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Health Policy Lessons from the First Wave of Coronavirus (COVID-19) to Reduce Economic and Health Impacts from Anticipated Future Waves

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ABSTRACT

Background: Coronavirus (COVID-19) pandemic has caused great shocks across all sectors of society. The pandemic highlighted three crucial policy issues (i.e., healthcare spending, social determinants of health, and health equity). It is also projected that recurrent wintertime outbreaks of COVID-19 will likely occur after this initial wave in the next few years.

Methods: Descriptive review was conducted to provide information on the critical lessons learned from the first wave of COVID-19 to improve the well-being of society in light of predicted future waves. We searched articles from PubMed/Medline, Scopus, Embase, and Google Scholar with systematic search inquiry.

Results: We included 96 articles in this descriptive review. Health is the ultimate goal of the healthcare sector and an essential prerequisite for achieving other societal goals. The first wave of the COVID-19 pandemic showed that countries that have given less attention to social determinants of health (SDH), health equity, and marginalized, vulnerable populations faced the tremendous burden of disease morbidity and mortality. Spending on healthcare or other developmental sectors should be based country's health production function status (i.e., understanding the marginal return of healthcare). Health and well-being are indivisible from other societal goals. It should be addressed with due consideration of their interconnectedness. A comprehensive multi-disciplinary approach involving health in all policies,

which integrates SDH and health equity into modeling with the principle of leaving no one behind, will have a critical impact on improving economic and health outcomes during future anticipated COVID-19 Waves.

Conclusion: In general, improving and adopting novel strategies, confronting the multiple facets of the public health mitigation measures, and facilitating and stimulating interdisciplinary public health interventions are essential to reduce the health and economic impacts of anticipated future COVID-19 waves. Developing countries could benefit from increasing public expenditure on health with due consideration of SDH. For developed countries like the United States, it is imperative to shift health policy focus from illness-oriented healthcare towards policies that affect the social determinants of health.

Keywords: Coronavirus; Anticipated future waves; Health in all policies; Disease based policy; Social determinants of health; Health equity.

Introduction

A novel coronavirus disease (COVID-19) is a global pandemic which claimed millions of deaths so far. It is caused by the zoonotic SARS-COV2 virus (1, 2). The structure of the receptor-binding gene region is very similar to that of the SARS coronavirus, and the virus uses angiotensin-converting enzyme 2 (ACE2) for cell entry. There are two different types of SARS-CoV-2, type L (accounting for 70% of the strains) and type S (accounting for 30%) of strains identified in Wuhan, China (3-5).

Infection is transmitted through large droplets generated during coughing and sneezing by symptomatic patients but can also occur in asymptomatic people and before the onset of symptoms. These infected droplets can spread one to two meters. The virus can remain viable on surfaces for days in favorable atmospheric conditions but is destroyed in less than a minute by common disinfectants. Infection is acquired by inhaling these droplets, touching surfaces contaminated by them, or touching the nose, mouth, and eyes. Other means of transmission include fico-oral and post-natal transmission. The incubation period varies from 2 to 14 days (median five days) (4, 5).

The elderly and patients with neutrophilia, diabetes, chronic lung disease, cardiovascular disease, and coagulation dysfunction are at higher risk for severe COVID-19-associated disease (6, 7). In adults, COVID-19 can be grouped into five categories based on the severity of illness: asymptomatic infection; mild illness; moderate illness; severe illness, and critical illness (8, 9). A confirmatory test should be done using specific molecular tests (e.g., polymerase chain reaction or antigen tests). On respiratory samples (throat/nasopharyngeal swab/sputum/endotracheal aspirate) (5, 10, 11). The unique properties of this virus make prevention difficult, namely; because of: Non-specific features of the disease, the infectivity even before the onset of symptoms in the incubation period, transmission from asymptomatic people, long incubation period, tropism for mucosal surfaces, prolonged duration of the illness, and transmission even after clinical recovery (5).

