Deloitte.
Insights

Smart health communities and the future of health

Five core components industry and government stakeholders can consider in the shift to health and well-being

The health industry is on the cusp of a major transformation that will affect all stakeholders. Incumbent players can either lead this transformation as innovative and well-connected market leaders or they can try to resist this inevitable change. A wide range of companies—from inside and outside of the health care sector—are already making strategic investments that could form the foundation for a future of health that is defined by radically interoperable data, open and secure platforms, and consumer-driven care. For more on Deloitte's perspective on the future of health, visit **www.deloitte.com/future**.

Contents

Executive summary

HISTORICALLY, HEALTH CARE was delivered in the community. Physicians made house calls; birth and death happened inside the home. As the modern hospital developed, health care migrated inside its walls. Meanwhile, the concept of health became increasingly medicalized, and separated from people's daily lives.

A significant body of research shows that about 80 percent of health outcomes are caused by factors unrelated to the medical system. Our eating and exercise habits, socioeconomic status, and where we live have a greater impact on health outcomes than health *care*.[1]

The pendulum is now swinging back to the community. Nontraditional players, including public, nonprofit, and commercial enterprises are establishing "communities" focused on prevention and well-being. These communities can be geographically based local initiatives, virtual communities with a global presence, or hybrids of the two.

The Deloitte Center for Health Solutions and the Deloitte Center for Government Insights interviewed over a dozen leaders from prevention and well-being initiatives outside of our traditional medical system to learn about the characteristics that are essential to their mission. These interviews

have contributed to the development of a concept we call *smart health communities (SHCs)*, which we define as containing some or all the following core features:

1. They empower individuals to proactively manage their health and well-being;

2. They foster a sense of community and belonging;

3. They use digital technology and behavioral science;

4. They use data to meaningfully improve outcomes; and

5. They create new and innovative ecosystems.

One example of an SHC is the YMCA's decades-old Diabetes Prevention Program (DPP), which uses community to encourage individuals to proactively manage their weight and exercise with a coach in a group setting based at a local YMCA. While successful, these programs have had limited reach since they are tied to brick-and-mortar locations and require individuals to participate in person. Digital technologies have the potential to significantly bring these programs to scale, thus increasing their impact. The widespread use of smartphones—which are prevalent even in lower-income communities—can increase the potential for virtual programs to scale widely. Apps on these phones can incorporate concepts from the behavioral sciences, such as nudges and gamification, to help people stay on track with their health care goals. The recently relaunched WW International (formerly Weight Watchers International), which now

uses a technology platform to create a virtual community focused on weight loss and wellness and is informed by the science of behavior change, is an example of an SHC that is leveraging technology effectively.

The dramatic changes reshaping health care today are driven in part by the intersection of Metcalfe's Law and Moore's Law. Metcalfe's Law describes how the value of a network escalates dramatically as membership increases. Moore's Law describes how computing power doubles roughly every two years. In tandem, these two phenomena will likely allow SHCs to grow and become more sophisticated, interconnected, and influential over time. As this happens, the impact of community-based health interventions could be brought to scale,

In 20 years, technology may allow for smart health communities to become more integrated into our daily lives.

while becoming more personalized. Looking 20 years into the future, technology and other factors may allow more health care to migrate out of institutions and for SHCs to become more integrated into our daily lives, allowing for more preventive and personalized health interventions that can exist alongside—and perhaps even in collaboration with—our existing health care structures.
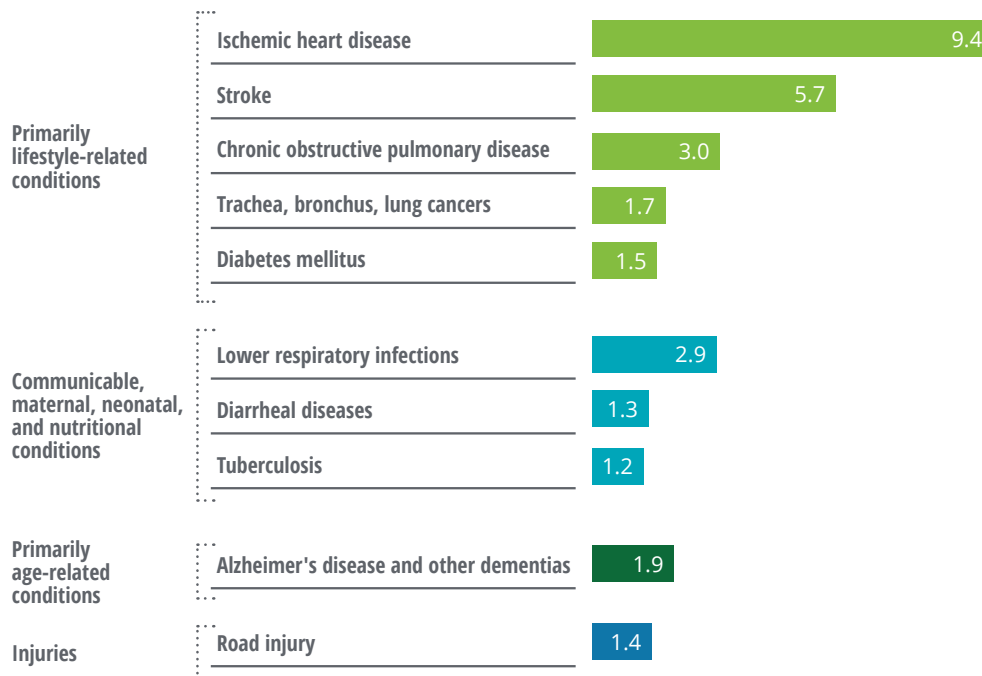
From sickness to health

AFTER DECADES OF focusing largely on the health care system as a means to improve health, we now understand that factors outside of it, including social determinants (such as access to transportation, stable housing, and sufficient and nutritious food) and health behaviors (such as smoking, diet, and exercise), generally have a far greater impact on health outcomes.[2] Globally, five of the 10 leading causes of death are due to conditions related to unhealthy behaviors (see figure 1).

