

SOCIOECONOMIC CHALLENGES AMIDST A GLOBAL TRIPLE THREAT OF CONFLICTS, COVID-19, AND CLIMATE CHANGE:

GENERAL ISSUES

PART 7

Editors:

Abdul Kader Mohiuddin
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Socioeconomic Challenges Amidst a Global Triple Threat of Conflicts, COVID-19, and Climate Change:

General Issues

(Part 7)

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FOREWORD

As of early 2026, the global economy is navigating a “new world disorder” defined by a polycrisis of interconnected geopolitical, economic, and environmental shocks that continue to strain societies worldwide. The lingering spillover effects of the COVID-19 pandemic, which escalated globally in 2020, remain deeply embedded, driving uneven economic recovery, heightened inequality, persistent inflation, energy disruptions, education losses, and growing social mistrust and political polarization. In 2020 alone, global debt surged by \$19.5 trillion as governments financed pandemic relief and corporations issued record levels of bonds, leaving a lasting fiscal burden. These overlapping pressures have intensified the cost-of-living crisis, reduced purchasing power and worsening food insecurity for millions. The uneven recovery has fueled widespread public anger and political instability, particularly in countries already weakened by high debt and rising living costs, leading to protests and power struggles. At the same time, the global economic toll of armed conflict reached approximately \$19 trillion to \$20 trillion annually by 2024–2025, accounting for over 11% of global economic output and translating to roughly \$2,380 to \$2,446 per person. Conflicts—whether domestic or international—continue to devastate infrastructure, disrupt trade, trigger humanitarian crises, and erode human capital. Economically, such instability reduces GDP growth by an average of 2 percentage points per year, with severe conflicts causing contractions of up to 4 percentage points in the first year alone. Since 2020, major geopolitical tensions, including the Ukraine war, escalating Middle East conflicts, and the US–China rivalry, have further destabilized global systems through supply chain disruptions, elevated energy prices, and sustained inflationary pressures. Meanwhile, climate-related disasters have nearly doubled over the past two decades, with 7,348 major events recorded between 2000 and 2019, underscoring the accelerating frequency of environmental shocks. Current projections estimate that climate change could inflict annual economic damages of around \$38 trillion by 2050, compounding existing vulnerabilities. Together, these crises have stalled or reversed progress on the UN Sustainable Development Goals, making poverty alleviation increasingly difficult. Additionally, warnings from the IMF and WTO highlight the risk of “slowbalization,” where rising trade tensions and geopolitical fragmentation could reduce global GDP by up to 7% over the long term. Ultimately, these intertwined challenges reveal how the ongoing economic strain, conflict dynamics, and climate crisis are deeply interconnected with the uneven recovery from the pandemic, reinforcing a prolonged and complex global instability.

The COVID-19 pandemic, ongoing armed conflicts, and escalating climate extremes are deeply interwoven forces driving today’s socioeconomic challenges by jointly straining health systems, disrupting economies, and destabilizing societies. Healthcare infrastructure has been overwhelmed and weakened, limiting access to essential services while increasing disease burden and mortality risks. Economies continue to face recessionary pressures, business disruptions, job losses, and fragile supply chains that amplify shortages and raise living costs. Inflation and tighter financial conditions have reduced household purchasing power, deepening inequality and financial insecurity. At the same time, food insecurity has expanded as climate-related shocks and conflict-driven disruptions damage agricultural production, supply chains, and distribution networks. Environmental degradation and extreme weather further intensify water scarcity, crop failures, and long-term resource stress, which in turn heighten competition over basic necessities in vulnerable regions. These pressures contribute to localized conflicts, displacement, and social instability, while armed conflicts themselves further destroy infrastructure, disrupt trade, and weaken governance systems. Healthcare delivery becomes even more fragmented in conflict zones, limiting vaccination, disease control, and emergency response capacities. The combined effects of environmental stress

and political violence also facilitate the spread of infectious and chronic diseases, compounding public health burdens. Energy systems are destabilized by geopolitical tensions and delayed transitions, increasing reliance on fossil fuels and adding further economic strain. Meanwhile, accumulating debt and prolonged fiscal pressures constrain recovery and development efforts across many countries. As living conditions deteriorate, public frustration grows, often manifesting in protests and broader political instability. Ultimately, these interconnected crises reinforce one another, creating a persistent cycle of vulnerability that undermines global recovery and resilience. The analysis on Intertwined relationship between the 3Cs discusses how COVID-19, armed conflicts, and climate extremes operate as a connected “3C” crisis that jointly amplifies global socioeconomic instability. COVID-19 disrupted economies, supply chains, energy transitions, and livelihoods, while armed conflicts and climate extremes further intensified resource scarcity, displacement, inflation, and public health deterioration. Together, these overlapping pressures expose systemic fragility and underscore the need for integrated, multidisciplinary, and internationally coordinated policy responses rather than isolated interventions.

As of 2025–2026, over half of the global population lacks access to comprehensive healthcare, while about one in four people still faces financial hardship in accessing services and roughly one in five is pushed into poverty due to medical costs. Although out-of-pocket health spending has declined between 2000 and 2022, it continues to affect about a quarter of the global population, showing stalled progress toward universal health coverage since 2015. Medicines represent 20–60% of health expenditures in developing countries, with up to 90% of people relying on out-of-pocket purchases, making them the second-largest household expense after food. More than one-fourth of the global population still lacks access to essential medicines, exceeding 50% in many low- and middle-income countries in Africa and Asia. Underfunded primary care systems, unequal health workforce distribution, and migration from low- to high-income countries weaken system capacity, while a projected shortage of up to 10 million health workers in LMICs by 2030—half in Africa—further deepens structural gaps. These challenges are compounded by insufficient training, widening inequalities, and the rising burden of over 40 emerging infectious diseases alongside shifting disease patterns and climate- and conflict-driven health pressures. The COVID-19 pandemic, emerging in the early 2020s, created a global health emergency with about 775 million cases and 18–33 million deaths by 2024, overwhelming health systems and disrupting essential services in more than 90% of countries, including sharp declines in immunization, maternal care, and chronic disease management due to workforce shortages and supply chain breakdowns. It exposed deep weaknesses in surveillance, financing, preparedness, and equity, particularly in under-resourced settings, while vaccine development and mass immunization reduced severity but were undermined by unequal access and misinformation. Meanwhile, armed conflicts have persistently undermined global health, causing an estimated 29 million excess deaths between 1990 and 2017, with civilians accounting for about 90% of conflict-related fatalities and health systems collapsing in many regions where only half of facilities remain functional. These conflicts drive mass displacement, malnutrition, and outbreaks such as cholera, measles, and polio, including over one million cholera cases in Yemen, alongside rising antimicrobial resistance, maternal and child mortality, and severe mental health burdens. Climate change further compounds these crises, with global warming already exceeding 1.5°C and projected to reach about 2.7°C by 2100, driving extreme heat events linked to a 167% rise in mortality among adults over 65 since the 1990s. Climate-related hazards cause over 150,000 deaths annually and millions of DALYs, while sea level rise of over 24 cm, water insecurity affecting billions, and hunger impacting over 730 million people intensify health vulnerabilities. Additionally, climate change is expanding vector-borne disease risks for 260–320 million more people and worsening malnutrition, respiratory illness, and mental health disorders. Together, COVID-19, armed conflicts, and climate