The COVID-19 pandemic has caused a significant challenge for healthcare systems globally. Including the risk to healthcare workers (12), high healthcare costs; shortages of protective equipment, including N95 face masks, low numbers of ICU beds and ventilators; increased investment in disease prevention infrastructure, including vaccine trials, accelerated digital transformation of healthcare delivery; disruptions of provision of HIV, tuberculosis and malaria services in developing countries(13). Prevalence and mortality rates are currently lower in Africa than among several Western countries and the USA, maybe due to early initiation of lockdown and border closures, the younger age of the population, lack of robust reporting systems, and as yet unidentified genetic and other factors (14). Social inequalities in health significantly to COVID-19 morbidity and mortality (15). The global north with better expertise and the global south with severe economic and capacity limitations face a similar burden. The highest infection and fatality rates recorded by the global economic powers suggest transforming the healthcare system (16).

A modeling study showed that deaths due to HIV, tuberculosis, and malaria over five years in high-burden settings could increase by up to 10%, 20%, and 36%, respectively. The most significant impact on HIV, TB, and malaria was estimated from interruption to antiretroviral therapy, reductions in timely diagnosis and treatment of new cases, and interruption of

planned net campaigns (17, 18). It is anticipated that recurrent wintertime outbreaks of COVID-19 will likely occur after this initial wave in the next few years (19, 20). The pandemic thought of the role of SDH, equity, and protection of vulnerable groups for population health outcomes (19, 21). Therefore, this descriptive review was conducted to provide information on the critical lessons learned from the first wave of COVID-19 to improve the well-being of society in light of predicted future waves.

Method

Search strategy and information source

We searched articles written in English since August 28, 2020, from PubMed/Medline, Scopus, Embase, and Google Scholar with the following search query: Coronavirus AND Health in all policies AND Social determinants of health AND Health equity AND Strategies for controlling epidemics. We found 252 articles with the above search strategy. Forty-five articles are removed because of duplication. We screened 207 articles by reading titles and abstracts and excluded 111 articles due to a lack of relevant information on COVID-19, social determinants of health, and health equity. Finally, 96 articles were included in this descriptive review (figure 1).

Study types

Systematic reviews, clinical trials, cohort studies, observational and cross-sectional studies related to the first wave of the COVID-19 pandemic

Inclusion and exclusion criteria

- Systematic reviews, clinical trials, cohort studies, observational and cross-sectional studies related to the first wave of the COVID-19 pandemic (health and economic impacts) are included
- Articles not related to the first wave of the COVID-19 pandemic (health and economic impacts) are excluded

Study selection

From a total of 252 articles identified by literature search, 207 potentially relevant articles were selected; after applying the inclusion-exclusion criteria listed above, 96 articles were found to be relevant (figure 1). Two investigators (MM, MD) independently reviewed each study's abstract against prespecified inclusion and exclusion criteria. A second investigator checked these data for accuracy. In case of disagreement on the quality of the article, two authors discussed it in front of a table in the presence of the third author (AK).

Data Synthesis and Analysis

We qualitatively described and summarized the evidence on the impact of COVID-19 on society's well-being, health policy directions, and the importance of reforming health systems to address SDH and equity. We stratified results by types of SDH: education, income and development, environment, energy, and food security. We also addressed the impact of social disparities on COVID-19-related morbidity and mortality. Finally, the importance of restructuring the health systems to address SDH to reduce the economic and health impacts of projected recurrent wintertime outbreaks of COVID-19, likely to occur after this initial wave, was discussed.

Findings

Impact of the first wave of COVID-19

The COVID-19 pandemic significantly impacted economic activities and the health of individuals and society (22). A study conducted to evaluate the economic impact of the first wave of the COVID-19 pandemic on acute care hospitals in Japan showed that during the first wave of COVID-19, total claimed hospital charges decreased by 5-14% compared to the same months before COVID-19 in 2019 (23). The cross-sectional survey was conducted to investigate maternal mental health during the COVID-19 pandemic lockdown in Thailand. It showed that the COVID-19 lockdown had a perceived impact on a household's ability to pay rent, make mortgage payments, and pay for other essentials (utilities and medication), household crowding after lockdown, and not going outside or doing outdoor activities (24).