FIGURE 1

Many of the top 10 global causes of death are related to unhealthy behaviors

Top 10 global causes of deaths, 2016 (figures in millions)

Primarily lifestyle-related conditions

Ischemic heart disease	9.4
Stroke	5.7
Chronic obstructive pulmonary disease	3.0
Trachea, bronchus, lung cancers	1.7
Diabetes mellitus	1.5

Communicable, maternal, neonatal, and nutritional conditions

Lower respiratory infections	2.9
Diarrheal diseases	1.3
Tuberculosis	1.2

Primarily age-related conditions

Alzheimer's disease and other dementias	1.9

Injuries

Road injury	1.4

The leading causes of heart disease, stroke, chronic obstructive pulmonary disease, lung cancer, and diabetes include one or more of the following lifestyle-related factors:

Smoking   **Poor diet**   **High blood pressure (hypertension)**   **Overweight**   **Obesity**   **Physical inactivity**

Source: World Health Organization (WHO).

So, what impacts a person's health behavior? It's a complex question, but part of the answer may lie with communities. Our networks—in-person and online—can influence our physical activity,[3] eating habits,[4] obesity rates,[5] anxiety levels, and overall happiness.[6] Meanwhile, the characteristics of our communities, including the prevalence of fast food establishments,[7] neighborhood walkability indexes,[8] air pollution, and other neighborhood stressors[9] affect the physical, mental, and cognitive health of community members.

We traditionally think of communities as in-person and place-based (geographic), but the near-ubiquitous adoption of the internet and mobile technology across the income spectrum[10] has led individuals to participate in massive and powerful virtual communities. These communities include online message boards and social media networks.

WHAT IS A SMART HEALTH COMMUNITY (SHC)?

A smart health community is an entity that operates largely outside of the traditional health care system[11] and encourages disease prevention and overall well-being in a geographic or virtual community setting. The basics of SHCs have been around for many years but have evolved because of technological advances and a greater understanding of health behavior change derived from the behavioral sciences. Advanced SHCs have all of the elements shown in figure 2.

FIGURE 2

The five key elements of smart health communities

- Empower proactive health and well-being management
- Foster a sense of community and well-being
- Enabled by digital technology and behavioral science
- Meaningfully use data to improve outcomes
- Enable new, innovative ecosystems

Source: Deloitte Center for Health Solutions and Deloitte Center for Government Insights.

The YMCA's DPP, which uses community to encourage individuals to proactively manage their weight and exercise with a coach in a group setting based at a local YMCA, is an example of a geographic SHC. WW International is an example of a virtual SHC, as it uses a technology platform to create a virtual community focused on weight loss and wellness, while encouraging healthy behavior with tools from the behavioral sciences. Many other SHCs also incorporate elements from the science of behavior change—be it a well-timed text message, an individually tailored *nudge*, or a new way of framing a choice or a problem—to help individuals make decisions to improve their health.

With the understanding that behavior change is critical to disease prevention and that communities have a powerful influence on health behavior, many nontraditional players, including public, nonprofit, and commercial enterprises, are establishing "communities" focused on prevention and well-being. These communities can be geographically based local initiatives, virtual communities with a global presence, or hybrids of the two.

To learn more about these communities and the characteristics that are central to their mission, the Deloitte Center for Health Solutions and the Deloitte Center for Government Insights interviewed over a dozen leaders from prevention and well-being initiatives that operate largely outside of our traditional health care system. These interviews contributed to the development of the smart health communities concept.

The dramatic changes reshaping health care today are driven in part by the intersection of Metcalfe's Law and Moore's Law. Metcalfe's Law describes how the value of a network escalates dramatically as membership increases (see figure 3). Moore's Law observes how computing power has doubled every two years or so for several decades and projects similar trends into the future (see figure 4). In tandem, these two phenomena will likely allow SHCs to grow and become more sophisticated, interconnected, and influential over time. As this happens, the impact of community-based health interventions could be brought to scale, while becoming more personalized. Data collected from (and voluntarily shared by) community members, including genetic and medical data, could help detect and prevent disease progression at an individual level, and assist in disease surveillance for the benefit of population health. Looking 20 years

FIGURE 3

Metcalfe's Law illustrates the growing value of a network as membership increases

Connections in a network = n(n-1)/2

2 telephones = 1 connection
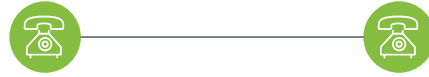
5 telephones = 10 connections
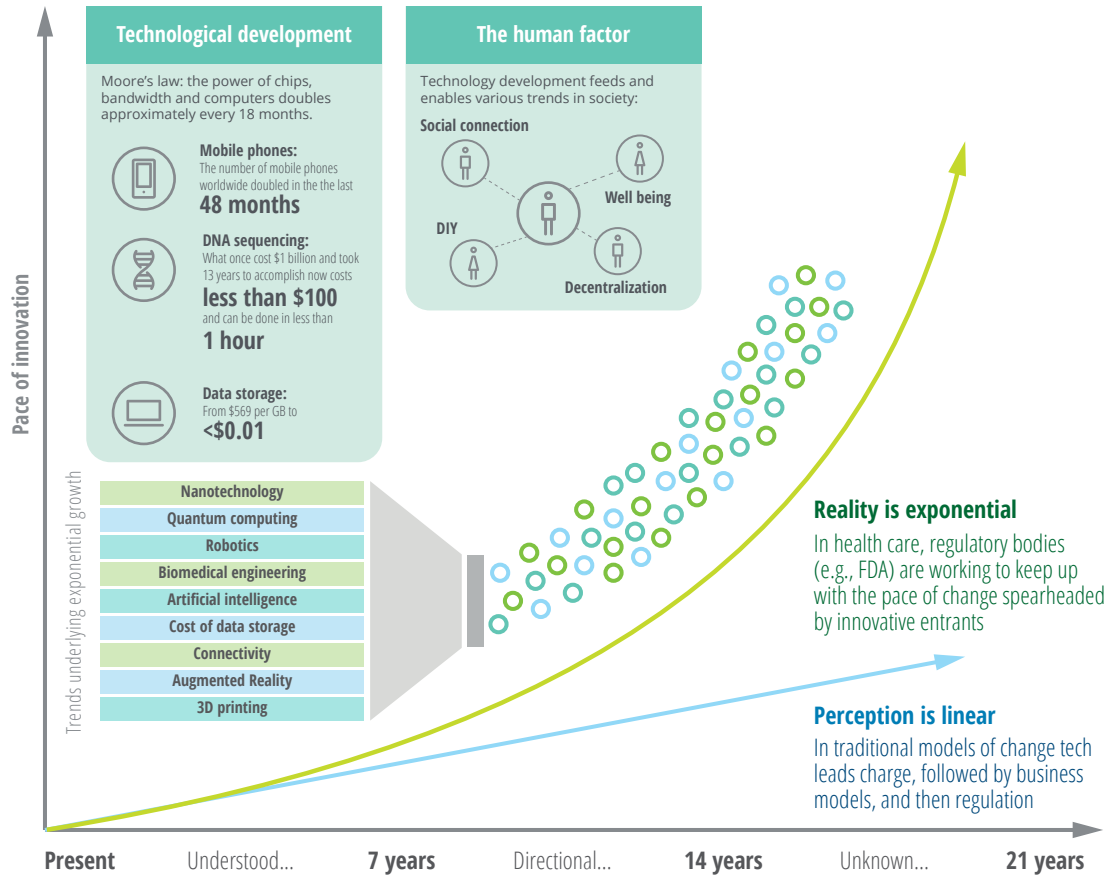

