is recent research to show that some common medications could make people more vulnerable to heatwaves by interfering with the body's internal thermostat or impairing sweating.4 • In 2019-2023, people were exposed, on average, to 46 more days of health-threatening heat than would have been expected without climate change, a value that reached a record high of 50 more days in 2023.5 • Temperature and humidity extremes, dust storms, extreme precipitation and increased climate variability are all risk 2 factors for respiratory tract infections.⁶ • Climate change increases particulate matter levels and ground-level ozone as well as leading to more intense wildfires. • Higher temperatures and increased CO., levels lead to longer pollen seasons as well as higher pollen potency, worsening allergies. • Increased storms, precipitation, heat and humidity promote mould growth, a common trigger for asthma and allergies. • Air pollution levels exceed safe values set by the WHO almost everywhere in the world (99% of population). • In 2021, there were 2.09 deaths attributable to PM2.5 ambient air pollution from fossil fuel combustion. This was a 6.9% decrease from the 2.25 million deaths from this cause in 2016.9 Greater proximity between humans and animals 3 as habitats shift due to rising temperatures (and deforestation) can raise the likelihood of crossspecies disease transmission and pandemics.10 • Higher temperatures can lead to accelerated microbial 4 growth and longer survival, greater persistence and faster transmission of pathogens. Higher temperatures will also shift the geographic and seasonal distribution of diseases, bringing them to regions where they did not previously exist, where populations have never been exposed to them and health systems are unprepared.11 • Climate change has contributed to the spread of malaria, dengue, Lyme disease and more. • Annual average transmission risk of the Aedes albopictus and Aedes aegypti varieties of dengue fever rose by 46.3% and 10.7% respectively between 1951-60 and 2014-23. Over 5 million cases of dengue were reported globally in 2023.12 • Researchers have predicted that the Aedes aegypti mosquito, the vector of yellow fever, dengue and Zika, might be able to reach cities such as Chicago and Shanghai by 2050 if global temperature rises by ~2.5°C.13

For references see page 17.

5	Extreme weather events such as floods, hurricanes and wildfires can lead directly to severe injuries or deaths, which create additional urgent healthcare demand. ¹⁴ The average number of days with exposure to very high or
	extremely high fire danger was higher in 2019-2023 than 2003-2007 for 124 countries (66% of all countries). ¹⁵
•	There were 2.1 million deaths from disasters attributed to weather, climate and water extremes between 1970 and 2021. ¹⁶
•	However, the lethality of floods and storms declined in 2013-2022 compared with 1990-1999, largely due to increased implementation of early warning systems. ^{77}
6	Climate change is exacerbating food insecurity and malnutrition. Climate change impacts such as drought and water scarcity are expected to threaten food production rates, food quality (including lowering nutritional content), food prices and distribution systems. ¹⁸
•	Higher temperatures will encourage higher rates of microbial growth, affecting food safety. ¹⁹
•	151 million more people were reporting moderate to severe food insecurity in 2021 than on average between 1981-2010 due to a higher frequency of heatwaves and droughts. ²⁰
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7	Climate change impacts on health, lifestyles and livelihoods can cause mental health to suffer. ²¹ For example, drought during growing season has been associated with worsening mental health among rural US
	farmers. ²²
•	Vulnerable populations are particularly likely to suffer poor mental health in the face of climate change – for example, those displaced from their homes as a result of extreme weather. Each year since 2008, an average of more than 20 million people worldwide have been forced to move because of weather-related events. ²³
•	High temperatures and heatwaves are associated with mood and behavioural disorders, including an increase in aggressive behaviour, crime and suicide risk. ²⁴
•	Chronic stress from climate change or the physical health effects it causes can lead to anxiety, depression, post-traumatic stress and a loss of connection to environment or community, among other mental health issues. ²⁵
8	There is a strong association between higher temperatures and increases in food- and water-borne diseases. ²⁶ Climate change can also help trigger natural disasters that make these diseases more prevalent. ²⁷
•	An example is cholera, which is spread by floods and disproportionately impacts the young, elderly and immunocompromised.
•	Climate change may lead to an 8%-11% increase in risk of diarrhoea in the tropics and subtropics by 2039. ²⁸
9•	Noncommunicable diseases (NCDs) account for 74% of all deaths globally each year. There is evidence to show that NCDs such as diabetes can be worsened by climate impacts, in particular extreme heat. The economic cost of NCDs attributable to lack of physical activity (such as obesity, diabetes, and heart disease) could reach \$27 billion annually on its current trajectory. Extreme heat and worsening air pollution could further reduce scope for physical activity and be a contributor to an increased burden of NCDs ²⁹

