Innovation for challenges of public health and sustainable growth

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Abstract

Innovation is a vital scientific activity for improvement of human production, quality of life and economic development in the globe. This review aims to discuss innovative strategies for a series of challenges of public health and sustainable growth as well as human diseases. Currently, there are huge challenges of public health due to both major viral infectious diseases (such as HIV infection and Covid-19) and major non-communicable diseases (such as cardiovascular disease, diabetes, and cancer), as well as aging, climate change, industrialization, and urbanization. These challenges and risks greatly affect modern economic and social development not only in China but also in the globe. Herein, we should "know more, do better, and be smarter" about related knowledge and information, "reject misinformation and accept uncertainty", and further understand the important roles of policies and laws as agents (PLA) in fighting against the infection of SARS-CoV-2 and its major variants, and effectively halting climate change for global health and sustainable growth. All in all, these innovative strategies and experiences in combating Covid-19 infection and climate change will help to get better economic and social development as well as sustainable growth in the countries worldwide, in particular the Covid-19 pandemic and post-COVID-19 era.

PERSPECTIVE

Innovation for challenges of public health and sustainable growth

Running title: Innovation for PH & SG

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Abstract

Innovation is a vital scientific activity for improvement of human production, quality of life and economic development in the globe. This review aims to discuss innovative strategies for a series of challenges of public health and sustainable growth as well as human diseases. Currently, there are huge challenges of public health due to both major viral infectious diseases (such as HIV infection and Covid-19) and major non-communicable diseases (such as cardiovascular disease, diabetes, and cancer), as well as aging, climate change, industrialization, and urbanization. These challenges and risks greatly affect modern economic and social development not only in China but also in the globe. Herein, we should "know more, do better, and be smarter" about related knowledge and information, "reject misinformation and accept uncertainty", and further understand the important roles of policies and laws as agents (PLA) in fighting against the infection of SARS-CoV-2 and its major variants, and effectively halting climate change for global health and sustainable growth. All in all, these innovative strategies and experiences in combating Covid-19 infection and climate change will help to get better economic and social development as well as sustainable growth in the countries worldwide, in particular the Covid-19 pandemic and post-COVID-19 era.

KEYWORDS

Covid-19, climate change, innovation, law, policy

Currently, there are huge challenges in public health due to aging, industrialization, urbanization and climate change. For example, blowout of major non-communicable diseases (mNCDs) and major viral infectious diseases (mVIDs), such as type 2 diabetes (T2D), COVID-19 and others [1-4]. There were several waves of the COVID-19 pandemic from 2020 to 2022 due to the infection of SARS-CoV-2 and its major variant Omicron, which led to more than 650.332 million confirmed COVID-19 cases and over 6.64 million deaths in the globe (Dec 21, 2022) according to the World Health Organization. These risks clearly affect economic and social development in the globe. Thus, more innovations for these challenges in public health are needed for sustainable growth.

1 | KNOW MORE, DO BETTER, AND BE SMARTER

In nowadays' internet plus era, knowledge is flooding into people's eyes. However, there is both science and misinformation [5]. Herein, the important role of education is to help people distinguish between false and true, obtain useful knowledge for economic and social development. For individuals, scholars and researchers, the general requirement of society is, as a famous Chinese writer Zhongshu Qian put it, not only "know something about everything" but also "know everything about something". And having such a knowledge system will be respected and valued. In the field of biomedicine and life sciences, from genomics and proteomics to artificial intelligence, big data and cloud computing [6, 7], these modern technologies have become the new cutting-edges. In particular, interdisciplinary integration will open a fresh page of scientific and technological innovation.

Chairman Mao Zedong, the founding leader of the Chinese people, once said: "Study hard and make progress every day". Here, it can also be understood as "know more, do better, and be smarter". Since the world is already in an era of a geometric explosion of knowledge. Taking COVID-19 as an example, we have gone from initial panic to calm. So far, we have fully known the origins, structures, pathogenic mechanisms, characteristics of transmission, detection and diagnosis, evolution and variation of SARS-CoV-2 [8], as well as the clinical characteristics, the strategies for treatment and prevention of COVID-19, and development of vaccines, antiviral drugs, and therapeutic antibodies [9, 10]. And we are still renewing these measures and strategies for COVID-19 according to current new situation.