Concerning health impact, a longitudinal household survey conducted in the United Kingdom (UK) to evaluate the first wave of the COVID-19 pandemic and its impact on socioeconomic inequality in psychological distress showed that the prevalence of psychological distress increased from 18.5% to 27.7% due to COVID-19. The main contributors to increased distress and socioeconomic inequality were chronic health conditions, housing conditions, and neighborhood characteristics (25). A similar cross-sectional electronic survey conducted to quantify psychological distress experienced by the emergency, anesthetic, and intensive care doctors during the acceleration phase of COVID-19 in the UK and Ireland showed that about 50% of frontline doctors reported psychological distress (26). A quasi-natural experiment done in England and Scotland showed that the

imposition of containment policies had a higher impact on mental health than the evolution of the pandemic itself (27).

Health and disease-based health policy

Globally today's healthcare system is spending more on medical care. However, the health outcomes are not changing at the same rate as the rise of millions of dollars being spent on medical care (28-33). For example, the UK spending per capita ($3,235) in 2013 was 37.1% of the US level ($8,713), or when expressed as a ratio of GDP (8.5% as opposed to 16.4%), has better coverage, easy access to primary care and higher life expectancy. Due to this, most health economists suggested the need for a US healthcare system in the following five areas: health "safety net" for all residents, irrespective of age, health, or employment status; mechanisms that promote cost containment; mechanisms that promote quality and high-value care; choice for patients and providers and ease in administration (34). These items are supported by evidence from the economics of health production; after the input threshold limit, the production function curve becomes flat (i.e., the law of diminishing marginal return) (35).

Health cannot be viewed as a single business because it is the ultimate goal of the healthcare sector and an essential prerequisite for achieving other societal goals. Many of the SDH have social, environmental, and economic origins that extend beyond the direct influence of the health sector and health policies (36, 37). For example, the health-related sustainable development goal (SDG 3) is good health and well-being. It is interconnected with SDG 1 (poverty), SDG 2 (zero hunger), SDG 4 (quality education), SDG 5 (gender equality), SDG 6 (clean water and sanitation), SDG 13 (climate action), SDG 14 (life underwater), SDG 15 (life on land) and SDG 17 (partnerships for goals) (38). The health in all policies (HiAP) approach is necessary to protect and promote health and health equity, particularly where there are competing interests (39-45). Implementation of HiAP involves the following interrelated strategies: developing and structuring cross-sector relationships; incorporating health into decision-making; enhancing workforce capacity; coordinating funding and investments; integrating research, evaluation, and data systems; synchronizing communications; and implementing accountability (46, 47).

SDH is the primary factor influencing population health and health equity. Health policy must shift its focus from illness-oriented healthcare towards sectors whose policies affect SDH (48). Investing in SDH contributed 50% of under-5 mortality reduction (between 1990 and 2010). Social inequalities in risk factors account for about 50% of inequalities in significant NCDs. Integration of social and medical services reduced child mortality by 10-fold. Addressing social determinants requires coordination and alignment among different sectors and stakeholders at international, national, and local levels. An interrelationship between health and other societal goals, as reflected in various sectors, including; economy and employment, security and justice, education and elderly life, agriculture and food, infrastructure planning and transport, environment and sustainability, housing and community services, and land and culture (49, 50). Therefore, understanding the interconnectedness of SDH and health and addressing SDH are critical for achieving SDGs (figure 2) (51).

