Global Drivers of Change & Disruptive Innovations

Introduction

The Brenda Strafford Foundation (The Foundation, BSF) is in the process of developing its 2022-2025 Strategic Plan. While this plan will cover a three-year planning cycle, it will have a long term outlook to ensure The Foundation is prepared for the future and the continued evolution of health care. To support this, The Foundation has completed a broad environmental scan looking at the key drivers of change and disruptive innovation over the next ten years. Political, economic, social/demographic, technological and environmental trends have been assessed at a global level with evaluation of how these emerging trends will impact health care, and more specifically, seniors' health. To further spark discussion, a series of guest speakers will be invited to present to BSF on these topics.

Political Trends

Politics often evolves as a reaction to changing societal and economic trends – for example, the recent shift from the industrial era to the information age. Some of the most important aspects will be industry disruption and political competition for new or more important voting blocs such as newly upper middle class professionals, former industry workers, gig economy contractors, and the elderly.

Worldwide, political trends include continued globalization, although this is increasingly fragile with a renewed emergence of nationalism and protectionism. Recent examples include the United Kingdom voting to leave the EU, China launching the Asian Infrastructure Investment Bank, and Trump's 'America First' vision which he demonstrated by pulling the United States out of the Trans-Pacific Partnership. Similarly, there have been shifting views on immigration globally with greater support for border security and stricter immigration laws.

Connectivity is becoming a forceful expression of political power. While connectivity, is in itself neither positive nor negative, it acts as a multiplier of human behavior. In this sense, any human pattern, whether detrimental or beneficial, will be strengthened by connectivity. This is evident in a number of political trends that are gaining traction in part as a result of the ability of individuals to connect with those that share their views. Within nations, we are seeing increased polarization across political party lines to the far right and far left, and in many countries, a populist appeal to the will of 'the people' and a rejection of elites has been a steadily growing phenomenon. On the other hand, the increased focus on social justice is expected to continue. This is the belief that all people should have equal access to wealth, health, well-being, justice, privileges and opportunity.

Implications for healthcare: The health care agenda and priorities will shift to meet the demands of the dominant voting block and ideologies of the governing political party. In Canada, millennials now make up the biggest voting block federally. Growing calls for social

justice among this group would suggest that equal access to healthcare may stall shifts towards the privatization of some health services. Interestingly, 20-30 year olds and 50-60 year olds are the largest two population groups in Canada, each comprising 14% of the population. These groups may have divergent views on health care priorities.

Implications for seniors' health: The same political trends that will influence healthcare will influence seniors' health. The focus on, and resulting funding for seniors' health, will continue to fluctuate based on the ideologies of the voting block and governing party.

Currently, Canada lacks a national strategy for seniors. The COVID-19 pandemic affected seniors more than any other age demographic, particularly those living in long term care. This experience may provide the impetus for the federal and provincial governments to act with renewed urgency in expanding options for Canadians to age at home, while improving the quality of nursing home care for those who need it. The pandemic has also sparked discussion of the need for national standards for long term care.

In 2020, a performance review of Alberta Health Services was completed and a resulting action plan released. Several initiatives were proposed for continuing care and seniors' health, including a review of delivery models and ways to support seniors to remain in their own homes as long as possible. At the same time, Alberta Health is undertaking a Continuing Care Program and Services review, highlighting an increased focus on this area provincially.

Economic Trends

Looking at global economic trends we see growing income disparity and economic inequality within developed countries. There is also growing disparity between developed and developing countries. In alignment with the political trends, we also expect continued global trade volatility and trade tensions (ex. Brexit, China-US relations). Despite rising protectionism, however, the benefits of open trading systems will likely continue to drive growth in global trade.

Advanced economies are moving towards services as the main source of economic value. This is transforming the composition of the world's economic production and employment and global trading patterns.

