


The future of public health: Personalized, participatory, predictive, precise

The Covid-19 pandemic has changed the entire concept of public health. As we progress through it and the subsequent global mental health pandemic we are likely to face, a future of public health that is personalized, participatory, predictive, and precise will help us navigate changed public health principles and how we deal with ourselves.

- ▶  HEALTH CARE
- ▶  VIRTUAL HOSPITAL
- ▶  MEDICAL SERVICE
- ▶  EMERGENCY



Public health has developed from focusing only on health promotion and lifestyle paradigms—to avoid many preventable diseases—to a more holistic view beyond traditional/clinical personal health and reactive care to include social, political, economic, environmental, and geographic determinants, all while improving outcomes and ideally reducing costs.

With the advent of globalization, increased interconnectedness, social media, and more readily available education, individuals are steadily becoming the stewards of their own health. We are living in a culture of health and well-being, in which a well-informed, more health literate person is the ultimate decision-maker and is at the center of their own health.

A strong foundation for the future of public health will be dependent on enabling governments (providing whole-of-government approaches to care provision) and collaborative ecosystems, based on intersectoral collaboration and cross-industry collective research. Digitally-enabled healthcare and public health sectors will emphasize a 360-degree view of the person leading a healthier lifestyle or seeking care, taking into account their health journey from pre-birth to grave, as well as the detailed

analysis of their health all the way down to their genes and granular behavioral insights (to be combined with data for Population Health Management), leading to decision-making and tailored treatments based on data. Finally, the digitally-enhanced user experience and public health and healthcare journeys for individuals, payers and care providers will be seamless and interoperable, allowing for greater satisfaction, empowered self-management of care, increased efficiency, and reduced costs.

Public health becomes personalized and predictive

As populations continue their demographic and epidemiological transitions, and people start suffering from consequent diseases related to aging, longevity and increased life expectancies, it is possible that future clinical medicine may see increased costs without significantly improved health outcomes. Medicine will therefore seek to become more data-driven and less individualistic in order to efficiently manage and improve the health of populations (versus solely individuals) while keeping costs from becoming too high. Conversely, yet in a complementary fashion, and in order to keep pace, public health will start benefiting from personalization and individualization of initiatives and practices for the well-being of communities and populations.

One of the forerunners of this future era of precision public health is the science of genomics¹. By taking our knowledge of health beyond the traditional disease correlates, genomics helps public health better improve the health of the population and of sub-groups within the population who are more pre-disposed to certain ailments and conditions that can now be more easily stratified into the more detailed layer of genetic risk and

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predisposition for common or rare diseases. Because some countries in the GCC are comprised of quite homogenous populations, this more precise method of public health can tailor population-level interventions to targeted groups whose conditions may have otherwise been missed in less bespoke and traditional public health interventions. The increased ubiquity and integration of genomic knowledge in clinical practice (partially due to the decreased cost associated with genome sequencing over the last few years) is lending itself to the delivery of targeted interventions for patients, better known as precision medicine. We should therefore expect the same for precision public health.

Another aspect of the future of public health that can offer contributions similar to those that the field of genomics does, but which focuses more on the sharing of interoperable, accurate and secure data, is Population Health Management. Using Big Data to more accurately and more precisely predict trends and analyze individuals' health choices, lifestyle factors and their environment can help authorities, regulators and providers apply tailored interventions and promotion and prevention campaigns at the community level, especially for at-risk and vulnerable groups—thus improving the health of the overall population. Predictive public health requires these in-depth data analyses to provide a highly targeted approach that can help prevent common diseases that are likely to spread or become endemic in a community, encourage certain lifestyle practices applicable to parts of the community, improve care outcomes, reduce costs, and reach a larger portion of the population. By understanding the drivers of health in a population, it will be easier to predict issues that may rise and, accordingly, decide on the strategies that


will be most useful to improving health and well-being.

Participatory public health

The Covid-19 pandemic has been a clear exemplar of the role each member of society plays as a part of the public health workforce, and the role all individuals must play in supporting effective public health outcomes. The most successful country responses have been those with robust public health and healthcare systems under governments who have employed a whole-of-government approach to their response.

In order to obtain effective public health interventions, there is a continued need for an intersectoral approach to care that goes beyond core health stakeholders—one in which academic institutions, workplaces, religious leaders, social institutions, civil society, law enforcement, have a place in providing the right culture and support for sustaining change. By continuing to educate, and raise awareness in, individuals regarding their important participation and key role in the improvement of the population's health, coupled with digital enablement leading to interconnectivity and empowerment of individuals to own and understand their health data, public health will succeed.