change interact to destabilize health systems, widen inequalities, and amplify both infectious and non-communicable diseases, revealing a global health system under sustained and compounding stress. The chapter on Global health system discusses how the COVID-19 pandemic, armed conflicts, and climate extremes have jointly strained global health systems by disrupting essential services, overwhelming infrastructure, causing workforce shortages and burnout, destroying facilities, displacing populations, and intensifying infectious and non-communicable diseases while deepening inequalities in access to care and medicines. Overall, it concludes that these interconnected crises disproportionately affect vulnerable groups and require resilient health infrastructure, integrated health–environment–security policies, and coordinated global action to ensure equitable and sustainable health system recovery.

The Green Revolution since the 1950s boosted food production by introducing high-yield seeds dependent on fossil fuel–based fertilizers, pesticides, irrigation, and mechanization. While it increased yields, it also tightly linked global food security to fossil fuel inputs, creating long-term social, ecological, and vulnerability costs. The onset of the COVID-19 pandemic then disrupted global food systems by breaking supply chains, restricting transport, and reducing labor mobility, triggering severe economic shocks affecting 2.7 billion workers and pushing 150 million people into extreme poverty by 2020. During this period, food insecurity rose from 11% to 38% in the United States and up to 80% in parts of India, alongside a shift toward cheaper, less nutritious diets. In the post-COVID period, armed conflicts have become a major driver of global hunger by destroying agricultural systems, displacing populations, and increasing fuel, transport, and fertilizer costs, with conflict accounting for about 70% of acute food insecurity. By 2024–2025, nearly half of the world’s 1.1 billion poor were living in conflict-affected areas. By August 2025, catastrophic IPC Phase 5 famine conditions were reported in six regions—Sudan, Gaza Strip, South Sudan, Yemen, Haiti, and Mali—affecting about 1.4 million people amid conflict, while at least 14 countries experienced worsening food crises driven by conflict, economic shocks, climate extremes, and displacement, with the most severe situations in Gaza, Sudan, Yemen, and South Sudan. By 2026, this contributed to over 318 million people facing acute food insecurity, including an additional 45 million linked to escalations in the Middle East, where starvation has increasingly been used as a “weapon of war.” Since 2019, climate extremes—intensified by planetary boundary stress—have acted as a “risk multiplier,” with 59 countries facing climate-driven food crises and 48 million people affected in 12 African countries in 2023 alone. In the Asia-Pacific region, shocks such as China’s 20% crop losses during 2022 heatwaves and Pakistan’s floods damaging 60% of crops further destabilized global supply chains. Together, these overlapping crises have exposed systemic fragility by reducing production, disrupting trade, raising prices, and limiting access to food, disproportionately affecting low-income populations, smallholder farmers, and importdependent countries, leaving over a quarter of the global population in moderate to severe food insecurity by 2025–2026. The chapter on Global Food Insecurity shows how COVID-19, armed conflicts (especially the Russia–Ukraine war), and climate extremes jointly disrupt food systems, breaking supply chains and inflating food and fertilizer prices, pushing over 700 million people into hunger and leaving billions unable to afford healthy diets, underscoring the need for coordinated global action on resilience, adaptation, and sustainable food systems.

The US–China rivalry, rooted in China’s rapid post-2001 WTO-driven rise and long-standing disputes over trade imbalances, state subsidies, market access, jobs, and intellectual property, has evolved since the 2018 trade war into a broader strategic competition over technology, semiconductors, AI, critical minerals, and global supply chain dominance, driven by economic nationalism and national security concerns; this has disrupted global supply chains

through tariffs, export controls, and regulatory barriers, raising production costs, weakening industrial output, and slowing global GDP growth while increasing consumer prices in the U.S. and reducing export markets for sectors like American agriculture, and constraining China's export-led growth and tech firms such as Huawei through semiconductor restrictions; it has also weakened multilateral institutions like the WTO and accelerated fragmentation into regional blocs such as the Regional Comprehensive Economic Partnership (RCEP) and the African Continental Free Trade Area (AfCFTA), while prompting firms to relocate production to countries like Vietnam and Mexico, which together gained over \$10 billion in diverted trade and benefited from rising FDI inflows; however, the EU and Japan suffered export losses, and emerging economies such as India, Pakistan, and ASEAN members experienced short-term gains from trade diversion but face long-term risks of dependency, volatility, and geopolitical pressure; overall, the rivalry is now widely seen as a structural and enduring global economic shock distinct from past crises like 2008 or COVID-19, reshaping global capital flows, governance, and supply chains into a more fragmented and multipolar world economy characterized by strategic hedging and persistent instability. The chapter on U.S.–China rivalry captures this transformation masterfully, describing the rivalry as a force that replaces global integration with realignments, protectionism, and uneven impacts—pointing toward an uncertain future.