12 telephones = 66 connections

Source: Amplitude.com.

into the future, SHCs may become more integrated into our daily lives, allowing for more preventive and personalized health interventions that can exist alongside—and perhaps even in collaboration with—our existing health care structures.

FIGURE 4

Moore's Law illustrates the exponential growth of technology

Technological development

Moore's law: the power of chips, bandwidth and computers doubles approximately every 18 months.

Mobile phones:
The number of mobile phones worldwide doubled in the the last
48 months

DNA sequencing:
What once cost $1 billion and took 13 years to accomplish now costs
less than $100
and can be done in less than
1 hour

Data storage:
From $569 per GB to
<$0.01

The human factor

Technology development feeds and enables various trends in society:

Social connection

Well being

DIY

Decentralization

Pace of innovation

Trends underlying exponential growth

Nanotechnology
Quantum computing
Robotics
Biomedical engineering
Artificial intelligence
Cost of data storage
Connectivity
Augmented Reality
3D printing

Reality is exponential
In health care, regulatory bodies (e.g., FDA) are working to keep up with the pace of change spearheaded by innovative entrants

Perception is linear
In traditional models of change tech leads charge, followed by business models, and then regulation

| Present | Understood... | 7 years | Directional... | 14 years | Unknown... | 21 years |

Note: All dollar amounts are given in US dollars.

Source: Deloitte analysis.

The five core features of an SHC

Empower proactive health and well-being management

SHCS ARE NOT just about improving health and well-being—though that is something many are beginning to achieve (see Appendix). They also empower individuals to proactively engage in and demand a lifestyle that promotes health and well-being so that they can take control of their health. SHCs that are tackling health issues "upstream" (i.e., the root causes of disease, rather than the disease itself) include the BUILD Health Challenge communities. BUILD, which stands for bold, upstream, integrated, local, and data-driven, awards funding to sites that address the root causes of chronic disease among their other activities. The National DPP is a Centers for Disease Control and Prevention (CDC)–recognized lifestyle change program. The program has proven success in the prevention or delay of type 2 diabetes through evidence-based lifestyle programs that empower individuals to lose weight by educating them about nutrition and physical activity and allowing them to establish their own goals. Programs like the National DPP, Program for Reversing Health Disease (the first lifestyle-based intensive cardiac rehabilitation program reimbursed by the Centers for Medicare and Medicaid Services [CMS]), and the Fresh Food Farmacy, which provides healthy foods to diabetic patients who have trouble accessing them, aim to teach individuals about food so that they have the tools to improve their lifestyles.[12]

Foster a sense of community and belonging

As their name suggests, the community aspect is vital to SHCs and their success. In addition to the impact of communities on health behavior, individuals also appear to reap larger benefits from activities done in groups rather than alone. One study, for example, showed that medical students engaged in group fitness achieved significant improvements in physical, emotional, and mental health, while those who exercised alone did so for twice as long and achieved improvements in mental health alone.[13] One reason for this may be that communities can accentuate certain social dynamics in ways that can improve health outcomes. For individuals who enjoy competition, sharing goals and outcomes data with peers can provide motivation to continue with diet and exercise regimens. For those who enjoy collaborative and supportive environments, virtual DPP groups and online discussion boards such as Cancer Survivors Network allow individuals to share success stories and challenges and seek support from each another.

Peloton, an exercise equipment and media company that provides on-demand fitness classes, is another example of an SHC that considers community as one of its strengths.[14] Compared to in-person exercise classes where participants may only see each other a couple of times a week, Peloton's presence on social media allows its members to stay connected between classes. Facebook groups run the range from the Official Peloton

Mom Group to Super Newbie Peloton Riders, Peloton Weight Watchers, Peloton Fitter Over 50 and Beyond, and Peloton Military & Veterans. Anecdotal evidence shows that these communities help improve members' mental health and overall well-being—they provide a community to support each other not only during a cycling class, but also through major life transitions.

Enabled by digital technology and behavioral science

The use of technologies such as mobile apps, fitness trackers, and GPS-enabled devices is a key function of advanced SHCs, as is the use of behavioral science. The following examples show how some of these communities are leveraging various technologies and behavioral science to (1) increase access and convenience (2) inform behavioral interventions, and (3) facilitate data collection.

INCREASE ACCESS AND CONVENIENCE

One-on-one and group DPPs have been operating successfully for several decades out of brick-and-mortar locations, including community YMCAs. But with 100 million diabetic or prediabetic individuals in the United States alone,[15] it might not be possible to serve everyone from such locations. Companies such as Omada Health, Noom, and many others have brought decades of evidence-based weight management programs and the CDC's National DPP program to scale by making them accessible and convenient through a mobile platform.