Powerful technology and its ethical use

The future of public health will render larger amounts of data—personal and system-level—more available than ever before; thus, the challenge and ethical dilemma of data storage and analysis will have to be tackled, especially in the field of genomics, whose advances have been dependent on, and facilitated by, progress in data science, informatics, and the development of novel and more advanced technology. The immense 

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volume of data that next-generation sequencing will generate as countries and public health systems sequence larger portions of their populations will require data storage and protection possibly beyond available capabilities.

Beyond the issue of storage and analysis will be the continuous ethical dilemma of data protection and confidentiality. As we move toward more integrated and consolidated sources of individual and population health data and information, some of the questions that will need to be addressed include: What will the cybersecurity and identity protection implications be? Which disease variants should be reported? How will governments safeguard the safety of their populations' health information and, moreover, how will public health and medical healthcare systems protect individuals' and patients' health information? How will employers and payers/insurance companies be prevented from using this readily available and large amount of data as bases for discriminatory practices regarding individuals?

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surveillance during emergencies like Covid-19 may therefore pose a threat to a person's privacy and consequent bodily integrity, thereby further increasing the importance of informed consent and privacy protections, along with the protection of the greater public good.

Not only will there be differences in health literacy and the intellectual capability to truly have informed consent, but there will be differing ease of, and barriers to, access of necessary digital technology and broadband services. As governments accelerate the digitalization of their public health systems and services, they will have to take these issues into account.

Back to basics – The importance of traditional public health

The Covid-19 global pandemic showed us that the traditional aspects of public health work are as important as ever; therefore, despite technological advancement, these must not be neglected or forgotten. Basic principles of hygiene, disease detection and prevention measures, screening and immunization, quarantine and safe social distancing in cases of outbreaks, and healthy lifestyle choices to prevent chronic conditions have been at the crux of successful Covid-19 prevention and mitigation—at both the individual and the community levels.

Due to the constant influx of economic migrants, the Gulf Cooperation Council (GCC) countries have enacted strong surveillance and disease diagnostic measures to stop unforeseen outbreaks of preventable infectious diseases such as Tuberculosis (TB), polio, measles, and Hepatitis C. These same surveillance measures and technologies have now been repurposed to respond to the Covid-19 pandemic: diagnostic centers

are used for testing, contact tracers do not have to relearn the process, and rapid decision-making for quarantine/isolation measures already exist. Furthermore, passive surveillance systems through which authorities and providers notify patients and individuals have provided the foundation for a more efficient and timely standing-up process for notification and response measures for Covid-19, as was seen in the GCC with the combination of tracking and tracing apps, social media, and regular press conferences by the leaders of the response teams and task forces.

On another note, the most advanced technology for screening and surveillance will not help much with disease outbreaks if necessary social distancing and isolation/quarantine measures are not followed once community spread exists, as has been the case with Covid-19. Moreover, it is now globally accepted that herd immunity for Covid-19 will not be achieved before a safe and efficient vaccine is widely and ethically distributed to a significant majority of the world's population. At the end of the day, technology and surveillance might make our health journeys seamless, but it is traditional isolation and immunization measures that will allow us to return to a normal semblance of life.

Most GCC countries have well-established childhood immunization programs, including centralized procurement and distribution infrastructure, that have laid the foundation for a successful roll-out of, and community compliance toward, vaccines against Covid-19. As safe and efficient SARS-CoV-2-combatting vaccines are being widely distributed, and which GCC countries have committed to administer free of charge to citizens and residents (and are currently doing so), we do not foresee their administration in the region being an issue.

Based on the trends and focus of countries in recent years, there exists a need for a shift in attention back toward traditional public health. Key to the success of a nation's public health is the strong foundational infrastructure that focuses on challenges we see in the region relating to both lifestyle factors and on increasing immunization.

Conclusion

The one thing we know for sure about the future of public health is that it is one of uncertainty. Despite the challenges mentioned in this article, the future of public health offers us possibilities heretofore unimagined by many. Globalization, increased interconnectedness, social media, and more readily available education are opening our eyes to lifestyles of wellness that will allow communities to not only increase their longevity, but their quality lifespans as well. The future of public health is paving the way for each of us to become well-informed, more health-literate persons and the ultimate decision-makers at the center of our own health.

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Whether we end up living in a digital society, one in which health is part of all policies, one led by technocrats and scientists, one that has learned nothing from the Covid-19 pandemic, one thing is certain—and that is that the future of public health is here and it will transform our health journeys across our entire lifecycle. ●

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Endnotes

1. The field of genomics involves the study of the entire genome—how all the genes in cells of an organism interact with each other and with environmental factors in order to determine an individual's growth, development and ultimate well-being. Research into genomics and genome sequencing have allowed the practice of healthcare to better understand disease etiology, risk, prevention, diagnosis, and treatment.