The sharing economy will continue to grow and the five sectors where this new business model is most prevalent includes consumer-to-consumer (C2C) lending and financing (crowdsourcing), online distance work, C2C home sharing, car sharing and online music and video streaming. Sales revenue by the sharing economic in these sectors is expected to grow from $15 billion in 2013 to $335 billion in 2025.

We expect the growth in e-commerce to continue. Following the COVID-19 pandemic, consumers are buying items rarely purchased online before such as groceries. It also amplified consumer's desire for convenience and immediacy. These shifts have accelerated the growth of e-commerce and fueled retailer's investments in e-commerce platforms. With the growth in e-

commerce as well as the sharing economy, we expect there to be a continued decline in bricks and mortar retail and office locations.

Following the severe global economic contraction experienced as a result of the COVID-19 pandemic in 2020, the outlook for the global economy has improved significantly as vaccination rates rise. Although high-contact industries like travel and hospitality have remained exceptionally weak, as economies reopen, household savings, which grew due to limited spending opportunities and high government transfers, will help to fuel a surge in services consumption.

In Canada, there is optimism about the post-pandemic economic recovery, with the International Monetary Fund (IMF) predicting the Canadian economy will grow 5% over the course of 2021, which is higher than previously forecast. Close to 80% of the jobs lost during the 2020 recession have already been recovered, although unemployment is expected to remain above pre-pandemic levels. According to the Alberta Occupational Outlook, the labor market in Alberta is expected to be balanced by 2028, with some potential labor shortages for occupations including early childhood educators, transport truck drivers, and general office support workers (administrative assistants, receptionists, bookkeepers). There are not anticipated to be significant shortages or surpluses of health care workers, but challenges filling rural positions may create imbalances in those areas.

Canada's inflation rate is expected to increase in the near term to closer to 3%, however, commodity price increases associated with supply chain bottlenecks and transportation disruptions aren't expected to persist. The increase in inflation is expected to be short-lived with inflation expected to return to the Bank of Canada's 2% target in 2022.

One final global economic trend of note is the increase in "moral capitalism" with ESG (environmental, social, governance) and impact investing strategies gaining popularity. According to a 2020 report published by the Forum for Sustainable and Responsible Investment, total US-domiciled assets under management that incorporate ESG metrics into decision making grew from USD $12 trillion in 2018 to $17 trillion in 2020, with climate change being the most important ESG issue considered. Thus investors are signaling their support for businesses that generate a measurable and beneficial social and environmental impact.

Implications for healthcare: An aging population and increase in chronic diseases has created enormous demands on, and higher costs for, the health care system. With up to 80% of health outcomes affected by social, economic and environmental factors, there has been a greater focus on the social determinants of health as a way to reduce overall health care expenditures.

At the same time, an increasing demographic of underserved consumers and communities is leading to health inequities—systemic disparities in the opportunities groups have to achieve optimal health, leading to unfair and avoidable differences in health outcomes.

It is expected that there will be continued payer and provider diversification within health care. In the context of Canada's public health care system, this means an increase in private-pay health care options as governments recognize the need for greater collaboration with the private sector. To this end, a new paradigm of public and private sector collaboration is developing to transform healthcare financing and delivery. Partnerships with new market participants from industries such as retail, telecommunications, technology, wellness and fitness are expanding. These partnerships open the door to a multi-trillion dollar global market for these new commercial entrants, while governments gain access to the innovation and efficiency of new technologies they would not otherwise be able to afford.

Implications for seniors' health: In alignment with growing income disparity globally, within seniors' health, we will see an increased ability and willingness to pay for care and services contrasted against those who are dependent on the public system.

We may also see changes in the funding models and alignment in funding models across the continuum of seniors' health options. This could include new efficiency-based reimbursement models to reduce the growing burden of healthcare costs These models incorporate comparative effectiveness, pay for performance and equitable models of reimbursement and reward providers for better outcomes, better quality, cost savings and value.