As of early 2026, global drug and medical supply chains are in a structural crisis, with nearly half of essential medicines dependent on single-country inputs and fragile supply networks, making them highly vulnerable to logistics shocks, airfreight limits, rerouting, and rising fuel costs. Historical events such as the 1942 Quinine Crisis (90% loss of global antimalarials) and Hurricane Maria (U.S. IV saline shortages) show how concentrated production amplifies systemic fragility. Evidence from a BMJ Global Health study using 2011–2022 data from 74 countries shows that drug shortages are not primarily driven by prices but by structural capacity—countries with greater economic strength and more manufacturers experience fewer and shorter shortages, highlighting the importance of diversified production over pricing strategies. Across studies, shortages consistently stem from upstream failures such as manufacturing disruptions, weak incentives, poor transparency, and limited coordination, while most policy responses remain reactive (e.g., substitutions and stockpiling), reinforcing the need for proactive, system-level prevention at early supply chain stages. In high-income countries, shortages arise from overlapping actors—manufacturing failures, demand spikes, logistics inefficiencies, and regulatory constraints—but responses still focus on downstream fixes, creating a persistent mismatch between causes and solutions. Geopolitical conflicts and trade tensions often produce delayed rather than immediate shortages by disrupting global production hubs and trade routes like the Strait of Hormuz, disproportionately affecting generic drugs reliant on concentrated manufacturing in India and China. The COVID-19 pandemic exposed these vulnerabilities at scale, with export restrictions, concentrated production, and demand surges causing global shortages of PPE, diagnostics, and medicines, alongside sharp price increases and governance failures. A study by researchers from Clemson University show that geopolitical strain and export bans reshape pharmaceutical production and pricing, sometimes increasing firm profitability but worsening global inequities, as high-income countries remain protected while low-income regions face persistent shortages without coordinated pricing and subsidy systems. The war in Ukraine further illustrates energy-driven shocks, where gas and fuel price spikes raised production costs for about 70% of European pharmaceutical firms, increasing downstream prices. US–China trade tensions have intensified shortages of medical accessories through tariffs, logistics disruption, and dependence on Chinese manufacturing, accelerating costly diversification efforts. The 2026 Hormuz strait blockade adds further strain by disrupting the Persian Gulf pharmaceutical transit hub, reducing shipping and air cargo capacity, and increasing risks of delays in cold-chain medicines, IV fluids, MRI helium, and overall cost

inflation. Finally, climate change is compounding all these pressures by increasing extreme weather events that damage infrastructure, disrupt transport, degrade cold-chain systems, and shift disease burdens—simultaneously raising demand for medicines while weakening global supply resilience. The chapter on drug and medical supply discusses how global crises—including pandemics, wars, sanctions, economic shocks, and climate change—have exposed severe fragility in highly concentrated pharmaceutical supply chains, leading to widespread shortages of essential medicines and medical technologies. It highlights deep global inequities driven by dependence on a few manufacturing hubs (China and India), alongside COVID-19, conflict, and policy disruptions, underscoring the urgent need for diversified production and stronger international coordination.

Global supply chain disruptions stem from overlapping geopolitical forces—internal instability, interstate tensions, terrorism, economic conflicts, nationalism, and wars—that interrupt material flows, logistics, and regulatory systems across regions. Events such as COVID-19 trade restrictions, the US–China trade war, Brexit, Red Sea attacks, and the Russia–Ukraine war demonstrate how these shocks raise costs, delay production, and create cascading global ripple effects. During the pandemic, supply chain fragility intensified as just-in-time systems collapsed into bottleneck-prone networks facing labor shortages and rising operational costs, with global shortages surging by more than six times. Currency devaluation has acted in tandem with these disruptions, amplifying procurement costs and financial instability, particularly in import-dependent sectors like automotive and technology. Even a 5% exchange rate shift can significantly erode profit margins, delay product launches, and increase transport expenses, especially for SMEs lacking hedging capacity. Supply chain stress has translated directly into inflationary pressures, as reflected in the Supply Chain Pressure Index during crises such as the 2008 Global Financial Crisis, when oil prices exceeded \$140 per barrel, and again during COVID-19, with inflation rising more persistently in the US than in the EU. In low- and middle-income countries, currency depreciation sharply raises the cost of essential imports—food, fuel, and medicine—triggering shortages and severe inflation. India illustrates this dynamic, where devaluation increases import costs in manufacturing, pharmaceuticals, and automotive sectors while boosting export competitiveness in textiles and IT, though short-term inflation and debt burdens, as seen in the 1991 crisis, often offset early gains. In conflict-affected economies, devaluation magnifies humanitarian crises; for instance, Yemen, which relies on imports for about 90% of its needs, faces acute shortages as weakened currency restricts access to hard currency for trade. Lebanon provides another stark case, where the pound has lost over 98% of its value since 2019, with the official rate shifting from 1,500 to 15,000 per US dollar in February 2023 while parallel market rates remain far weaker, fueling hyperinflation, poverty, and dollarization through 2024–2025. Similarly, amid international sanctions, Iran’s rial fell to around 1,500,000 per US dollar by January 2026—an 800% decline since 2020—driven by sanctions, economic mismanagement, and SWIFT restrictions, which have forced reliance on alternative financial channels and intensified scrutiny of global transactions. This collapse in currency value has drastically reduced purchasing power, increased inflation, and contributed to social unrest, while pushing essential goods like milk to more than 800,000 rials per liter. Together, these cases show how supply chain disruptions, currency volatility, and economic activity are tightly interconnected, reinforcing each other to produce prolonged instability, inflationary spirals, and unequal global economic impacts. The chapter on Global supply chain crisis analyses how overlapping shocks—from the pandemic to geopolitical conflicts and trade tensions—disrupted global trade, exposed structural weaknesses in supply systems, and destabilized economic activity. It emphasizes how currency volatility and policy responses interacted with these disruptions to deepen inflation, inequality, and vulnerability, highlighting the need for more resilient and diversified supply chains.

Therefore, the discussion reveals a deeply interconnected global polycrisis where pandemics, armed conflicts, economic instability, and climate change collectively disrupt health systems, food security, supply chains, and economic stability. These overlapping shocks amplify inequality, inflation, debt burdens, and social unrest while weakening governance, trade systems, and access to essential services worldwide. The analysis highlights how structural fragilities—such as concentrated production, import dependence, and fragmented global cooperation—intensify vulnerabilities across regions and sectors. By understanding these interlinked crises, readers gain a holistic perspective that can inform more resilient, coordinated, and forward-looking policy and research approaches.