How investors can invest in healthcare adaptation

Finance can both help to mitigate these climate-related risks to health and healthcare systems, and reduce their economic impacts, while also helping companies to take advantage of adaptation opportunities.

Some 70% of countries cited lack of finance as a constraint to health adaptation according to the 2022 report of the Lancet Countdown - up from 56% in 2018.11 This result is unsurprising given that less than 0.5% of multilateral climate adaptation funding to date has targeted the health sector.¹² However, there are some signs of health considerations increasingly being factored into adaptation spending: in 2023, the Green Climate Fund approved funding for adaptation projects with potential health benefits of USD 423 million - up by 137% since 2021.13 Companies and governments will need increased investment to evaluate climate risks and to help them start to build solutions.14

Investors can gain access to opportunities aligned to the healthcare adaptation theme via investment in private sector companies across the entire healthcare value chain. Institutional investors and asset managers could help to fill adaptation funding gaps through investment in specialised thematic funds, or impact funds. There is also growing issuance of sustainability debt in the healthcare sector, where the use of proceeds targets sustainable outcomes. Innovations such as the integration of climate resilience criteria into bond covenants could further help increase the flow of funds dedicated to health adaptation. Investors could also look to alternative assets, such as infrastructure providers constructing climate-resilient healthcare facilities, or transportation companies covering the healthcare supply chain.

The deployment of private capital will be encouraged by consistent, well-designed public policy. Because successful adaptation projects often benefit from a mix of public and private capital, co-operation between the public and private sectors can be useful. The potential for this co-operation has been demonstrated by a recent resurgence in industrial policy, which has in several cases been supportive to action on climate change,¹⁵ as well as explicit recognition by governments of the potential for public-private partnerships, as in the case of the United Kingdom's proposed new National Wealth Fund.¹⁶

Romanello, M., Di Napoli, C., Dummond, P., Green, C. Kennard, H., Lampard, P. et al. "The 2022 Report of the Lancet Countdown on Health and Climate Change: Health at the Mercy of Fossil Fuels", The Lancet Countdown Volume 400, Issue 10363, pp. 1619-1654 (November 2022). https://doi. org/10.1016/S0140-6736(22)01540-9

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J.P. Morgan Asset Management, "2024 Long-Term Capital Market Assumptions: Time-Tested Projections to Build Stronger Portfolios", J.P. Morgan Asset Management Portfolio Insights (2023).

¹⁶ HM Treasury, National Wealth Fund: Mobilising Private Investment (October 2024) https://assets.publishing.service.gov.uk/ media/6710cf42080bdf716392f558/NWF_IIS_Publication.pdf

Opportunities for adaptation in the healthcare sector and beyond

While climate change threatens significant impacts on both individual companies and the wider economy, the interaction of climate risks with structural economic shifts can also create opportunities for investors. For example, an increased consumer focus on health and wellbeing is apparent in some developed countries, which are also seeing increased government spending on health as their populations age. Per capita spending on healthcare in the US is expected to increase from USD 13,000 in 2022 to USD 20,000 by 2031.17 (Exhibit 3). Additionally, as the effects of climate change materialise, there may be increased appetite to counter them through the development of new medical products and services.

Climate change risks to health can also be addressed from a more holistic standpoint, rather than focusing solely on the healthcare sector. Because healthier environments and lifestyles can help prevent ill health occurring in the first place, human health can be both negatively and positively impacted by the products and services provided by infrastructure, utilities and consumer goods companies, as just some examples.

Our previous articles on climate adaptation, looking at opportunities to build more resilient and sustainable

cities and opportunities for helping nature adapt to climate change, explore some of the actions that can contribute to improving the general health of communities and reducing their susceptibility to climate change-related ill health. These actions include broad health education, surveillance and communication of health threats, better urban infrastructure and city redesign, the protection of nature and green spaces, improved water, sanitation and hygiene, and proactive targeting of vulnerable people to reduce inequity.