Social & Demographic Trends

According to the United Nations, there are four global demographic "megatrends" – population growth, population ageing, migration and urbanization – with implications for economic and social development. The world's population continues to grow and is expected to be about 8.5 billion by 2030. The rate of growth will be highest in sub-Saharan Africa, followed by Central and Southern Asia. The total population of the 47 least developed countries is growing 2.5 times faster than the population of the rest of the world.

Despite this, overall the rate of growth is slowing and is projected to continue to slow through the end of this century. In North America and Europe, the population is stabilizing.

While the age distribution varies globally, with increased longevity, the population aging and those over 65 now outnumber children under 5 years of age. By 2050, the number of persons over age 65 is expected to double. Further, the number of persons over age 80 is expected to triple by 2050. Global life expectancy is now 72.6 years, an increase in 8 years since 1990. At the same time, the population of the workforce (25-59 years) will decline in developed countries. This means that economic growth will depend more heavily on the productivity of the workforce. In the aging economies, older workers will need to learn new skills and work longer, and their work may have to be supplemented by migrant populations. In emerging growth markets, the gaps between supply and demand for those with university-level education will have to be filled. Although we see an overall growth in highly skilled workers, these individuals are also highly mobile, driving competition for skilled labour.

Urbanization will continue. By 2030 two-thirds of the world's population will live in cities. Small-to medium-sized cities of under 1 million are growing at twice the rate of mega-cities (1-5 million). In addition, the middle class is growing, particularly in developing and emerging economies. By 2030, 5.2 billion people will be classified as middle-class globally.

Implications for healthcare: Demographic shifts and societal changes are intensifying pressures on the health system. Individuals are living longer with chronic disease and there is growth in those aged 95-105. Aging populations in both emerging and developed countries are driving up the demand for healthcare and putting pressure on health system resources.

There is already a want for skilled doctors, nurses and other healthcare providers. The approaching wave of retirements of healthcare professionals looms large at a time when demand for services is rising. According to the World Health Organization, by 2035, we face a projected shortage of 12.9 million healthcare professionals globally.

The rising middle class will fuel increasing demand for more health options and we see the emergence of the "empowered consumer". Consumers are taking advantage of unpreceded access to information to become more informed about their own health. The growing power of the patient as a consumer is creating demand for new models of care that are convenient, transparent and personalized. New models of care will orient around the consumer that is better educated and empowered to manage their own health. The definition of health will be broadened to include its spiritual, mental and emotional components with a greater emphasis on the social determinants of health.

An increasing demographic of underserved consumers continues to lead to health inequities. Health disparities remain among marginalized populations, including LGBTQ+, low income, and racialized populations. 25% of Canadians are non-English speaking. The health system will need to adapt to meet the needs of these consumers and to reduce health inequities.

Implications for seniors' health: The social and demographic trends that impact healthcare as a whole will trickle down to seniors' health. Baby boomers are aging and taking increased accountability for their own health. They too are becoming "empowered consumers" and will demand choice and personalization in the health care and services they receive. At the same time, they face increased ageism – the systematic stereotyping and discrimination against people because they are old. This impacts the quality of geriatric care and patient-provider communication.

Similar to the greater focus on the social determinants of health, for seniors' we expect to see a shift from the medical or custodial model of care and hospital based services towards a focus on wellbeing, healthy aging and community based care. Seniors want to age well and in place – in their home and community. Seniors will need housing options that are flexible and adjustable as their needs change with age.

In Canada, seniors volunteer more time and money than any other demographic. They are committed to remain active community members and living a life with purpose. This creates opportunities to leverage the experience of senior professionals.

Technological Trends

There are five key trends in technology that will drive innovation into the future. The first is artificial intelligence (AI). It is expected that AI learning systems will transform all sectors of the economy. Deep learning is a type of artificial intelligence that uses data to write software, thereby "automating" this process. With this technology, AI can now understand and generate language with human-like accuracy. In addition, AI will support the growth and value of big data by providing new ways to explore and interpret data. Examples of technologies driven by AI and deep learning include neural networks, mobile connected devices, cloud computing, conversational speakers, streaming, natural language processing and the internet of things.