A digital interface can also make chronic disease management programs more accessible and convenient for individuals who live in rural and remote locations, as demonstrated by mySugr, a diabetes management company. In November 2018, mySugr launched a program with the Montana

Primary Care Association to bring its diabetes management solution to people in rural and frontier Montana—some of whom live hours from doctors, hospitals, and supplies.[16] While access to reliable internet can be a challenge in rural and remote areas, mySugr has found that Bluetooth meters don't require internet to sync data to the app. Intermittent access to internet, however, is needed to chat with mySugr's diabetes coaches. Alternatively, coaching sessions can also take place via phone calls when there is no internet access.[17]

INFORM BEHAVIORAL INTERVENTIONS

Clinicas del Azucar (which translates to "sugar clinics") is a private network of diabetes and hypertension clinics in Mexico. With 30,000 patients using it over seven years, the network has volumes of data. Behavioral scientists are working with the clinics to segment consumers based on motivational profiles—a framework that helps them understand why some individuals adhere to a diabetes management program while others don't. With these profiles, the clinics are exploring ways to incorporate targeted behavioral nudges to encourage patients to follow clinicians' recommendations. This could include offering choices within an incentive scheme designed to address the patient's specific motivational profile.[18]

FACILITATE DATA COLLECTION

Geographic communities are leveraging technology, too. AIR Louisville made GPS-enabled "smart" inhalers available to individuals who have asthma in Louisville, Kentucky. Each time an individual took a puff, the inhaler logged the location, time, weather, and pollutants in the air. The individual then received notifications about bad air quality days and information that helped predict the time and location of asthma attacks. The data was also used to calculate the health care costs of poor air quality and was shared with city officials to understand where to concentrate air purification efforts.[19]

As data platforms such as Apple HealthKit™[20] developer software and Google's Android ResearchStack become more advanced and widely adopted, SHCs will likely be better positioned to collect, analyze, and act on the data collected within their communities, provided they can overcome privacy and security challenges.

Meaningfully use data to improve outcomes

As technology makes data collection and data sharing easier, SHCs are using data to (1) predict risk (2) create a continuous learning loop through experimentation and innovation, and (3) conduct research and evaluation.

PREDICT RISK

The Chicago Department of Public Health and the Department of Innovation and Technology created a predictive analytic model to help prioritize health inspections of retail food establishments. The tool combines information from various city data on Chicago's open data portal with sophisticated analytic techniques to identify risk factors most likely to result in health code violations. Data includes a range of 311 data[21] such as nearby sanitation complaints, previous inspection results, food license history, and outdoor temperature. Violations most likely to lead to food-borne illness were identified over seven days earlier using predictive analytics.[22]

As data sources become richer and more numerous, SHCs will likely need analytics, artificial intelligence (AI), and future technologies to make sense of all the data and determine the best course of action to predict and prevent health risks.

CREATE A CONTINUOUS LEARNING LOOP THROUGH EXPERIMENTATION AND INNOVATION

Health and wellness programs that are delivered through an app have significant flexibility to

experiment and determine how to most effectively engage with participants to help them achieve their goals. Noom, a company that delivers its DPP and Healthy Weight program through a mobile platform with human coaching, uses data to improve the product in real time.[23] With its Healthy Weight program, it can experiment with the content of the app or the timing of text messages to see if these tweaks translate into higher engagement. User response to these new engagement efforts can help the company fine tune the overall Healthy Weight program, creating a continuous and iterative learning and improvement loop.

CONDUCT RESEARCH AND EVALUATION

Many SHCs conduct research to evaluate their own programs, and some may form primarily to promote research on a specific disease condition or to give individuals the opportunity to opt into a larger research study (for example, 23andMe's Global Genetics Project, which aims to increase genetic research in underrepresented populations[24]). Amstelhuis—Living Lab is a residential community for senior citizens in Amsterdam and the site of the Urban Vitality research program through the Amsterdam University of Applied Sciences.[25] Students, lecturers, and researchers from the school regularly spend time in the community talking to residents, observing them, and administering questionnaires. Current research topics include an exercise and fall prevention study and a nutrition, food, and weight management study.

Data collection and program evaluation are key to understanding whether an SHC is achieving its goal. Most of the people we interviewed are collecting data to help evaluate their programs. While some can use real-time data analysis and real-world data, others are planning multiyear longitudinal studies to measure impact. Healthy New Towns, a combined initiative by England's National Health Service (NHS) and 10 housing developments across the country, is conducting one such program of work. Its goal is to create

healthy communities by planning and designing a healthy built environment (such as clean air and safe streets), creating innovative health models and encouraging strong and connected communities. The evaluation work is funded by the National Institute for Health Research and driven by a collaboration between site leads and academic partners (i.e., universities).[26] As SHCs are established, they should have a plan in place to evaluate progress against goals. SHCs may wish to engage governments, foundations, and academic institutions to fund or independently carry out these evaluations as establishing impact on health outcomes will likely be required in some SHC funding structures.

Enable new and innovative ecosystems

Enabling new and innovative ecosystems composed of public and private entities is another essential element of SHCs. England's Healthy New Towns program, for example, places particular emphasis on sharing information with other public agencies, local governments, housing developers, and trade unions to promote best practices. Congress' bipartisan Food is Medicine Working Group is bringing together stakeholders from the agriculture and health policy sectors by emphasizing the link between nutrition programs and health outcomes.[27] The Chicago Department of Public Health's Healthy Chicago 2.0 initiative partners with local philanthropic organizations to align grantee goals with department goals, rather than forcing grantees to split their attention between different measures. It also leverages data from previously untapped sources such as NASA to improve its ability to monitor community health. And WW is partnering with Kohl's to hold workshops and

wellness sessions inside the retailer's brick and mortar Chicago location.

Funding of SHCs is also often collaborative, brought together from different industry sectors and organizations. NIH, for example, funds Noom research; the BUILD Health Challenge awardees receive funds that have been aggregated by a funding collaborative that includes several different foundations, as well as a local matching source; and public and private health care payers reimburse for DPP apps. Blue Cross Blue Shield of Massachusetts pays for member meals from Community Servings, a nonprofit food program that provides medically tailored, home-delivered meals and nutrition education to critically ill individuals and their families.[28]

Doctors, nurses, and other health care providers can also play a key role as connectors to the traditional health care system. In the case of AIR Louisville, data generated from smart inhalers were shared with patients' physicians. This gave doctors insight into how often their patients were using emergency inhalers and helped them determine the most effective asthma medication dosage for each patient to avoid excessive use of emergency inhalers. Meanwhile, Fresh Food Farmacy, an initiative launched by a Geisinger Health System community hospital in 2017, is designed to address the social determinants of health through an ecosystem approach that views "food as medicine." Through this initiative, physicians write "prescriptions" for high-risk diabetes patients who cannot afford or do not have access to fresh, healthy food. They can then pick up recipes and free groceries from the Farmacy's food bank and receive the education and support needed to manage their diabetes with healthier food choices.[29]