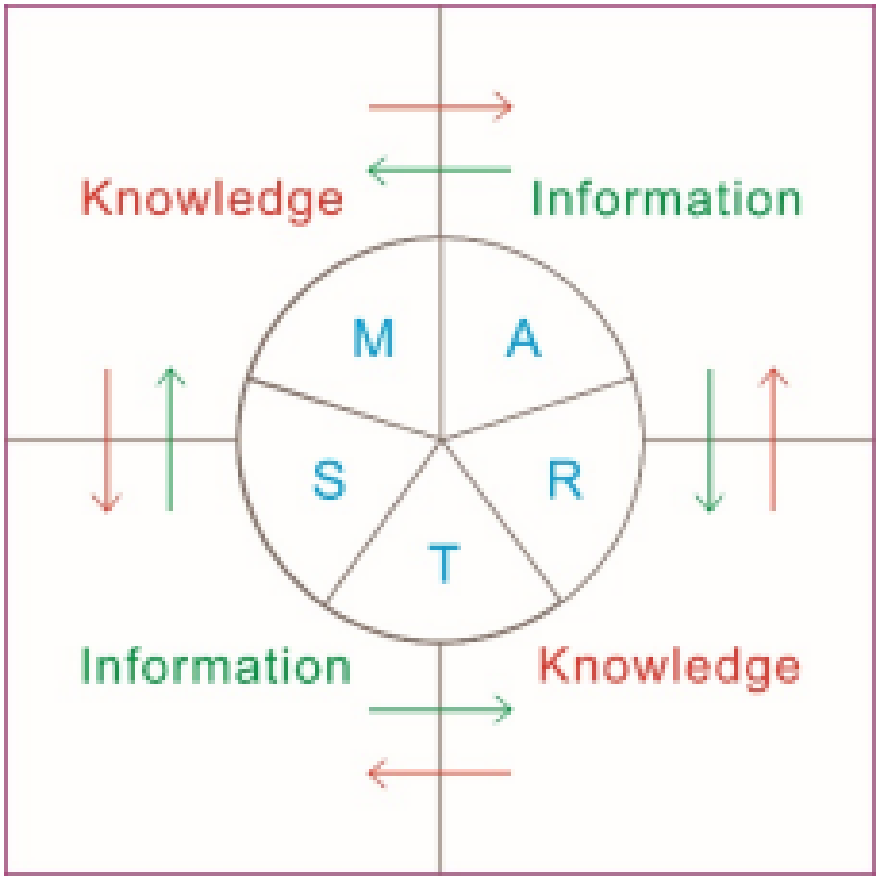

Fig 1. "Know more, do better, and be smarter".

According to this figure, it is easy to understand that knowledge and information can be transformed into each other. Thus, we should strive to master more knowledge and information. Here, S: study; M: memory; A: action; R: research; T: translation.

Although there were new variants of SARS-CoV-2 including the Delta, Omicron, and others, which are emerging continuously, the overall pandemic status can be prevented and controlled. So is the latecomer Monkeypox [11-13]. These major emerging infectious diseases have taught us how to effectively deal with potential risks and challenges. Herein, scientists and educators should take responsibility for teaching and communicating science and knowledge, rejecting misinformation [5], and developing scientific consensus in certain areas of science where there is uncertainty. In the new era, if you want to be smarter, you should do "study, memory, action, research, and translation (SMART)" of knowledge and information (Fig. 1), then, you are really smarter. In fact, this is an economic era of knowledge and information, that is to say, knowledge and information are money. Therefore, we should know more, do better, and be smarter.

2 | POLICIES AND LAWS AS AGENTS FOR PUBLIC HEALTH

Geographical earthquakes, the COVID-19 pandemic, and local wars are major killers of human life. These events are high risks not only for individual or population health but also for global economic and social development. Thus, policies and laws as agents (PLA) (Fig. 2) could be global consensus in the new era. However, while the policies and laws may restrain individual behaviors and stop wars, who can halt "God" and deadly virus so as to prevent emotional "earthquakes", such as mass public shootings, and the pandemics of COVID-19 and Monkeypox?

Currently, PLA is an effective strategy for major emotional "earthquakes" and the pandemics. First, effective firearm violence prevention strategies [14] from the policies and laws will control and reduce gun violence, and when the COVID-19 pandemics and Monkeypox came [1, 2], the policies of isolation and screening in time can greatly control the spread and reduce related risks as well as the morbidity and mortality. Second, regulation of individual lifestyle and behaviors by PLA, the emotional "earthquake" and the pandemics will also be prevented or reduced. For example, prohibiting the killing and trading of wild animals, gun control for minimizing injury or deaths due to individual or mass public shootings [15-18]. So far, gun violence has already highly linked to individuals' health and wellness [19] since there is a new peak by gun deaths in the United State (US) [20]. In fact, everyone can understand "how the US can have guns but fewer gun problems" [21]. In addition, PLA can also greatly help to prevent and control environment harm [22].