The second trend is robotics. Advances in software and sensors should enable robots to operate alongside humans in all sorts of environments. As their unit costs decline and their capabilities increase, robots will transform businesses that depend upon physical processes and workflows. Examples of technologies driven by robotics include adaptive robotics, 3D printing, drones and autonomous ride hailing.

Third, we expect to see widespread adoption of DNA sequencing as the cost to sequence a whole human genome falls. Underlying technologies include sequencing technology, gene editing, and immunotherapy.

Fourth, with growth in blockchain technologies, everything will become more money-like – exchangable, liquid and quantified. A blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking. Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved. It provides immediate, shared and completely transparent information stored on an immutable ledger that can be accessed only by permissioned network members. Underlying technologies include bitcoin and fintech.

The final trend is energy storage. Improved battery storage will increase the demand for electrical energy, displacing fossil fuels and reducing not only the vulnerability of grids but also operating expenses and the capital intensity of transmission and distribution. Underlying technologies include battery systems, hydrogen power and electric vehicles.

Implications for healthcare: Each of the five global trends has important applications within healthcare. In many cases we see the convergence of technologies from among these five groups to support healthcare applications.

One of AI's biggest potential benefits is within healthcare. The use of AI in interpreting diagnostic information results in faster results with improved accuracy, reducing the need for

unnecessary follow up tests and treatments. The proliferation of consumer wearables and other medical devices is creating new data sources. The alignment of big data with predictive analytics can support clinical decision making. Population health machine learning models can predict populations at risk of particular diseases. AI is also being used to increase patient engagement and adherence with messaging alerts and targeted content.

AI combined with advances in DNA sequencing, supports a precision based model or personalized medicine to select the most suitable treatment option. There will be a shift in the use of genetics from diagnostics to patient care, where variant and pathway information can be used to proactively affect disease mechanisms with new treatment options. Next-generation DNA sequencing is enabling liquid biopsies and driving down the cost of multi-cancer screening, enabling earlier intervention that can prevent cancer deaths. At the same time, molecular prognostic testing can help pathologists differentiate between aggressive and indolent cancers, reducing over treatment.

There are numerous applications for robots within health care. Robots range from simple laboratory robots to autonomous healthcare assistants to highly complex surgical robots that can aid a human surgeon or execute operations independently. 3D printing presents new options for the development of health care equipment and supplies. 3D printed anatomical models from patient scans can be used to prep for complex surgeries while 3D printed prosthetics make custom and affordable options available for many. Researchers soon hope to utilize bioprinting to create tissues, blood vessels and organs on demand.

Electronic medical records, remote monitoring and communications are supporting the delivery of mobile health and virtual care. Blockchain could reinvent the way electronic health records are shared and stored by providing safer mechanisms for health information exchange.

Even energy storage has implications for health care. Back up power sources are essential for critical medical equipment. With improvements in battery technology, more lightweight and compact options are available.

Implications for seniors' health: Robots have the potential to revolutionize seniors' care, helping people to remain independent for longer, reducing the need for hospitalisation and care homes. AI combined with the advancements in humanoid design are enabling robots to go even further and have 'conversations' and other social interactions with people to keep aging minds sharp and combat loneliness. Voice first technologies, such as smart speakers and voice assistants, are transforming everything from hospital rooms to appointment scheduling. The hearables market is also benefiting from advances in AI, including AI-enabled hearing aids with fall detection and better noise cancellation.

Mobile devices, wearables and remote monitoring devices are enabling greater patient engagement and safety, supporting seniors to remain at home as long as possible. These devices can send reports wirelessly to a patient's family or physician, flagging potential issues that need follow up. New solutions support family care givers to monitor details like diet,

activity and medication adherence. Remote monitoring, telemedicine and mobile devices will help reduce the burden on health systems as care shifts away from professional settings.