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PREFACE

This book is conceived as an attempt to make sense of a world increasingly shaped by interlocking crises rather than isolated disruptions, where COVID-19, armed conflicts, and climate extremes operate not as separate events but as mutually reinforcing forces. The pandemic's global shock did not simply represent a health emergency; it recalibrated economic systems, strained governance structures, and exposed deep inequalities that continue to persist in recovery trajectories. In parallel, escalating armed conflicts have intensified geopolitical fragmentation, disrupted trade corridors, displaced populations on a massive scale, and weakened institutional capacity across regions already under stress. Climate extremes, meanwhile, function as a persistent stress amplifier, accelerating resource scarcity, undermining agricultural stability, and worsening public health outcomes while interacting with both conflict and economic instability. Within this interconnected landscape, global health systems stand at the frontline of vulnerability, burdened by workforce shortages, unequal access, fragmented financing, and the compounding pressures of infectious disease outbreaks, non-communicable diseases, and emergency shocks. Food systems are similarly destabilized, as climate variability, conflict-driven disruption, and pandemic-era breakdowns in logistics converge to deepen global food insecurity and widen nutritional inequality. The U.S.–China rivalry adds another structural layer of fragmentation, reshaping global trade, technology flows, and industrial networks through strategic decoupling, export controls, and regional bloc formation, thereby altering long-established patterns of globalization. At the same time, global drug and medical supply chains reveal acute fragility, with concentrated production, geopolitical constraints, and logistical vulnerabilities producing recurrent shortages and inequities in access to essential medicines. These pressures are further magnified within broader supply chain systems, where disruptions originating from COVID-19 have been compounded by currency devaluation, exchange rate volatility, and financial instability, transforming efficiency-oriented global networks into structurally fragile and crisis-sensitive systems. Taken together, these domains illustrate a single systemic condition rather than parallel problems: a global order in which health, food, trade, finance, and security are deeply entangled, and where shocks in one sphere inevitably propagate across all others.

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Section 1 (General Issues)

CHAPTER 1

Intertwined Relationship Between the 3Cs**Sabyasachi Pal^{1,*}**¹ *Department of Pure and Applied Sciences, Midnapore City College, West Bengal, India*

Abstract: Armed conflict, the climate crisis, and the COVID-19 pandemic—three major global challenges are indeed deeply intertwined, and their impacts on health, economies, and social stability are profound. All of them contribute to a strain on healthcare systems, leading to widespread mortality. Economies have suffered through recessions, job losses, business closures, and supply chain crises. The food crisis and inflation are affecting more than a billion people across the world. Central banks around the world are increasing the lending interest rate, which further affects living costs and business expenditure. People are ignoring health issues and abstaining from food intake due to unprecedented challenges. The crisis is bringing people to the roads, and protests have erupted in many countries. Climate change exacerbates health issues and introduces new ones, leading to crop failures and food shortages. Underprivileged populations engage in conflicts due to food and water scarcity, disrupting healthcare systems, limited access to medical supplies, and damage to infrastructure. This leads to a higher incidence of injuries, preventable diseases, and mortality. Climate change and pollution directly and indirectly impact COVID-19 spread, affecting chronic diseases that are comorbidities among affected individuals. The ongoing Ukraine war has direct and indirect links to the food and energy crises, inflation, and the delay of renewable energy transitions. It also added insult to injury by having an impact on ongoing inflation and economic crises brought by the pandemic that very few economies could avoid, or possibly none.

Keywords: Coal-fired power, currency devaluation, food and energy crisis, inflation, renewable energy transitions, supply chain crisis, Ukraine war.

INTRODUCTION

Virologists have thoroughly debunked conspiracy theories suggesting that SARS-CoV-2 was artificially engineered in a laboratory. Extensive genomic analyses have demonstrated that the virus closely aligns with known coronaviruses present in bats and other wildlife. The degradation of ecosystems increasingly brings humans into closer contact with animal populations, thereby elevating the likeli-

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hood of zoonotic spillover events (Voskarides, 2022). Various anthropogenic factors, including landscape modifications, climate change, global transportation networks, and the illicit wildlife trade, contribute to the emergence of novel human-animal interfaces, thereby facilitating the transmission of pathogens with pandemic potential (Amin, 2020). Historically, numerous infectious diseases—such as swine flu, HIV, rabies, salmonellosis, West Nile virus, and toxoplasmosis—have originated in animal reservoirs before crossing into human populations, as documented by the Washington State Department of Health. While pathogens like anthrax, plague, brucellosis, and Q fever have been weaponized in acts of bioterrorism (Anderson & Bokor, 2012; Tin *et al.*, 2022; Shrum *et al.*, 2025), these instances do not substantiate claims of SARS-CoV-2 being artificially manipulated. Instead, the interplay between climate change, ecological disruptions, and zoonotic transmission remains a critical factor in understanding the emergence and spread of COVID-19. Furthermore, a vast body of research spanning multiple nations and communities has established a strong correlation between environmental pollution, climate change, and the dynamics of SARS-CoV-2 transmission (Kadoya *et al.*, 2025; Olsen Martinez *et al.*, 2025; Montcho *et al.*, 2025). These aspects will be explored in greater detail in subsequent discussions (Fig. 1).

The global outbreak of COVID-19 brought forth a complex interplay of environmental consequences, yielding both positive and negative short-term effects. One of the most notable outcomes was the unprecedented reduction in global emissions, marking a historic decline in atmospheric pollutants (Nguyen *et al.*, 2021). However, this environmental reprieve was accompanied by an overwhelming surge in medical waste, particularly in densely populated nations such as China and India, which collectively accounted for more than 70% of global medical waste discharge (Oo & Thin, 2022). Additionally, the pandemic led to a significant decline in waste recycling efforts, further exacerbating environmental concerns (Talukdar *et al.*, 2024). While numerous studies highlighted a temporary reduction in water pollution, the crisis also led to new forms of contamination, including accumulation of medical waste and a surge in microplastic pollution (Tiwari *et al.*, 2023; Devereux *et al.*, 2023; Ding *et al.*, 2024). The energy sector, too, faced considerable disruption, with the pandemic stalling progress toward renewable energy transitions. A post-pandemic resurgence in coal consumption, coupled with shifting investment priorities and plummeting fossil fuel prices, significantly undermined the competitiveness of renewable energy sources (Zhang *et al.*, 2023; Tian *et al.*, 2022). In response, many nations intensified their reliance on fossil fuels and unveiled new developmental strategies, ultimately revealing the fragile state of the global green recovery.