Despite this, health outcomes have only responded marginally, raising concerns about the significance of health expenditure in improving health outcomes. Different studies from an African region showed that government and private healthcare spending significantly improved the region's infant, under-five, maternal mortality, and life expectancy (52, 53). A study from 40 Sub-Saharan African countries showed that health expenditure has a significant but inelastic effect on health outcomes in SSA, reducing mortality rates and improving life expectancy at birth (54). Increasing health expenditure (public expenditure through health insurance schemes) is vital to improving health outcomes in the African region (54). It should be done with due consideration of contributors to population health outcomes socioeconomic, individual behavior, medical and clinical, and living environment accounts for 40%, 30%, 20%, and 10%, respectively (55). Currently, the average sub-Saharan African country spends approximately 5.5% of its GDP on healthcare, of which perhaps half has been spent on hospital care (28) (figure 3).

Reducing health inequities through addressing SDH through an inter-sectoral approach is a global health system priority (56-61). The COVID-19 pandemic has unrevealed health, social, racial, political, and economic inequities within American society as the incidence of severe morbidity and mortality from the disease appeared to be much more significant in Black and racial/ethnic minority populations (62-64). In the USA, the COVID-19 infection and mortality rates were three times and six times higher in blacks than whites (15). The association of social inequalities and COVID-19 is more explained by the interplay between SDH, Asthma, and COVID-19. Data released

by the CDC on hospitalizations in the USA in March 2020 notes that 12 (27%) of patients aged 18–49 years, seven (13%) of those aged 50–64 years, and 8(13%) in those ≥ 65 years were hospitalized had a history of asthma (20). Another study conducted on COVID-19 and social determinants of health showed that the higher risk of the consequences of COVID-19 quickly spreading in the US was mainly due to poor preparedness and inattention to the foundational social determinants of health (65-67). A recently developed approach aimed to support the movement of national health programs to ensure that no one is left behind encompasses eight action steps to reduce healthcare inequality. These steps are: completing the diagnostic checklist; understanding the program theory, identifying who is being left out by the program; identifying the barriers and facilitating factors that subpopulations experience; identifying mechanisms generating health inequities; considering intersectoral action and social participation as central elements; producing a redesign proposal to act on the review findings, and strengthen monitoring and evaluation. Applying this novel approach will help to reform the health systems to address SDH and health equity concerns (68-71) (figure 4).

COVID-19 pandemic on Social determinants of health

Education sector and COVID-19

The COVID-19 pandemic has affected all levels of the education system, from preschool to tertiary education. Schools have closed down, ranging from complete closure to targeted closure and running online classes (13). UNESCO estimates that close to 900 million learners have been affected by the closure of educational institutions (13). The short-term disruption felt by many families was the impact of homeschooling on parents' productivity and children's social life and learning. These interruptions in the teaching and learning process will also have long-term consequences for the learners and likely increase inequality. In higher education institutions, online assessment tools replaced traditional exams with the possibility of having more significant measurement errors (72). The COVID-19 pandemic also had a severe impact on medical schools. Some hospitals suspended clinical attachments, which could lead to reduced clinical exposure in specific specialties, causing a detrimental effect on exam performance and competency (72).

Food security and nutrition and COVID-19

The emergence of COVID-19 affected food distribution and retailing due to decreased production and panic-buying and stockpiling of food (13). Addressing food security during the pandemic needs expanded public health activities and efficiency in resource utilization. Optimal nutrition and dietary intake require individual effort to:

Consume a healthy diet and physical activity, community involvement to improve (food availability, accessibility, and equity), and national commitment to improve (food security, food and agriculture policies, food marketing, food assistance programs, healthy food basket) and global cooperation for (food trade agreement, food distribution, and shipping, food standards, commodity pricing and so one) (73, 74).

Household Energy and COVID-19

The COVID-19 pandemic has caused great shocks across all facets of society, including the energy sector. The recent review revealed that most financial and short-term interventions were made by governments in Africa (75). Improving the availability of energy alleviates poverty, increases industrial productivity, improves household income, and positively impacts health. A longitudinal, nationally representative survey conducted in the United Kingdom to evaluate fuel poverty and financial distress showed a statistically significant relationship between fuel poverty indicators and financial distress (76).