Cardiac arrest remains a leading cause of death among seniors. For those who experience cardiac arrest outside a hospital, the survival rate is only 12%, owing to long response times by ambulances. Electric vertical take-off and landing drones could transport paramedics to a patient in less than 5 minutes, saving lives.

Seniors will also benefit from the broad advances in pharmaceuticals, DNA sequencing and big data to support personalized medicine that are impacting the health system as a whole. Of the top 10 leading causes of death in the US, Alzheimer's remains the only disease that cannot be prevented, cured or slowed. Alzheimer's has been resistant to drug therapy for decades, however, new treatments in trial based on monoclonal antibodies are showing promise.

Environmental Trends

Changes in the global climate due to rising greenhouse gas emissions will continue, along with the consequences of climate change, including extreme weather events (drought, famine, extreme heat, floods). This may lead to competition and potential conflict over resources, including food, water and land. Climate migrants and refugees will be displaced from their homes by the effects of climate change and natural disasters that threaten their livelihoods. Increased temperatures will be felt particularly in cities, making urban planning more important.

At the same time, there will be continued advances in renewable energy sources such as wind and solar. The proportion of energy generated from renewable sources will continue to grow as the cost of renewables decreases and become more affordable. This is coupled with the rise of clean technologies, including carbon and methane capture, and hydrogen fuel cells.

While there will be a shift away from single use plastics, wasteful habits developed during the COVID-19 pandemic will take time to reverse with consistently high demand for face shields, gloves, takeout food containers and bubble wrap for online purchases. Plastic recycling will remain a challenge with the lack of domestic plastics recycling facilities.

Implications for healthcare: Climate change impacts health through mechanisms including increased extreme weather events, pollution and decreased air quality, food and water security, and increased illnesses transmitted by disease carriers. Potential consequences include increased respiratory and cardiovascular disease, injuries and premature deaths related to extreme weather events, changes in the prevalence and geographical distribution of food- and water-borne illnesses and other infectious diseases, and threats to mental health.

Certain countries and communities will be particularly hard hit with vulnerable groups disproportionately suffering the health effects of climate change. Limited resources and an already high burden of chronic health conditions, including heart disease, obesity, and diabetes,

will place the poor at higher risk of health impacts from climate change than higher income groups. This will further intensify health disparities and inequity between the "haves" and the "have-nots".

Implications for seniors' health: Extreme weather conditions, especially heat, hit older populations harder. Seniors are at much higher risk of dying during extreme heat events. Pre-existing health conditions also make older adults susceptible to the cardiac and respiratory impacts of air pollution and to more severe consequences from infectious diseases. Limited mobility among older adults can also increase flood-related health risks.

References:

2021 Global Health Care Outlook (Deloitte). https://www2.deloitte.com/global/en/pages/life-sciences-and-healthcare/articles/global-health-care-sector-outlook.html

Ark Disruptive Innovation. https://ark-invest.com/strategy/ark-disruptive-innovation/

Emerging Trends in Healthcare (PWC). https://www.pwc.com/gx/en/industries/healthcare/emerging-trends-pwc-healthcare/depleting-resources.html

Global Trends to 2030 – Challenges and Choices for Europe (European Strategy & Policy Analysis System). https://www.politico.eu/wp-content/uploads/2019/04/ESPAS_Report2019_V15.pdf

Global Trends to 2035 – Geo-politics and International Power (European Parliament). global-trends-to-2035-geopolitics-and-power.pdf

Macroeconomic Outlook- March 2021 (RBC)*.* https://thoughtleadership.rbc.com/vaccines-put-global-economy-on-recovery-track/?_ga=2.127530634.683543354.1620858535-815668391.1620858535

National Seniors Strategy 2020 (National Institute on Ageing). http://nationalseniorsstrategy.ca/wp-content/uploads/2020/09/NSS_2020_Third_Edition.pdf

Statistics Canada. https://www.statcan.gc.ca/eng/start