These actions span all sectors, and can reduce the burden on health systems by increasing general wellbeing and reducing population vulnerability. Products and services promoting general population health and wellbeing can also be sources of financial return and drivers of long-term value for investors.

Overall, investors with a focus on the long-term resilience of their investments to health-related climate risks can look to invest in companies in the healthcare sector, and beyond, that are either effectively adapting their business models to climate change risk, or developing specific products and solutions to combat climate-related risks to health and healthcare systems.

Exhibit 3: US healthcare spending as percentage of total

Personal consumption expenditures on healthcare as % total, nominal, SAAR, monthly



Source: BEA, FactSet, J.P. Morgan Asset Management; data as of September 2023. SAAR = seasonally-adjusted annual rate.

McGough, M., Salaga, M., Cox, C., Amin, K., "How Much is Health Spending Expected to Grow?", Peterson-KFF Health System Tracker (11 October 2023).

Evolving the conversation with healthcare companies on climate adaptation

While health can be impacted by companies in many different sectors, it's the healthcare sector that has a particularly critical role to play in combating climate change-related health risks. There is evidence that some companies in the healthcare sector are now beginning to disclose risks and opportunities to do with physical climate risk, as recommended by existing frameworks such as those provided by the Task Force on Climate-related Financial Disclosures (TCFD), and CDP. Some of these disclosures include plans that companies have made to increase resilience and the active steps they have taken towards adaptation.

These disclosures are encouraging, since rising physical risk from climate change and a lack of adaptation within the healthcare sector to date means that climate adaptation may now be a financially material consideration for the healthcare sector and related sectors. Healthcare companies that do not make efforts to understand climate risks and take adaptation measures could be left exposed to economic losses and unable to continue providing their products and services. Those that do take action could see benefits in terms of operational cost efficiencies from waste and energy use reduction, increased access to green capital and subsidies, a lower cost of debt where resilience criteria are integrated into covenants or sustainability-linked bond targets, and a stronger reputation with both internal and external stakeholders. However, the overall level of disclosure is still relatively light, so additional research by investors is needed to help investors fully understand how healthcare companies are approaching climate adaptation and to highlight adaptation-related risks and opportunities in portfolios.

Examples of climate-related disclosures that we have observed from companies in the healthcare sector include:

- Some large pharmaceutical companies are now highlighting the pressures that healthcare is facing from climate-related nature degradation, and the need to look at interconnections between climate change, nature and health to adapt to these risks and avoid financial losses.
- One drug manufacturer disclosed that it is looking to align research with the changing burden of disease and invest in rapid response capabilities, for example developing treatments for malaria with experimental compounds and pan-serotype dengue inhibitors, or investing in treatments for non-communicable

diseases (diabetes, cardiovascular diseases, respiratory diseases) that may be exacerbated by climate change. Another drug company has disclosed that it is constantly expanding its portfolio to include more comprehensive options for diseases likely to become more prevalent as a result of climate change, such as dengue, Chikungunya, Zika, and Lyme disease.

- One global medical technology and services company acknowledges the US Center for Disease Control and Prevention's assessment that climate change may lead to an increase in respiratory and cardiovascular disease, and suggests it can contribute to managing this risk through its existing products and services. It forecasts a potential increase in patients demanding related services and an additional potential increase in revenue.
- Recent adaptation efforts disclosed by healthcare providers have included landscape design at a Colorado facility to mitigate wildfire exposure and the installation of generator power for locations in Puerto Rico with hurricane exposure.
- One pharmaceutical distributor has partnered with a third party to assess the physical climate risk exposure of its top 100 locations across the globe, which showed moderate risk exposure with wildfires the greatest source of risk. It notes that its ability to provide drug distribution services to customers could be impacted by climate change and weather events and, as a result, has designed its distribution network to provide backup for all distribution centres, including proactive planning for alternative transportation methods and delivery routes. Other distributors cite a supply chain structure with a broad geographic footprint, dual sourcing for key products and inventory management as strategies for preemptive climate adaptation.
- A distributor notes that the cold chain is vital for delivery of drugs. As temperatures rise, the ability for packaging to withstand heat shortens, so the company is working on new packaging solutions that can maintain temperatures throughout transit, protecting products.