Growth and employment and COVID-19

COVID-19 has inadvertently affected the financial markets and the global economy due to lockdowns which led to a disruption in the supply chain (reduced production of goods). At the same time, quarantine and self-isolation policies decreased consumption, demand, and utilization of products and services (13, 77). Estimates of the impact of COVID-19 on global poverty based on three scenarios: low, medium, and high global contractions of 5, 10, and 20%; at the poverty headcount using the international poverty lines of US$1.90, US$3.20, and US 5.50 per day showed that COVID-19 posed a real challenge to the UN SDG of ending poverty by 2030 because global poverty is expected increase for the first time after three decades (I.e., since 1990) and which require decades to reverse. Under the most extreme scenario of a 20% income contraction, the number of people living in poverty could increase by 420–580 million compared to 2018 figures (78).

Africa bears a disparate burden of poverty and disease, which the COVID-19 pandemic could exacerbate. The fact is that many developed countries are substantially financing COVID-19-related activities in their own countries, which may leave little room for providing relief funds to developing countries (79). The study that analyzed the COVID-19 situation in Africa showed that many African countries had taken bold quarantine and lockdown measures to control the spread of COVID-19. However, it has come at costs, such as the collapse of health systems and a painful economic crisis or recession (80).

Environmental sustainability, conflict, and COVID-19

COVID-19 caused difficulties in tackling climate change (16). Lockdown and social distancing measures to prevent the spread of COVID-19 have heightened fears of increasing levels of domestic violence, which include physical, emotional, and sexual abuse (13). Conflict and violence are higher in the African region. For example, 37% of global physical and/or sexual intimate partner violence among women is in the WHO African Region; this figure could be further aggravated by the COVID-19 pandemic (81, 82).

A study that evaluated conflict during COVID-19 in Africa showed that the probability of experiencing riots, violence against civilians, food-related conflicts, and food looting has increased since lockdowns. An increase in the local food price index is associated with increased violence against civilians, and anti-poverty measures reduced it (83). Addressing food insecurity, Future planning for providing incentives for employers to preserve employee jobs can help maintain family income and reduce family, domestic, and intimate partner violence (84).

The concept of equity is simple to understand but challenging to implement. This is because equitable distribution depends on economic and political factors. The choice of distribution methods also needs critical evaluation of available options, including:

Accepting market outcomes; accepting market outcomes but ensuring equity of opportunity; reducing inequalities with progressive taxation and transfers; accepting market outcomes but providing a safety net for those who cannot earn, and creating complete equality (34). In response to this practical difficulty, 36 sets of core indicators suitable to existing indicators, often SDG indicators, were selected for government action on the social determinants of health to improve health equity. The indicators address five domains: National governance, participation, health sector reorientation, global governance, monitoring, and accountability (85). Promoting health equity and having a national monitoring system for SHD are crucial. SDH concerns every healthcare system, including countries with extensive national health systems (86). It is because of the interconnectedness of population health outcomes with SDG 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 16. Therefore, monitoring health systems for SDH is vital to assess inequalities in coverage and health outcomes (figure 5) (87)

Discussion

We reviewed available documents related to coronavirus (COVID-19), health in all policies, social determinants of health, and health equity to provide important information on lessons learned from the first wave of COVID-19 in light of the anticipated future waves. Health cannot be viewed as a single business because it is the ultimate goal of the healthcare sector and an essential prerequisite for achieving many other societal goals. Many of the determinants of health have social, environmental, and economic origins that extend beyond the direct influence of the health sector and health policies (36-38). Indicates the need for multi-sectoral collaboration to address these interrelated sectors. Therefore, public health policymakers should give due attention to the interconnectedness of health outcomes with other sectors to improve health outcomes (39-45, 51).