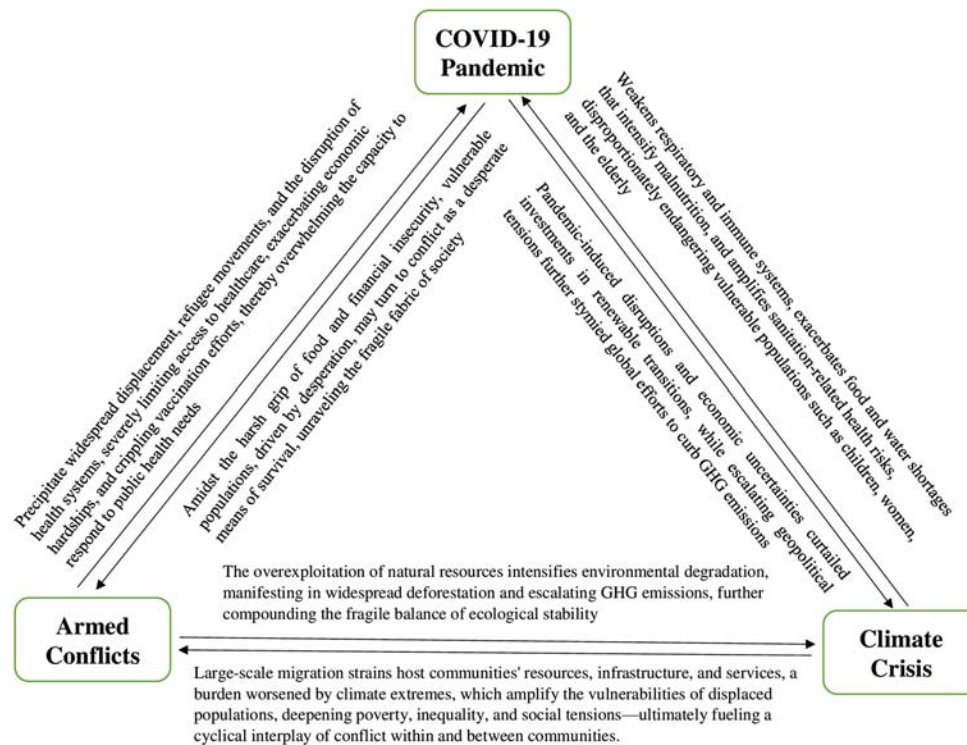


Fig. (1). The inter-relationship between the covid-19 pandemic, ongoing global conflicts, and the climate crisis. The confluence of these crises generates a cumulative impact that exceeds the individual consequences of each, with far-reaching effects on the entire planet. Multidimensional research highlights the critical and immediate necessity for coordinated international efforts to address these complex, interrelated challenges (author's own work using MS Word).

The interplay of climate extremes and conflicts had long drawn global attention, with reports highlighting their intensifying relationship. An IMF report underscored how climate change exacerbated conflicts in fragile and war-torn states, projecting that by 2060, an additional 50 million people in such regions would face hunger, worsening food insecurity, and poverty (Jaramillo *et al.*, 2023). While climate change did not directly cause wars, it heightened existing unrest by amplifying socio-economic vulnerabilities. An IRC report examined the Central Sahel region—Mali, Burkina Faso, and Niger—where, since 2016, humanitarian needs surged by 172%, over 16 million people required aid, food insecurity affected over 5 million, and internal displacement rose by 2400% since 2014, leading to increased poverty and armed conflicts (Jalani *et al.*, 2023). A large-scale study by Ko *et al.* (2024) covering 123 developing nations from 1995 to 2020 demonstrated a strong positive correlation between GHG emissions and

CHAPTER 2

Global Health System: Crisis Multiplied by Disruptions

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Abstract: The global health system is a complex and interconnected network of various components that work together to promote and protect public health. Healthcare facilities, health professionals, research and innovation, public health organizations, regulatory bodies, health policy and governance, health financing, information systems, education and promotion, pharmaceutical industries, and health technologies are core to the global health system. The present health system is advancing towards excellence, but thorns are in its way. The COVID-19 pandemic hit the system hard, affecting 90% of countries around the world with one or more disruptions to essential health services, shortened resource funding, jeopardized health service delivery, and routine immunizations. Above all, it pointed to its lack of preparedness for facing a pandemic like this. Climate change affects the social and environmental determinants of health, such as clean air, safe drinking water, sufficient food, and safe accommodation. The current global climate crisis has an adverse impact on human health, ranging from severe event mortality to morbidity from heat waves, starvation, and disease susceptibility, which has become more apparent over the last decade. Social inequity, intolerance, differences of opinion, a scarcity of resources, undue influence, and imperialism all contribute to cross-border and internal conflict that results in enormous violence and destruction. The collective impact of the pandemic, climate crisis, and ongoing global conflicts is creating massive pressure on the health and economy of common people and impeding recovery, and it is common that health is always neglected in crisis moments.

Keywords: Access to healthcare, Attack on health facilities, Chronic diseases, Drug shortage, Health workforce shortage, Infectious diseases spread, Inflation.

INTRODUCTION

The concept of global health is dynamic and constantly evolving to adapt to the changing landscape of health research, education, policy, and practice. It has been promoted on numerous exchange platforms, such as conferences, workshops, and academic publications. It consists of all people, institutions, resources, and

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activities whose primary purpose is to promote, restore, and maintain health. Global health systems encompass a wide range of critical components that are vital for the effective functioning of healthcare systems on a global scale. It focuses on issues such as governance, health care financing, and human resources for health. Effective governance ensures that healthcare resources are allocated efficiently, that health policies are evidence-based, and that accountability is maintained within the healthcare system. Sustainable financing is essential for maintaining healthcare systems and ensuring access to quality care. This involves strategies to raise funds, allocate resources, and manage financial risk. An adequate and skilled healthcare workforce is a cornerstone of any functional healthcare system. This includes doctors, nurses, technicians, and other healthcare professionals. The management of a global health crisis is an intimidating endeavor. Individual, organizational, and institutional responses, as well as large-scale coordination incorporating interdisciplinary and multidisciplinary methods, are required.