Potential adaptation solutions across the healthcare value chain

Actors across the healthcare value chain face operational and financial risks from climate shocks and stresses that will compound the growing burden of climate-related ill health by reducing the healthcare system's ability to cope. Adaptation aims both to protect healthcare companies and their consumers from these climate risks, and to allow companies and countries to take advantage of new opportunities. For these reasons, we have focused in on the healthcare sector to assess the numerous potential health adaptation solutions that healthcare companies could consider in more detail. As companies look to respond to changing healthcare requirements, there are numerous potential solutions they could consider. **Exhibit 4** highlights potential adaptation solutions covering two bases. First, we look at investable solutions, via companies providing products and services that address climate risks to health. Second, we look at solutions that companies themselves could implement so that their operations become more resilient to climate change health risks.

Exhibit 4: Potential adaptation solutions across the healthcare value chain

				Risks
Risks	Impacted economies, communities and work forces: Climate change-related health impacts are increasingly recognised as a key risk factor for financial stability, for example in the United States' 2023 Economic Report of the President. ¹		phoyers, corporations Drug, quipment, quip of the second s	_
Opportunities	Implement robust climate adaptation plans: Government budgeting and investments should factor in health risks and impacts from climate change and create national strategies, as well as hazard-specific strategies such as Heat Health		Manura Manura	
	Action Plans (HHAPS). Many European Union members states, for example, have submitted their adaptation plans and actions to the Climate-ADAPT database. ² The US recently released a National Climate Resilience Framework which includes discussion of strategies to make healthcare more resilient. ³ This can inform future planning to ensure funds are available for pre-emptive and reactive climate adaptation.			Opportunit
	Financial incentives for organisations to pursue adaptation activities: Lowering cost of capital requirements in return for evidence of adaptation planning; integrating adaptation KPIs into bond and loan covenants.		uterwices	
	Concessional public healthcare adaptation funding: Increasing the deployment of blended public-private finance would help provide the capital needed to implement health adaptation projects and solutions.		Pistoortation	
	·		Service providers	
Risks	Increase in insurance claims: Climate change-related ill health could lead to a rise in health insurance claims and subsequent payouts. This issue could also impact companies via workplace health insurance schemes that see claims from increased general ill health, and even workplace-specific claims related to extreme heat and air pollution (in the case of outdoor workers).		Health facilities and clinicians, pharmacies and dispensaries diagnostic services	
	Operational challenges: Providers could see higher costs of capital and insurance where they do not demonstrate sufficient awareness of climate change and efforts to adapt to it in their strategy and risk management	Bielco	Dhunian I damage to ben the are familitian. Henritely and other pritical familities are often not adapted to encourish	Risks
Opportunities	Insurance products that incentivise climate-related risk prevention: Integration of metrics related to the environmental sustainability of providers and patient interventions into value-based insurance contracts. Lower premiums for policyholders implementing climate related adaptation measures. Investing in risk management information systems and tools for stress testing: This investment can provide insurance firms with a clearer view of their exposure to climate-related hazards to better guide readiness for potential losses. Adapt business model and strategy: Health plan providers might wish to focus more on the impact of environmental factors on the health of their members and how these risks can be mitinated	RISKS	threats such as heatwaves, storms, flood and wildfires, which can result in electricity and water outages at key moments of crisis. Facilities not adapted to climate risks may ultimately become unusable stranded assets.	
			disruption of health information systems, limiting access to important patient records. Increased demand for emergency care: Healthcare providers could see lower revenues as spikes in urgent care needs from extreme weather events hurt capacity for more lucrative elective healthcare offerings.	Opportunit
			Increased demand for remote care: Climate change can lead to both greater demand for medical care and restricted ability for patients to travel for care.	
		Opportunities	Robust disease surveillance: Tools integrating climatic, sociodemographic and preventive data. These tools might include user-friendly interfaces to openly share and visualise results.	
			Robust contingency plans: Healthcare facilities should have plans and processes for evacuating patients during disasters and for treatment of specific climate-related health threats. This includes upskilling medical staff to be able to cope with the increase in demand for care and different types of care.	
			Analytics for tailored care: Environmental health data can create personalised insights, allowing for more rapid and targeted care. The use of this data is part of a wider structural trend towards personalised health care interventions, enabled through innovations such as wearable devices, and can have adaptation benefits by pre-emptively improving health and tailoring healthcare recommendations to a changing environment.	
			Telemedicine and remote monitoring: Remote solutions can take the burden away from healthcare systems and help prevent climate-induced illness due to early detection by monitoring.	
			Reduce infrastructure disruption: Climate-proof infrastructure, flood insurance and barrier defences; modular facilities, off-grid water / generator power if grid supplies are disrupted; cooling and heating systems that can withstand extreme heat and cold.	
For references see	page 18.			