As stakeholders work together to advance SHCs, they will need an integrating body that can bring partners together to (1) establish shared values, (2) develop, implement, and invest in strategic planning, goal setting, and needs assessment, (3) manage and integrate funding from diverse sources and programs, (4) analyze shared impact, and (5) ensure accountability and continuous quality improvement. One way to achieve this is by establishing a Community Funding Hub which, through a central integrator or "hub," could bring together and coordinate previously siloed sectors and funding streams. This position could be taken on by one of the SHC stakeholders, including government, or can be established as a new entity.[30]

WW INTERNATIONAL: A VIRTUAL COMMUNITY AT WORK

WW International is an example of a virtual SHC which also has physical locations. With a focus on weight loss, health, and wellness, the program uses a points system that encourages and empowers individuals to eat healthy food and track their eating via their mobile app. Individuals can also receive and provide support through in-person or digital community meetings and receive personalized information and motivation through a personal online/phone coach, and a host of digital tools.

WW is an illustrative example of SHCs, as it contains all the key elements:[31]

It empowers individuals to proactively manage their health and well-being. WW empowers users to make choices that can proactively improve health, well-being, and quality of life to reduce adverse health outcomes in the future.

It fosters a sense of community and belonging. Virtual and in-person community meetings foster a sense of community and belonging.

It uses digital technology and behavioral science. It uses a mobile application to enable users to enter/track data and seek information (for example, fitness tips, recipes) and deploys the use of coaching and guides to support adherence and uptake of behaviors associated with healthy, active living. Behavioral nudges, such as a rewards program for healthy habits, are also incorporated into the program.

It uses data to meaningfully improve outcomes. This allows users to track their progress. It also gains consent to use and share data to target programming to further improve health and fitness outcomes for users.

It creates new and innovative ecosystems. WW is now partnering with retail to enhance its physical presence in the community. To drive more traffic to its store, a Kohl's in Chicago will open a WW-branded studio, offering workshops and diet coaching.[32]

HEALTHY CHICAGO 2.0: A GEOGRAPHIC COMMUNITY AT WORK

In 2016, the City of Chicago launched Healthy Chicago 2.0, the second phase of the city's multi-stakeholder plan to maximize its residents' health and well-being. Led by then-Mayor Rahm Emanuel and the Chicago Department of Public Health, the four-year plan's vision is to reduce health inequities by focusing on expanding partnerships and community engagement, addressing the root causes of health, increasing access to health care and human services, improving health outcomes, and utilizing and maximizing data and research.[33] There are 82 objectives and 200 strategies to reach 30 goals.

Healthy Chicago 2.0 is an example of a geographic SHC in the following ways:

It empowers individuals to proactively manage their health and well-being. Healthy Chicago 2.0 focuses on proactive health and well-being by addressing social determinants of health through strategies including promoting healthy food access, expanding the bike-share program, and promoting and supporting self-management programs for chronic disease, among others.

It fosters a sense of community and belonging. Healthy Chicago 2.0 was developed in response to a community health assessment that engaged hundreds of stakeholders from different parts of the city. As part of the work, the city communicates with community residents regarding efforts and educates communities on public health issues.

It uses digital technology and behavioral science. The program leverages technology in new and innovative ways. For example, the city tracked public Twitter messages using a supervised learning algorithm for possible foodborne illness complaints that may have been linked to food consumed in food establishments that are under the purview of the city's food inspection, leading to early and targeted inspections.[34] Healthy Chicago 2.0 has not yet incorporated behavioral science into its strategy but has begun looking into how behavioral science complement existing strategies.

It uses data to meaningfully improve outcomes. It looks to novel data sources to proactively determine which areas are more at risk for poor health outcomes. Specifically, using data from the Women, Infants, and Children (WIC) program to determine where to target proactive lead paint inspections and satellite data from NASA to monitor air quality.

It creates new and innovative ecosystems. In addition to working with other government agencies, Healthy Chicago 2.0 also works with community organizations, academia, businesses, and philanthropic organizations to align on health outcome measures, and coordinate investments in communities.

How to take SHCs to the next level

THE SHC LEADERS we interviewed revealed some challenges in creating and sustaining effective SHCs. For example, it is much easier to attract and retain the "wealthy, worried, and well" than those who lack the motivation or resources to improve their health. SHCs must embed strategies for helping the poor, unmotivated, and unhealthy to adopt healthy behaviors using the science of healthy behavior change and interventions that address the social determinants of health. New Jersey's Department of Community Affairs is addressing social determinants of health by providing housing vouchers to homeless individuals who are high utilizers of emergency departments.[35] One of a number of pilot projects in the state, Housing First is a joint partnership of local health care and social services, and employs case managers to offer support services including assistance enrolling in Medicaid, Temporary Assistance for Needy Families (TANF), food stamps, substance abuse treatment, mental health counseling, domestic violence prevention, and employment training.

Like many transformative initiatives, SHC leaders must identify seed funding to get started, and develop a sustainable business model that can be scaled. SHCs that can demonstrate improved health outcomes through rigorous monitoring and evaluation of their programs will increase their chances of securing sustainable funding through public or private investments, health care payers, or individuals willing to pay out of pocket.

Finally, SHCs could face privacy and data security challenges when it comes to collecting and sharing data. One SHC interviewee initially hoped to provide in-home sensors to seniors to help predict the risk of falls. Seniors, however, were concerned that the sensors could create privacy issues. Another SHC interviewee wanted to combine multiple datasets from various sources but found that data-sharing agreements could prevent the full exploration of data sets and data integration. SHCs might be able to encourage users to share their data if they are completely transparent about how information will be collected, stored, secured, shared, used, and when/if it will be deleted. When faced with data restrictions, they can identify proxy data sets that can help them get the information they need.

How can today's stakeholders get involved with SHCs?

AS SHCS MATURE and proliferate, stakeholders such as governments, health systems, health plans, life sciences firms, and nontraditional health care companies, such as technology companies and retailers, can promote and support these communities.

Governments

Government agencies can lead or support SHCs in several ways. They can create pilots and payment models that stimulate the development of cost-effective SHCs through public health insurance programs like Medicare, Medicaid, Veterans Affairs, and the Military Health System in the United States. Through their national health services, governments around the world can build SHCs and recruit other public and private agencies to expand their reach. Funding or evaluating SHCs alongside foundations and academic institutions is another way government agencies can incentivize SHC growth.