The novel COVID-19 pandemic revealed that the global north's highest disease burden is recorded, which has better expertise and well-equipped health facilities (20). Health policy must shift its focus from illness-oriented healthcare toward sectors whose policies affect the social environments of daily living (48). Irving Zola wrote the following beautiful story explaining the dilemma faced by modern physicians and criticizing disease-based health policy. "You know, sometimes it feels like this: I am standing by the shore of a swiftly flowing river, and I hear the cry of a drowning man. So, I jump into the river, put my arms around him, pull him to shore, and apply artificial respiration. When he begins to breathe, there is another cry for help. So I jump in the river, reach him, pull him to shore, apply artificial respiration, and just as he begins to breathe, there is another cry for help. So back in the river again, reaching, pulling, applying for breathing support, and then another yell. Again and again, without end, goes the sequence. I am so busy jumping in, pulling them to shore, and applying respiration that I have no time to see who is upstream pushing

them all in"(88). It is supported by higher dollars spent on curative medical care and less on the social drivers of health, contributing to the lowest health outcome of the US population (65).

Health is interrelated with other societal goals and should be addressed by multi-sectoral collaboration (39, 89-92). Linking SDH and health equity require:

- Delivering quality health services for all;
- Ensuring compulsory insurance to decrease out-of-pocket expenses;
- Establishing innovative and effective policy frameworks that allow coordination across sectors;
- Enabling and sustaining equitable health system development;
- Engaging civil society in healthcare decision-making (93, 94) ensures universal access to health;
- Providing specifically designed health services and social protection measures for socially disadvantaged groups.

They are improving the capacity of the health sector to identify and contribute to addressing SDH (28, 51, 87, 95-99). Specific action areas to address SDH include: adopting better governance for health and development; promoting participation in policy-making and implementation; reorienting the health sector towards reducing health inequities; strengthening global governance and collaboration; monitoring progress; and increasing accountability (100).

Reforming health systems to address SDH and health equity concerns involves the following components: strengthening capacity of essential public health services; clarifying first-point-of contact strategy for possible cases; improving accessibility health facilities; ensuring availability basic emergency service supplies; training the health workforce; protecting the physical and mental health of frontline health workers; ensuring access to essential medicines and health technologies; mobilizing financial support and easing logistical and operational barriers; assessing and mitigating potential financial and physical barriers to accessing care for vulnerable groups of people; optimizing social protection to mitigate the impact of public health measures on household financial security; ensuring clarity in roles, relationships and coordination mechanisms in health system governance; expanding capacity for communication and health information dissemination and ensuring that no one is left behind from accessing essential healthcare (68-70).

Lessons from public health revealed that Mitigating SDH, such as improved housing, reduced overcrowding, and improved nutrition reduces the effect of infectious diseases, such as tuberculosis, even before the advent of effective medications (101, 102). A multi-disciplinary approach involving HiAP, which integrates the SDH and health equity into modeling with the principle to leave no one behind (i.e., the whole population, including the disadvantaged), will impact population well-being (103). Implementation of HiAP involves the following interrelated strategies: developing and structuring cross-sector relationships; incorporating health into decision-making; enhancing workforce capacity; coordinating funding and investments; integrating research, evaluation, and data systems; synchronizing communications; and implementing accountability structures (46, 47).

The COVID-19 pandemic significantly affected the global economy and all SDH (104-109). Education is one SDH that has a critical role in improving health outcomes and reducing health inequities. Spending on education, with expanded coverage, is believed to improve life expectancy on average by 1.19 years (97, 110). Quality education promotes employment, health, poverty reduction, increases innovation and social welfare (104-109). The COVID-19 pandemic has affected all levels of the education system, from preschool to tertiary education. Both teaching learning and assessment methods are affected, which could affect the quality of learners (13). Countries with better access to digital technology shifted teaching and learning to online classes. However, those with poor access to digital technology used watchful waiting and home-take assignments. This will contribute to future increased inequality in career status and job opportunities, and income (72). Therefore, it is essential to address issues related to digital technology utilization (knowledge, availability, accessibility of technology, internet access, and power supply) to reduce the inequality caused by the anticipated future COVID-19 wave (72).