Across the world, common health system crises lie in a lack of qualified medical personnel, scarcity of funds, changing disease patterns, slow capacity and infrastructure development, frequent supply chain shortages, drug shortages or less availability of effective drugs, under-resourced health facilities and their unplanned expansion, fewer available treatment options, pragmatic administration in the modern age, lack of awareness promotion and low health literacy, defective policymaking or lack of implementation, and above all, weakening regulation and surveillance. These challenges can significantly affect the effectiveness and efficiency of healthcare delivery, resulting in negative outcomes for individuals and populations. Global healthcare faced systemic challenges, with over half the population lacking access to essential services due to rising costs, inadequate investment, and economic disparities, which exacerbated financial ruin and disease spread. Essential medicine shortages, HCW distribution inequalities, migration trends, and insufficient education further weakened healthcare systems, worsening global workforce shortages and increasing economic burdens. Emerging infectious diseases, changing epidemiological patterns, political instability, gender disparities, ageing populations, and child mortality crises underscore the need for urgent policy reforms, equitable resource distribution, technological innovation, and strengthened global cooperation to mitigate future health crises and enhance resilience. Table 1 describes the global healthcare challenges, their causes, impacts, and future projections, highlighting the urgent need for systemic reforms and international cooperation.

Table 1. Global healthcare challenges: Causes, impacts, and future projections.

Issue	Global Impact	Possible Reason	Future Projection of Crisis	References
Limited access to basic health services	Over half of the global population—4.5 billion individuals—lacks comprehensive healthcare access, with 1.3 billion plunged further into poverty due to high medical costs.	Progress toward universal healthcare has stalled since 2015, driven by rising costs, inadequate primary healthcare investment, and various economic and demographic challenges.	Without intervention, healthcare disparities will widen. More people will face financial ruin due to medical costs. Uncontrolled diseases may spread, increasing global health risks.	Sirag & Mohamed Nor, 2021; Taylor, 2023; Torkington, 2024;
Availability and affordability of essential drugs	More than one-third of the world's population lacks consistent access to essential medicines, and a quarter of them have no access to essential medicines.	Economic barriers, supply chain crisis, inequalities of distribution, regulatory challenges, limited healthcare facilities, and awareness.	An increase in patient out-of-pocket costs, disease proliferation, complications, mortality, and disability will be increasingly reported among vulnerable populations.	Chattu <i>et al.</i> , 2023
Under-resourced primary care	Understaffing, underfunding, a lack of resources, and neglect all prevail in primary healthcare of both high and low-income countries.	Public funding for primary healthcare is insufficient; access to services remains inequitable.	Unnecessary strain on more advanced healthcare facilities due to preventable health issues not being addressed at the primary level.	Hanson <i>et al.</i> , 2022
Inequality in HCW distribution	HICs have 6.5 times more HCWs per population than LICs.	Chronic underinvestment in the health and care workforce.	Climate change, major demographic shifts, and rising burdens of NCDs (chronic diseases) and health emergencies	Agyeman-Manu <i>et al.</i> , 2023

CHAPTER 3

Revealing the Nexus of Global Food Insecurity

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Abstract: Global food insecurity is a complex and evolving crisis shaped by the interconnected impacts of pandemics, climate change, and armed conflicts. The COVID-19 pandemic has deepened existing vulnerabilities in the global food system, disrupting supply chains, reducing agricultural productivity, and pushing millions, particularly in low- and middle-income countries (LMICs), into acute food poverty. Simultaneously, geopolitical conflicts destabilize agricultural infrastructures, restrict access to vital resources, and drive mass displacement, further straining food production and distribution networks. In 2024, an estimated 673 million people faced hunger, 2.3 billion experienced moderate or severe food insecurity, and up to 2.6 billion could not afford a healthy diet according to a 2025 FAO and UNICEF joint report, with conflict, extreme weather events, and rising food inflation remaining the primary drivers of food crises and placing millions at immediate risk of starvation in vulnerable hotspots. Conflict zones and regions affected by climate-induced disasters experience the highest levels of food shortages, malnutrition, and economic instability, exacerbating global disparities. The ongoing depletion of natural resources, soil degradation, and extreme weather events further hinder sustainable agricultural development. Strengthening food security requires a multifaceted approach, including sustainable farming practices, investment in climate adaptation, and localized food production to mitigate external shocks. Additionally, policy interventions and international cooperation are critical in ensuring equitable access to food, stabilizing supply chains, and fostering resilience in vulnerable communities. Advancements in agricultural technology, improved infrastructure, and targeted social protection programs can help mitigate the long-term effects of food insecurity. Addressing the root causes of hunger necessitates coordinated global efforts that integrate economic, environmental, and humanitarian strategies. Only through sustained, collaborative action can food systems be fortified against future disruptions, ensuring a more secure and sustainable global food supply.

Keywords: Access to sufficient food, Agricultural system, El Niño effect, Economic repercussions, Food system disruption, Food distribution, Hunger.