Governments can also establish data-sharing agreements and then collect, analyze, and share data on local population needs with other players in the SHC ecosystem to collaborate on innovative solutions. Making information available to SHCs can help accelerate research and discovery, develop upstream solutions with predictive analytics, and empower individuals to make healthy choices. Additionally, governments can help SHCs by developing and/or supporting SHCs' technological infrastructure and governance, including standardization and security of data.

Providers, payers, life sciences companies, and nontraditional health care players

Health systems, health plans, physicians, life sciences companies, and nontraditional health care players such as technology companies and retailers may want to partner with and participate in SHCs as part of their digital and consumer engagement strategies. Early movers on SHCs may be able to establish consumer loyalty, improve behaviors such as medication adherence, thrive in value-based care arrangements, increase access, and reduce costs. As organizations build or participate in SHCs, data collection, analytics, and ongoing monitoring and evaluation of SHCs will help make them more effectively improve health and well-being.

Looking ahead: What does the future hold?

MANY OF TODAY'S SHCs display one or more of the essential ingredients of mature SHCs. But they operate in silos, largely isolated from each other and the geographic communities in which people live. As technologies such as the Internet of Things (IoT) connect even more people and more advanced devices to one another, SHCs will likely become larger. Per Metcalfe's law, the growth of these communities will make them more powerful; they will capture more data from their growing membership and the many devices their members use, rendering the data richer and more comprehensive. This will allow SHCs to conduct more robust research, learn more about the science of behavior change, and create cohesive and supportive social groups based on common interests and values.

In the future, we expect many more of the communities in which we live, work, and interact (both virtually and physically) to consist of a web of interconnected SHCs. These communities could constitute an ecosystem of public and private players that support each other. They may address social determinants of health, such as access to food, transportation, and employment; incorporate emerging technologies such as artificial intelligence, augmented/virtual reality, robotics, and radically interoperable data; use behavioral science to empower individuals to eat right and exercise; and detect and treat disease at its earliest stages using genomics and precision medicine.

SHCs may also communicate and integrate with aspects of health care. Physicians may be able to write prescriptions for digital wellness programs, health plans and employers may reimburse for such programs, and data could be shared seamlessly between all stakeholders. Most importantly, individuals can own their health care data, allowing them to make informed decisions about their health. As SHCs mature and proliferate, their governance and funding approaches could become more sophisticated, affording them the management and resources necessary to empower communities to invest in their own health and well-being—not just to stave off illness, but to reach their full physical and mental potential.

Appendix

Geographic and virtual smart health communities: Landscape and outcomes

MANY DIFFERENT SMART health community initiatives are still early in development and do not yet have outcomes data, but some examples of programs that have demonstrated improved health outcomes, and even cost savings, are listed below.

FIGURE 5

Geographic smart health communities

Program	Evidence
YMCA's Diabetes Prevention Program The program focuses on healthy eating, physical activity, and lifestyle changes for the prevention of type 2 diabetes	• Average weight loss of patients after 25 weekly sessions is 4.6 percent. One year after starting the program, the average weight loss is 5.5 percent.[36] • Over a 10-year period, a 34 percent reduction in diabetes was observed among the intensive lifestyle intervention group compared to the placebo group.[37] • Medicare expects to save US$180,000 over 10 years from the two-year National DPP program.[38]
Clinicas del Azucar A one-stop shop that offers patient-centered and cost-effective treatments for diabetes	• When patients first arrive in the clinic, their blood glucose levels are usually in crisis mode, but with behavioral changes aided by the clinic, the levels stabilize, resulting in a 200–400 percent reduction in adverse outcomes.[39]
Healthy Chicago 2.0 The project is dedicated to improving health equity and making Chicago a connected, vibrant, and healthy city for all residents	• The percentage of high school students smoking cigarettes has fallen from 13.6 percent in 2011 to 6 percent in 2017 through efforts by the city to make tobacco less accessible, affordable, and attractive.[40] • All-time low teen birth rates (a 36 percent decrease) and HIV transmission rates (an 8.2 percent decrease) through education, confidential screenings, and connecting youth to care.[41]
The BUILD Health Challenge BUILD is a national US program designed to promote partnerships between communities, local government, and health systems to address health issues	The Des Moines BUILD Initiative: • The Healthy Homes Des Moines team focused on reducing pediatric asthma though home improvements and education. Kids who participated had on average six more symptom-free days each month.[42] The Albuquerque BUILD Initiative: • The Addressing Healthcare's Blindside in Albuquerque's South Side team used a referral system to link clinics to community resources. Over 1,500 referrals were made to 20 resources, including chronic disease management classes, healthy cooking classes, physical activities, and the Mobile Farmer's Market. Due to the Mobile Farmer's Market, more than 1,700 people gained access to healthy food grown by local farmers.[43]

FIGURE 5 CONTINUED

Program	Evidence
Air Louisville project The project uses GPS-fitted inhalers to manage asthma	• As part of the pilot study, participants saw an 82 percent decrease in the use of rescue inhalers and experienced twice the number of symptom-free days.[44]
Humana Bold Goal An initiative which aims to make communities 20 percent healthier by 2020	• San Antonio, Texas, achieved a 3.5 percent improvement in healthy days[45] in their Humana Medicare population in 2017. In addition, San Antonio Healthy Days improved 5.1 percent among Humana seniors living with diabetes. These achievements were met through a focus on diabetes prevention, food insecurity, nutrition, health literacy, and physical health.[46] • Knoxville, Tennessee, saw a 5.4 percent improvement in healthy days among Human Medicare members and a 9.7 percent increase among Humana seniors living with diabetes. Strong collaborative efforts with the Knoxville Health Advisory Board and community partners on diabetes prevention, social isolation, and nutritional literacy helped lead to these improvements.[47]

Source: Deloitte analysis.