The emergence of COVID-19 affected food distribution and retailing (13). Food can be a source or vector of disease for society (i.e., malnutrition and food-borne disease due to poor food handling). Food security is a crucial precondition for a healthy life, and better cognitive abilities, especially in early childhood

(i.e., the first 1000 days of its life). A study conducted in the United States showed that food-insecure children are at least twice as likely to report being in fair or poor health and at least 1.4 times more likely to have asthma than food-secure children (111). The recent meta-analysis of child malnutrition in sub-Saharan Africa showed Africa's highest prevalence of child malnutrition (stunting, wasting, and underweight) (112). Malnutrition causes a substantial risk to children's physical and mental health, including lowering immune response and school performance (113, 114). In addition, more than 200 known diseases can be transmitted by food, which can reduce labor productivity, increase healthcare costs, impose substantial stress on the healthcare system and reduce economic output (98, 115-118).

Similarly, healthy eating and regular physical activity substantially prevent heart disease, cancer, and stroke among adults aged > 18 years (119, 120). It is estimated that roughly 1 in seven and one in 12 cardiovascular deaths could be attributed to not eating enough fruits and vegetables, respectively (121). A recent meta-analysis showed that the risk of heart disease, strokes, and premature death could be decreased by 10.8% for each 200-gram increase in consumption of fruit or vegetables up to an intake of 800 grams (122). It could have a direct impact on COVID-19 disease severity and associated mortality. Because the elderly, patients with neutrophilia, diabetes, chronic lung disease, cardiovascular disease, and coagulation dysfunction are at higher risk for severe COVID-19-associated disease [acute respiratory distress syndrome (ARDS) and progression from ARDS to death] (6, 7).

Addressing the COVID-19 pandemic added nutrition needs to public health activities and improved resource utilization efficiency. Optimal nutrition and dietary intake require individual and community involvement, national commitment, and global cooperation (73, 74). The triple epidemics of obesity, malnutrition, and food safety are increasing in many low and middle-income countries, requiring action at the local, regional, and national levels to address determinants of food insecurity to tackle the anticipated health and economic impact. The national nutrition assistance program (NAP) substantially reduces the prevalence of undernutrition and thus is critical to reducing adverse health outcomes. The globalization of unhealthy lifestyles (smoking, high-fat diets, salt consumption, and alcohol use) is a political and trade issue. Therefore, enacting strong policies with priority to the health of citizens, re-evaluating trade policies and agreements, and collaborating and controlling industries working in this area are critical. It is equally important to ensure transparency of strategies and actions to control the big hands of business owners in the area, as it is a source of billions of dollars in investment (123).

The COVID-19 pandemic has also affected the energy sector (75). Improving the availability of energy alleviates poverty and has a positive impact on health. It has severe socioeconomic inequality in accessing household energy in developing countries. It is anticipated that household air pollution will lead to over 1.5 million premature deaths annually by 2030. It is greater than similar projections for infectious diseases, including malaria, tuberculosis, or HIV/AIDS (124). The recent review revealed that most financial and short-term interventions were made by governments in Africa (75). To address social disparity concerning energy utilization, it is crucial to:

- Monitor trends and outcomes for populations and specific groups using disaggregated data that uncover the impact of equity on energy policies
- Advocate energy sustainability and health;
- Encourage needs-based assessment for disadvantaged populations and specific groups (to better design actions that increase access to energy);
- Develop guidelines, standards, and recommendations on energy-related risk factors;
- Disseminate technical guidance in the spirit of shared responsibility for health and energy actors.

COVID-19 has inadvertently affected the financial markets and the global economy due to lockdowns which led to a disruption in the supply chain (reduced production of goods). At the same time, quarantine and self-isolation policies decreased consumption, demand, and utilization of products and services (13). The Health crisis caused by COVID-19 changed the history of global poverty (77). Estimates of the impact of COVID-19 on global poverty showed that COVID-19 poses a real challenge to the UN SDG of ending poverty by 2030 because global poverty could increase for the first time since 1990 (78). Africa bears a disproportionate burden of poverty [almost half-world poor (earning below 1.90 USD/day) living in the region] and disease, which could be exacerbated by the COVID-19 pandemic (79, 125-127).