Almost 500 million individuals will develop cardiometabolic diseases (obesity, hypertension, diabetes) or other major noncommunicable diseases (mNCDs) due to physical inactivity (https://news.un.org/en/story/2022/10/1129662). Since PLA are high efficient for both mNCDs and mVIDs, both "*Health in All Policies* " and "*Health in All Laws* " should be worthy of promotion in the globe [23-25]. In fact, strengthening the regulatory efficiency of policies and laws is conducive to improving global health and preventing mNCDs and mVIDs. For example, effective policy strategies can greatly improve the awareness, treatment and control rates of hypertension since they are not yet high enough in China [26].

Fig 2. Policies and laws as agents (PLA).

This figure is helpful to understand PLA. In fact, "Health in All Policies (HiAP)" and "Health in All Laws (HiAL)" can help to combat huge challenges in public health, including mNCDs and mVIDs, and are helpful to sustainable growth in the globe.

Therefore, PLA could be a powerful tool and we really need the strong PLA for global health. For example, health policies that support exercise can prevent obesity, cancer, and cardiometabolic diseases. It should be a new scientific and social consensus, particularly in the era of pandemics. In addition, as a major public health crisis, there were an increase of gun deaths in firearm violence during the pandemic of COVID-19 [27, 28], including child deaths [29, 30]. Thus, effective preventive strategies by legislation for gun violence are worthy of further discussion and suggestions [31-33]. Since some socioeconomic factors (such as race/ethnicity and income) play a vital role in disparities in the population at risk of severe illness from COVID-19 [34], national barriers are crucial to future goals [35] and the Road Map [36] of eliminating mVIDs (such as HCV, HIV, and SARS-CoV-2). For example, we should support vaccination of COVID-19 due to additional benefits [37]. Herein, both HiAP and HiAL are pivotal to the control and prevention of COVID-19, influenza, and other mVIDs, which were also supported by current literatures of the American and France scientists [38-40]. All in all, PLA is an effective strategy and innovation in the COVID-19 pandemic and post-COVID-19 era.

3 | EXPERIENCES IN COMBATING COVID-19 IN CHINA

As we known, there were several waves of the COVID-19 pandemic in the globe from 2020 to 2022 due to the SARS-CoV-2 infection and its major variants. However, China successfully and rapidly controlled the COVID-19 pandemics in Wuhan in 2020, in Zhejiang in 2021, and Shanghai in 2022. These are indeed miracles. China's experience of combating COVID-19 pandemics has demonstrated the superiority of her national and social system and the advanced nature of the Communist Party of China (CPC) leadership. Due to the strong powder of PLA, it will also help to control the pandemics in the future.

First, scientific and accurate decision-making and timely and rapid action. China implemented the concept of "*People First, Life First* " sponsored by President Xi Jinping, and adhered to the normalized strategy of prevention and control with efficient, rapid and comprehensive measures after the pandemic in Wuhan [41]. Similarly, when the new wave of COVID-19 induced by the Omicron variant came in Shanghai in 2022, China adhered to the general policy of comprehensive and dynamic zero-COVID-19 community transmission [42], and also achieved a total victory.

Second, high efficient and powerful anti-COVID-19 teams and iron discipline. In the face of the COVID-19 pandemic in Wuhan in 2020 and Shanghai in 2022, China has mobilized medical and health rescue teams from other provinces and cities, and mobilized military health and service forces to support the fight against the pandemics. In addition, a large number of volunteers and services at all levels have participated in the control and prevention of the COVID-19 pandemic, and the public have strictly observed and enforced the related rules and regulations.

Third, novel, scientific, reasonable and effective strategies combating the pandemics could be summarized as the program of "iRT-ABCDEFG" + "ISISI" local or national barriers. For example, the general goal is the persistence of dynamic zero-COVID-19 community transmission, and lasting isolation and screening. Lastly, adequate and free medical supplies, and solid and reliable logistics services. In fact, the global COVID-19 pandemic was just like a world war induced by coronavirus. China has provided a large number of masks for the world and free nucleic acid testing as well as universal vaccinations for her residents. These measures have laid the foundation for China's victory over the pandemics. Herein, the governance models and practices in China are worthy of learning in the globe [43].