FIGURE 6

Virtual smart health communities

Program	Evidence
WW International (formerly Weight Watchers International) Offers products/services that assist in weight loss, health, and wellness	• An *Annals of Internal Medicine* study found evidence that WW is effective in maintaining weight loss in the long term.[48] • Twenty percent of Tennessee Medicaid participants lost a clinically significant amount of weight and those who attended more meetings lost more weight.[49] • As part of an independent audit of WW's partnership with the National Health Service in the United Kingdom, a third of patients who were referred to WW and started a 12-session course lost at least 5 percent body weight, which has been associated with clinical benefits.[50]
Noom A behavioral change platform to treat chronic and prechronic conditions (hypertension, diabetes management, and weight loss)	• Using the Noom smartphone app for weight loss, Korean adults aged 20–60 years were able to reduce their body weight by 5.2 percent at the end of 52 weeks.[51] • Results from a 65-week DPP featuring a fully mobile pilot intervention showed a mean weight loss of 6.15 percent in participants.[52]
Omada Health Provides online coaching to help prevent chronic health issues (diabetes) using a mix of behavioral science, user design, and human interaction	• Three independent claims analyses have shown that a payer can recoup its investment in Omada Health in as little as six months.[53] • Three years after completing four or more DPP lessons, participants demonstrated significant long-term weight loss (3 percent of body weight) and reductions in blood glucose levels to the normal glycemic range.[54]
mySugr A digital diabetes-management program that offers patients coaching, supplies, and data tracking	• A study of the mySugr app found that high-risk users who have type 1 diabetes significantly lowered their blood glucose levels after six months of active data tracking through the app.[55]

Source: Deloitte analysis.

Endnotes

1. Steven A. Schroeder, "We can do better—Improving the health of the American people," *The New England Journal of Medicine* 379, no. 12 (2007): DOI: 10.1056/NEJMsa073350.

2. Ibid.

3. Sinan Aral and Christos Nicolaides, "Exercise contagion in a global social network," *Nature Communications*, April 18, 2017.

4. Suzanne Higgs and Jason Thomas, "Social influences on eating," *Current Opinion in Behavioral Sciences* 9 (2016): pp. 1–6.

5. Nicholas A. Christakis and James H. Fowler, "The spread of obesity in a large social network over 32 years," *The New England Journal of Medicine* (2007): pp. 370–79, DOI: 10.1056/NEJMsa066082.

6. Lorenzo Coviello et al., "Detecting emotional contagion in massive social networks," *PLoS ONE* 9, no.3 (2014).

7. Kristen Cooksey-Stowers, Marlene B. Schwartz, and Kelly D. Brownell, "Food swamps predict obesity rates better than food deserts in the United States," *International Journal of Environmental Research and Public Health* 14, no. 11 (2017): p. 1366.

8. Ken R. Smith et al., "Walkability and body mass index," *American Journal of Preventive Medicine* 35, no. 3 (2008): pp. 237–44.

9. Jennifer Ailshire, Amelia Karraker, and Philippa Clarke, "Neighborhood social stressors, fine particulate matter air pollution, and cognitive function among older U.S. adults," *Social Science & Medicine* 172 (2017): pp. 56–63.

10. Melissa Majerol and William Carroll, *Medicaid and digital health: Findings from the Deloitte 2018 survey of US health care consumers*, Deloitte Insights, September 7, 2018.

11. While SHCs operate outside of the traditional health care system, they may be initiated by traditional health care players. The Fresh Food Farmacy is an example of such an SHC.

12. Alice Park, "Why food could be the best medicine of all," *Time*, February 21, 2019.

13. Dayna M. Yorks, Christopher A. Frothingham, and Mark D. Schuenke, "Effects of group fitness classes on stress and quality of life of medical students," *Journal of American Osteopathic Association* 117 (2017).

14. Leah Groth, "Pelotons online community is changing the fitness game for moms," MSN Lifestyle, April 9, 2019.

15. CDC Newsroom, "New CDC report: More than 100 million Americans have diabetes or prediabetes," press release, July 18, 2017.

16. Paul Geevarghese, "Bringing digital diabetes management to rural communities," mySugr, November 14, 2018.

17. Interview with senior official, mySugr, February 12, 2019.

18. Thomas H. Davenport, James Guszcza, and Greg Szwartz, "Using behavioral nudges to treat diabetes," *Harvard Business Review*, October 10, 2018.

19. AIR Louisville, "AIR Louisville results summary," accessed May 15, 2019.

20. *Smart health communities and the future of health* by the Deloitte Center for Health Solutions is an independent publication and has not been authorized, sponsored, or otherwise approved by Apple Inc.

21. 311 is a nonemergency phone number that people can call in many cities to find information about services, make complaints, or report problems.

22. City of Chicago, "Food inspection forecasting: Optimizing inspections with analytics," accessed May 10, 2019.

23. Interview with senior researcher, Noom, February 6, 2019.

24. 23andME, "Global genetics project," accessed May 13, 2019.

25. Amsterdam smart city, "Amstelhuis—living lab: Residential facility for senior citizens/living lab for the Urban Vitality research programme," accessed May 15, 2019.

26. NHS England, "Putting health into place: Introducing NHS England's Healthy New Towns programme," September 20, 2018.

27. Helena Bottemiller Evich, "Bipartisan nutrition group kicks off in house," *Politico*, January 22, 2018.

28. Park, "Why food could be the best medicine of all."

29. Fresh Food Farmacy, "Learn more: Turning education and food into life-changing results," accessed May 10, 2019.

30. Jitinder Kohli and Anne de Biasi, *Supporting healthy communities: How rethinking the funding approach can break down silos and promote health and health equity*, Deloitte University Press, August 2, 2017.

31. Weight Watchers Reimagined, "Homepage," accessed May 10, 2019.

32. Kohl's, "Kohl's to open first WW Studio in-store and add WW Healthy Kitchen products in select stores and on Kohls.com beginning June 2019," January 29, 2019.

33. Chicago Department of Public Health, *Healthy Chicago 2.0: Partnering to improve health equity, 2016–2020*, accessed May 13, 2019.

34. Centers for Disease Control and Prevention, "Health department use of social media to identify food-borne illness—Chicago, Illinois, 2013–2014," *Morbidity and Mortality Weekly Report* 63, no. 32 (2014).

35. State of New Jersey, Department of Community Affairs, "Housing first pilot project launches in Middlesex county to fight homelessness and address health-related social needs of individuals who are homeless," December 13, 2018.

36. YMCA, "Diabetes prevention program: Factsheet, June 2018," SlideShare, 2018.

37. Diabetes Prevention Program Research Group, "10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study," *Lancet* 374, no. 9702 (2004): pp. 1677–86.