The study that analyzed the COVID-19 situation in Africa showed that many African countries had taken bold quarantine and lockdown measures to control the spread of COVID-19. However, it has come at costs such as the collapse of health systems and a painful economic crisis or recession (80). Africa has the highest unemployment rate in the world, and unemployment is further aggravated by a poor education system and weak technological integration, which is yielding an unskilled graduates (126, 128, 129). The working poor constitutes around 25% of the employed labor force in all developing countries. In addition, workers in the informal economy are less likely to be covered by social insurance schemes and thus lack access to health care. Fair employment relations and decent work, including employment and working conditions and reasonable wages contributing to income security, are critical social determinants of workers' health (130-132). Addressing poverty alone can improve life expectancy by (2.4-5.4 years) (133-135). Addressing poverty in pandemic situations requires a national commitment to:

- Provide public funds to improve the capacity of health systems;
- Provide financial support to individuals to help them cope with financial and economic crises associated with the pandemic;
- Provide incentives for employers to preserve employment;
- Provide liquidity and credit support to protect local markets from liquidity crashes;
- Ensure access to effective communication systems to enhance social interaction between the community, families, and friends (79, 80).

COVID-19 caused difficulties in tackling climate change (16). Out of the 133 diseases or disease groups listed in the global health observatory, 101 (76%) had significant links with the environment. A study on preventing disease in a healthy environment by WHO in 2012 showed that 12.6 million (23%) deaths globally and 26% of deaths among children under five were due to modifiable environmental factors (136-138). Children, the elderly, people with heart disease, lung disease, and diabetes, and minority and low-income communities are particularly vulnerable to adverse health outcomes from exposure to air pollution (136). It has direct implications for the anticipated future wave of COVID-19 since most of these populations are at greater risk for disease severity and mortality. It could be due to differential levels of ACE2 in the cardiac and pulmonary tissues of younger versus older adults; aging-associated immune deterioration; increased number of commodities in the aging population, SDH, and potential unexplained factors that could be illustrated in the future (139). Effectively addressing environmental root causes (e.g., energy, hygiene, housing, and transport) will significantly improve health. For example, energy policies that facilitate or scale-up household access to clean cooking, heating, and lighting fuels in LMICs will help avert the 3.5 million deaths yearly (140-142).

Air pollution can be addressed by a comprehensive mix of policies and measures:

Fiscal policies to reduce different forms of pollution cost-effectively and accelerate efforts towards a pollution-free planet;

Taxes on polluting activities and substances to discourage the use of harmful pollutants while raising public revenues;

Providing subsidies can encourage the use of alternatives to pollutants by reducing their prices (143). Actions required to reduce inequities in health should include assessment of the current health system for inclusion of SDH (85), developing strategies for improving equity in health care with the principle of leaving no one behind (71), and monitoring of the health system for SDH and equity) (87). Inequities are driven by inequities in money, resource, and power. Therefore, decisions made outside the health sector, such as political, economic, and resource distribution decisions, should consider health as an outcome across the social distribution instead of focusing exclusively on increasing productivity. Implementing health in all policies approach can help address some of these components (87).

Conclusion

The first wave of the COVID-19 pandemic showed that countries that have given less attention to SDH, health equity, and marginalized, vulnerable populations faced a tremendous burden of disease morbidity and mortality. In general, improving and adopting novel strategies, confronting the multiple facets of the public health mitigation measures, and facilitating and stimulating interdisciplinary public health interventions are important to reduce the health and economic impacts of anticipated future COVID-19 waves. Developing countries could benefit from increasing public expenditure on health with due consideration of SDH. For

developed countries like the United States, it is imperative to shift health policy focus from illness-oriented healthcare towards policies that affect the social determinants of health.

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Compliance with ethical guidelines
This study was approved by the ethical committee of the Tehran University of Medical Sciences (TUMS). All the participants accepted enrollment in the study orally and all of the data that were gathered was considered confidential.

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The authors declare no conflict of interest

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