	Depletion of natural capital poses significant risks: Failure to safeguard ecosystems from climate change could lead to fewer pharmaceutical development options. Medical devices could lose efficacy: high temperatures and humidity are known to accelerate degradation of certain medical devices, especially those with sensitive components and material. Reliance on other climate-sensitive inputs: Pharmaceutical and medical manufacturing companies rely on inputs like water that are at risk from climate change to produce their products.
ies	Biobanking and synthetic biology: These techniques can help to preserve and recreate important genetic material that may be lost due to climate change and nature degradation. Resource efficiency and waste reduction: Leveraging new
	processes (such as Al-enabled sensors) to minimise waste and manage resources to adapt to future resource scarcity. Investing in reusable medical equipment and medical device reprocessing.
	Accelerating vaccine development: Vaccination can support healthcare system resilience by pre-emptively reducing future demand; as well as improving general health resilience against more prevalent infectious diseases.
	Manufacture of products to mitigate climate-related health impacts: These products can include air filters, devices to check water quality, heat early warning systems, or protective equipment for exposed workers.
	Environmental health data to better predict vulnerabilities and for surveillance of viruses: This data can help predict when treatments will be needed, including more detailed climate scenario analysis and leveraging of real-time information. An example of data mapping would be overlaying data on drought risk with patient location data.
	Medical technology innovation: Redesigning devices to ensure they can function even under climate-stressed conditions.
	Supply chain disruption: Timely deliveries are vital for medicines and medical equipment, and health and social care delivery relies on major infrastructure, road networks, utilities and information technology. Disruption to any of this infrastructure due to climate change impacts will have knock-on effects for supply chains and service delivery.
ies	Al supply chain solutions to improve resiliency and transparency: Al could assist with demand forecasting, re- optimising delivery routes in the case of climate-related shocks, automation of data processing to speed up delivery, and enable digital twins to model impacts of changes in external conditions or internal operating parameters. Cold chain technology: Robust investment in cold chain logistics to ensure transportability of health products and
	equipment under climate-disrupted conditions and with product-specific compliance. Smart delivery technology: Solutions for uninterrupted delivery in the case of supply chain or access challenges, such as
	medical drones for drug delivery. Supply chain reorganisation: Backup suppliers to handle critical
	flows of medicines and devices throughout the supply chain. Includes localisation and diversification of supply chains.
	Reduce reliance on delivery via supply chain: An example is to increase reprocessing, or reusability of medical devices and equipment. Doing this onsite or locally would be particularly effective.

Conclusion

Climate change is increasing the risks to health across the world. With many impacts already visible today and set to multiply in future, we believe it is advisable for investors to begin paying greater attention to the topic of climate change and its impacts on health and the healthcare sector. The risks that climate change poses to the healthcare sector and the broader economy may not materialise over the time horizon of some investors today, but we believe it is in the best interests of companies and their investors to be prepared. Yet physical climate risk does not have to be solely a source of risk and economic damage: it can also be an opportunity to revolutionise the way in which healthcare is delivered, for the better. Understanding the risks that climate change poses to health, the healthcare sector and the wider economy can therefore help investors identify ways to change the existing healthcare paradigm. The evolving landscape of adaptation finance and policymaker support for adaptation, alongside the threats that climate change poses to health and the healthcare sector, highlight the growing importance of this emerging area.

References

Exhibit 1: Impacts of climate change on health around the world

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