4 | INNOVATION FOR CHALLENGES OF PUBLIC HEALTH AND SUSTAIABLE GROWTH

There are several factors which contributed to the risk of COVID-19 death. And both conventional [44] and novel risk factors (Age/BMI score) [45] can help to predict mortality in critically ill cases with COVID-19 infection. In fact, innovative measures are highly needed for the control of COVID-19 infection due to the unique situations in India [46] and other countries. For example, the children immunization App for vaccination registration in refugees camps [47], genetic screening [48] for predicting subsequent critical conditions, and improving acceptance rate for COVID-19 vaccination [49] among health care workers (HCWs)

and the general population. Moreover, there are an urgent need of emotional and psychological support due to increased stress levels [50] among HCWs.

Currently, big challenges of public health and climate change have become global topics [51], since these problems may hinder sustainable growth and affect economic and social development in the globe. For example, the high temperature and dry weather continued in China this summer, seriously affecting industrial and agricultural production. Thus, we need to carefully assess the current climate risks [52] and let the public and policy-makers know about these risks.

How to rationally cope with these challenges and their risks? On the one hand, energetically implement energy conservation, emission reduction and consumption reduction, optimize resource allocation and enhance the efficiency of production. For example, according to the characteristics of long sunshine hours in summer, improve the work schedule. On the other hand, scientific and technological innovation can reduce the impact of production and residents' daily life on the climate, protect the ecological environment, and make people and nature more harmonious.

Sustainable growth requires innovation. As a primary driver of growth, innovation will bring higher efficiency and lower consumption, help us to address public health challenges, and alleviate the climate crisis. And high level innovation is conducive to high quality economic and social development, particular in this era of pandemics. Herein, as a national or local platform of innovation, "government-enterprise/university-researcher" should become the closely connected entirety, and give full play to the mainstream role of innovation in serving economic and social development in the globe.

As innovative and stronger protective measure, PLA will help to combat the challenges of public health, and better implementation of the healthy initiative of both China and the globe as well as sustainable economic growth [53], for example, green space [54], wearable devices [55], comprehensive tobacco control [56] for cardiovascular and cerebrovascular health, and eating disorders [57]. In addition, due to adverse effects of COVID-19 and climate change on both global health and economies [58, 59], we also need a series of innovative measures, policies and mechanisms to improve risk assessment and management of climate change [60, 61], to reverse biodiversity and ecosystem losses, so as to reset food security and the global economy for sustainable growth.

Herein, policymakers should consult front-line healthcare providers, since there is a strong and positive relationship between gross domestic product and health expenditure [62, 63]. At the same time, due to great impacts on health and well-being, the COVID-19 pandemic resulted in current implications for policy-making and climate change research [64, 65], so as to cope with the challenges of public health, environment and sustainable growth. For example, an innovative structured decision-making will provide a transparent and rigorous, evidence-based decision-theoretic framework [66], and has wider ecological, economic, and social benefits. In addition, due to the association between more ambitious climate targets and potential health benefits [67], controlling carbon emissions will be helpful in better socio-economic sustainable development. And novel technologies of molecular biology and Chinese medicine will help to combat both mVIDs and mNCDs in the pandemic and post-COVID-19 era for better sustainable futures [68, 69].

All in all, we should always remember that the goals of technological innovation are for sustainable development [70]. For example, machine learning [71] may help to predict the attitudinal and behavioral responses to the COVID-19 pandemic, which is helpful in understanding adherence to public health recommendations. Some research projects on the protection of endangered species, for example, the Earth BioGenome Project [72, 73], need to consider ethical, legal, and social issues. And people already knew that emerging environmental and climate problems require new innovations in law, policy, and governance [74]. At the same time, we should develop and adopt a standard policy in open science for protection and conservation global biodiversity for better sustainable development [75] and ecological economy, in particular current marine natural resources [76].

5 | CONCLUDING REMARKS AND FUTURE PROSPECTS

In conclusion, we should "know more, do better, and be smarter" about related knowledge and information and "reject misinformation and accept uncertainty" in the new era, and understand and apply the important role of PLA in combating SARS-CoV-2 and its variants (such as Omicron, XBB, EG.5, BQ.1, and JN.1), COVID-19, and Monkeypox as well as current climate change and risks, particularly in the era of pandemics. China's success lays on implement of the concept of "*People First, Life First* " sponsored by President Xi Jinping, and adopting scientific and accurate decision-making, and timely and rapid action as well as highly effective and innovative strategy, such as PLA, for challenges of public health and sustainable growth.

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AUTHOR CONTRIBUTIONS

C.H. contributed to conceptualization, methodology, data curation, investigation, visualization, writing-original draft, writing-review & editing; The author read and approved the final manuscript.

CONFLICT OF INTEREST

The author declares no competing interests.

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