38. Better Medicine Alliance, "Medicare diabetes prevention program: Factsheet, June 2018," 2018.

39. Davenport, Guszcza, and Szwartz, "Using behavioral nudges to treat diabetes."

40. Chicago Department of Public Health, *Getting to the root: Healthy Chicago Symposium report*, Healthy Chicago 2.0, February 2019.

41. Ibid.

42. Ibid.

43. The Build Health Challenge, "Addressing healthcare's blindside in Albuquerque's South Side," accessed May 10, 2019.

44. Laura Bliss, "How Louisville is using GPS to control asthma," Citylab, August 9, 2017.

45. Healthy Days measures health and well-being by tracking self-reported unhealthy days of individuals over a 30-day period.

46. Humana, *Health happens where you are: 2018 Bold Goal progress report*, accessed May 10, 2019.

47. Ibid.

48. Kimberly A. Gudzune et al., "Efficacy of commercial weight loss programs: An updated review," *Annals of Internal Medicine* 162, no. 7 (2015): pp. 501–12.

49. Nia S. Mitchell et al., "Evaluation of the effectiveness of making weight watchers available to Tennessee Medicaid (TennCare) Recipients," *Journal of General Internal Medicine* 28, no. 1 (2013): pp. 12–7.

50. Amy L. Ahern et al., "Weight Watchers on prescription: An observational study of weight change among adults referred to Weight Watchers by the NHS," *BMC Public Health* 11 (2011).

51. Tatiana Toro-Ramos et al., "Effectiveness of a smartphone application for the management of metabolic syndrome components focusing on weight loss: A preliminary study," *Metabolic Syndrome and Related Diseases* 15, no. 9 (2017).

52. A. Michaelides et al., "Usefulness of a novel mobile diabetes prevention program delivery platform with human coaching: 65-week observational follow-up," *JMIR mHealth and uHealth* 6, no. 5 (2018).

53. Vinay Chiguluri et al., "Virtual diabetes prevention program—Effects on Medicare Advantage health care costs and utilization," *Diabetes* 67, supplement 1 (2018): DOI:10.2337/db18-45-lb; Omada Health, "Participant outcomes," https://www.omadahealth.com/outcomes, accessed May 28, 2019. Cigna, "Cigna expands personalized diabetes prevention program in collaboration with Omada Health," press release, September 18, 2018.

54. S. Cameron Sepha et al., "Engagement and outcomes in a digital Diabetes Prevention Program: 3-year update," *BMJ Open Diabetes Research & Care* 5, no. 1 (2017).

55. Marcus Homepesch et al., "Significant improvement of blood glucose control in a high risk population of type 1 diabetes using a mobile health app—A retrospective observational study," Prosciento, accessed May 10, 2019.

About the authors

ASIF DHAR is a principal in Deloitte Consulting LLP's Monitor Deloitte practice. He serves as chief health informatics officer and helps drive the Therapeutic Area Transformation integrated offering. He is a thought leader on topics such as comparative and clinical effectiveness, exponentials and innovation, personalized medicine, informatics, and disease transformation. He has a deep understanding of the complexities of clinical data reuse for safety, quality, and outcomes. He is based in Arlington, Virginia.

DAVID A. FRIEDMAN is Deloitte's Federal Health Consulting leader and the lead client service partner for the Centers for Disease Control and Prevention. Friedman ensures the integration of consulting offerings for Deloitte's federal health clients and is a key member of consulting's life science and health care national leadership team. He also leads major organizational transformation projects as a principal in Deloitte's Human Capital practice. He is based in Atlanta.

CHRISTINE D. CHANG is a research manager with the Deloitte Center for Health Solutions, Deloitte Services LP. She conducts primary and secondary research and analysis on emerging trends, challenges, and opportunities within the health care system. She supports Deloitte's Life Sciences and Health Care practice across all sectors and has written on topics including innovation, value-based care, and emerging technologies. Chang is based in New York.

MELISSA MAJEROL is a health care research manager with the Deloitte Center for Government Insights. She supports the Deloitte Government and Public Services practice with her research and comprehensive policy analysis in areas including Medicaid, health reform, emerging technology, and value-based care. She is based in Washington, DC.

Acknowledgments

About the Deloitte Center for Health Solutions

The source for fresh perspectives in health care: The Deloitte Center for Health Solutions (DCHS), part of Deloitte LLP's Life Sciences and Health Care practice, looks deeper at the biggest industry issues and provides new thinking around complex challenges. Cutting-edge research and thought-provoking analysis give our clients the insights they need to see things differently and address the changing landscape. To learn more about the DCHS and our research, please visit www.deloitte.com/centerforhealthsolutions.

About the Deloitte Center for Government Insights

The Deloitte Center for Government Insights (DCGI) shares inspiring stories of government innovation, looking at what's behind the adoption of new technologies and management practices. The center produces cutting-edge research that guides public officials without burying them in jargon and minutiae, crystalizing essential insights in an easy-to-absorb format. Through research, forums, and immersive workshops, the goal of the center is to provide public officials, policy professionals, and members of the media with fresh insights that advance an understanding of what is possible in government transformation. To learn more about DCGI and our research, please visit www.deloitte.com/us/DCGI.

Contacts

INDUSTRY CONTACTS

Asif Dhar
Chief health informatics officer
Deloitte Consulting LLP
+1 571 766 7468
adhar@deloitte.com

David A. Friedman
Federal Health Consulting leader
Principal
Deloitte Consulting LLP
+1 404 220 1943
davfriedman@deloitte.com

CENTER CONTACTS

Sarah Thomas, MS
Managing director
Deloitte Center for Health Solutions
Deloitte Services LP
+1 202 220 2749
sarthomas@deloitte.com

William D. Eggers
Managing director
Center for Government Insights
Deloitte Services LP
+1 571 882 6585
weggers@deloitte.com

Deloitte.
Insights

Deloitte Insights contributors
Editorial: Ramani Moses, Blythe Hurley, Rupesh Bhat, and Abrar Khan
Creative: Adamya Manshiva and Rajesh Venkataraju
Promotion: Alexandra Kawecki
Cover artwork: Taylor Callery

About Deloitte Insights

Deloitte Insights publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte Insights is an imprint of Deloitte Development LLC.

About this publication

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.