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INTRODUCTION

The FAO of the UN defined food security as the condition in which all individuals, at all times, have the physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (Masoura, 2024). Global food insecurity, demonstrated by inconsistent availability or access to sufficient nutrient-dense food, remains a persistent and urgent issue influencing millions of people worldwide (Long *et al.*, 2020; Pollard & Booth, 2019). The WFP further reported that 828 million people faced hunger daily, while 50 million teetered on the brink of starvation across 45 countries, reflecting the dire state of global food systems (WFP, 2023a; World Vision, 2022). Global food insecurity has remained one of the most pressing humanitarian and development challenges of the twenty-first century. Following the disruptions caused by the COVID-19 pandemic, economic instability, conflicts, climate-related shocks, and rising food prices, hunger and malnutrition increased markedly worldwide. According to the 2024 State of Food Security and Nutrition in the World report, an estimated 733 million people were undernourished in 2023, representing an increase of 152 million compared with 2019. The crisis was further compounded by declining food affordability, as approximately 2.8 billion people were unable to access a healthy diet in 2022 due to escalating food prices and widening income inequalities (FAO, IFAD, UNICEF, WFP, & WHO, 2024; World Bank, 2025). Although modest improvements were observed thereafter, the overall burden of hunger remained alarmingly high. Between 2022 and 2024, more than 8 percent of the global population continued to experience hunger, with an estimated 673 million people affected in 2024. Progress in several parts of Asia and South America was offset by persistent food insecurity in Africa and Western Asia, where conflict, economic hardship, climate variability, and limited access to resources continued to undermine food systems. Looking ahead, global projections indicate that more than half a billion people may still face hunger by 2030, nearly 60 percent of whom are expected to reside in Africa, underscoring the enduring and geographically concentrated nature of the global food security crisis (FAO, IFAD, UNICEF, WFP, & WHO, 2025). (Fig. 1). Findings from more than 200 NGOs revealed a harrowing reality—one person lost their life to hunger every four seconds, with 345 million individuals requiring immediate food assistance, a figure that had more than quadrupled since 2019 (Cook, 2022) (Fig. 1). If current trends persist, the World Bank projected that by 2030, acute food insecurity could engulf over 950 million individuals, signaling an impending humanitarian catastrophe (Mahler *et al.*, 2022). Economic inefficiencies within the food sector exacerbated the crisis, with the Food System Economics Commission estimating hidden costs of \$10 trillion annually, highlighting the structural failures that undermine global food security (Ruggeri Laderchi *et al.*, 2024).

The global food insecurity crisis, driven by intertwined factors such as pandemics, conflicts, climate change, and economic instability, intensified significantly in recent years, straining supply chains and jeopardizing the right to food. This urgent issue was highlighted in the Hunger Hotspots report by the UN FAO and the WFP, which pinpointed eighteen critical areas, notably Mali, the Palestinian Territories, and (South) Sudan (Hendriks *et al.*, 2022; Masoura, 2024). By 2023, over 250 million people worldwide faced acute food insecurity, marking an increase of 24 million from the previous year. Conflict remained the primary driver, affecting 20 countries and nearly 135 million people—almost half of the global total (Wylie, 2023; UNICEF Press Release, 2024). Reports from the WFP indicated that in 2023, across 78 WFP-operated countries, an estimated 333 million people experienced acute food insecurity, while in 2024, this number was projected at 309 million across 71 countries—at least 160 million more than pre-pandemic levels in both cases (WFP, 2023c; WFP, 2024). Meanwhile, the Food Security Information Network (FSIN) reported that between 2023 and early 2024, the compounded effects of conflict, climate change, migration, and economic shocks further deepened the crisis, with 282 million people across 59 countries experiencing significant food insecurity, including 36 million in emergency conditions (FSIN & GNAFC, 2024).

Since 2020, global shocks, including climate change, extreme weather events, the Russian invasion of Ukraine, and COVID-19 public health restrictions, have disrupted food production and supply chains, pushing food prices higher (Lewis *et al.*, 2023; Zorbas *et al.*, 2022). The COVID-19 outbreak severely disrupted global food security, exacerbating hunger, malnutrition, and economic vulnerabilities, particularly in low- and middle-income countries (LMICs) (Kakaei *et al.*, 2022). Lockdowns, trade restrictions, and labor shortages led to reduced agricultural productivity, supply chain breakdowns, and increased food prices, affecting food availability and access (Swinnen & McDermott, 2020; Pereira & Oliveira, 2020). Abdel-Rahman & Abonazel (2025) explored the drivers of food insecurity in Egypt, Tunisia, Jordan, Sudan, and Morocco during the COVID-19 pandemic, revealing that both permanent and temporary job losses, alongside wage reductions, significantly contributed to increased food insecurity. The International Labor Organization reported that over 80% of the workforce faced pandemic-induced impacts, worsening food poverty, with many turning to cheaper, less nutritious diets, especially affecting children and adolescents. Bayrak (2024) found that supply chain disruptions and mobility restrictions reduced farm incomes and strained global trade, with OECD estimates indicating a potential annual GDP decline of up to two percentage points. Global hunger surged by 161 million people in 2020, with food affordability and safety deteriorating due to inflation and economic instability (Boratyńska, 2025). Demand shocks, panic buying, and climate change further compounded risks,

CHAPTER 4

The US-China Rivalry: Economic Impact and Global Ramifications

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Abstract: The US-China trade war, initiated in 2018, has emerged as one of the largest non-military global conflicts, significantly impacting both nations and interconnected major economies. This conflict led to substantial economic losses for the US, including job reductions, GDP decline, and stock value losses, as reported by Moody's Analytics and Bloomberg Economics. Retaliatory tariffs, affecting 8.7% (\$134 billion) of US exports, particularly in agriculture, resulted in a \$27 billion reduction in agricultural exports. The auto industry faced reduced sales and layoffs due to retaliatory tariffs, contributing to a 9.9% reduction in total US exports and a \$32 billion decline. In contrast, analyzing detailed Chinese firm-level customs data revealed an unexpected within-firm cross-product chilling effect, altering export dynamics despite no immediate adverse impact on Chinese exports at the firm-product level from added US tariffs. Additionally, the trade war affected Foreign Direct Investment (FDI) in China, with a negative FDI gauge for the first time in 25 years, indicating a potential trend of foreign companies withdrawing investments. Despite escalating tensions, bilateral trade and investment between the US and China surged in 2021, with exports rising by 21.4% to \$151 billion and imports by 16.5% to \$506 billion. The trade war prompted a shift towards protectionist policies, potentially weakening support for free trade and stoking nationalist sentiments. Geopolitical tensions extend beyond economic issues, impacting cybersecurity, territorial disputes, and geopolitical alliances globally, leading to increased military spending and security concerns for countries caught in the middle.

Keywords: Economic impact, FDI flow, Geopolitical rivalry, Global consequences, Protectionist policies, Retaliatory tariffs.

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INTRODUCTION

The transformation of China into a major global player has fueled a new era of confrontation with the U.S., marked by mutual claims, trade restrictions, and technological struggles. The trade war began in March 2018 when the Trump administration proposed a 25% tariff on over \$50 billion of Chinese imports, citing alleged intellectual property theft. China retaliated with tariffs on 128 US products. Negotiations in early 2019 led to progress, but in May 2019, President Trump announced plans to raise tariffs on \$200 billion of Chinese goods from 10% to 25%, escalating tensions further (Huang *et al.*, 2023). The conflict, considered one of the largest non-military global conflicts in recent history, has adversely affected both parties and other major economies interconnected through global production networks (Song & Zheng, 2023). The U.S. initiated the trade war with China due to concerns over intellectual property theft and espionage, employing measures like banning Huawei and targeting supercomputing companies, reflecting a broader competition for technological dominance, potentially leading to a “Thucydides's Trap”; exacerbated by Trump's “Chinese virus” rhetoric amid the COVID-19 pandemic, the unexpected trade tensions from the Chinese perspective were fueled by nationalist sentiments and historical grievances (Boylan *et al.*, 2021).

The U.S.-China rivalry, originally rooted in economic and trade disputes, gradually morphed into a broader ideological conflict, particularly under the Trump administration, which sharply criticized China for its human rights violations and actions that undermined international agreements (Mykhalskyi *et al.*, 2023). While there were hopes for improved relations under President Biden, tensions persisted as the United States adopted an increasingly aggressive posture, instituting a series of sanctions and restrictions. Empirical analysis by McDonagh (2025) revealed a clear continuation of deglobalization trends, with trade flows between the two nations declining in relation to GDP, despite a modest increase in U.S. imports from China, which rose from \$427 billion in 2023 to \$439 billion in 2024. U.S. economic policy, focusing more on strategic decoupling from China, increasingly diverged from traditional WTO frameworks, prioritizing national security concerns. On September 13, 2024, the U.S. Trade Representative (USTR) announced substantial increases in Section 301 tariffs on Chinese imports, ranging from 25% to 100%, targeting goods such as electric vehicles, steel, and critical minerals, with further tariff hikes scheduled for semiconductors, medical equipment, and lithium-ion batteries (Bond *et al.*, 2024). These tariff measures, set to extend into 2025 and 2026, also included new duties on tungsten and polysilicon. In a further escalation, on February 4, 2025, President Trump implemented an additional tariff increase on Chinese imports, raising the duties from 10% to 20%, with limited exemptions, exacerbating the trade conflict.

Moreover, the tariff measures were extended to imports from Canada and Mexico, marking a significant intensification of the global trade rivalry (Okun *et al.*, 2025).

The trade war has caused significant economic losses to the US, including a slowdown in economic growth, a freeze in business investment, reduced hiring, and increased bankruptcies among farmers. Moody's Analytics reported a loss of nearly 300,000 jobs and a 0.3% decline in real GDP. Bloomberg Economics projected a \$316 billion impact on the US economy by 2020, with research showing that US companies suffered at least \$1.7 trillion in stock value due to tariffs on Chinese imports (Hass & Denmark, 2020). Retaliatory tariffs, affecting 8.7% (\$134 billion) of US exports, notably \$30 billion in agricultural products, led to a \$27 billion reduction in US agricultural exports from mid-2018 to 2019. The auto industry also experienced reduced sales, supply chain adjustments, and layoffs due to retaliatory tariffs. Overall, retaliatory tariffs caused a 9.9% reduction in total US exports and a \$32 billion decline, imposing a monthly cost of \$2.4 billion on US firms (Durante, 2022).

Analysts express concerns about the slow growth, prompting expectations of new measures from authorities to boost the economy (Liang & Marsh, 2023). Analyzing detailed Chinese firm-level customs data, particularly multiproduct firms, Song & Zheng, (2023) surprisingly found no immediate adverse effect on Chinese exports at the firm-product level from added U.S. tariffs. While certain US imports from China, such as semiconductors, certain IT hardware, and consumer electronics, have seen significant drops, imports of clothing, footwear, furniture, laptops, computer monitors, phones, video game consoles, and toys from China are at all-time highs (Amiti *et al.*, 2019). However, aggregating the data exposes a significant trade destruction effect, indicating an unexpected within-firm cross-product chilling effect, causing collateral damage and altering export dynamics substantially (Song & Zheng, 2023). China forecasts predicting GDP growth in 2023 to be below 5%. The US, employing a familiar playbook, has pursued policies aiming to impede China's economic and technological competition, violating WTO rules. Contrary to expectations, President Joe Biden has reinforced anti-China strategies, reminiscent of those used against the Soviet Union and Japan, involving tariffs, technology restrictions, and encouraging companies to relocate supply chains away from China, as highlighted by economist Jeffrey D. Sachs (Sachs, 2023). Additionally, the trade war has had a significant impact on FDI flow in China. Data from the State Administration of Foreign Exchange (SAFE) shows that China's gauge of FDI, measured by direct investment liabilities, turned negative for the first time in 25 years, standing at minus \$11.8 billion in the third quarter of 2023. The 87% year-on-year drop in direct investment liabilities in the second quarter, reaching its lowest level since

CHAPTER 5

The Impact of Global Crisis over Drug and Medical Supply

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Abstract: The global pharmaceutical crisis is a complex phenomenon influenced by multiple factors rather than a singular cause. The recent global events have exposed the unfortunate inadequacies of the pharmaceutical supply chain on a global scale. Problems with supply, demand, and administration all contribute to scarcity. Production troubles, raw material shortages, logistics challenges, and market fluctuations are all examples of factors that might disrupt supply. Supply-chain disruptions encompass a range of challenges, such as production difficulties, scarcity of essential inputs, logistical impediments, and commercial obstacles. On the other hand, demand-related concerns include managing immediate stock levels, addressing heightened demand for goods, seasonal fluctuations, and unforeseeable demand patterns. It is imperative to implement effective policies that focus on developing a resilient supply chain, incentivize manufacturers to adopt high-value quality systems, and prioritize the production of medicines at greater risk of global shortages. Drug and medical equipment supply chains, like food and other essential commodity supply chains, have been severely impacted by ongoing global conflicts and the pandemic. Even catastrophic weather events have a minor or indirect impact on the drug supply chain.

Keywords: Currency devaluation, Dollar crisis, Drug monopoly, Drug regulation, Fragile drug supply chain, Pharmaceutical shortages, Raw material pricing, Trade barrier.

INTRODUCTION

The term “Universal Health Coverage” refers to a healthcare system that ensures equitable access to quality medical services for all individuals, without the risk of

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financial hardship due to medical expenses. Drug shortages significantly affected various stakeholders, particularly patients, who experienced suboptimal treatments, delays in care, increased monitoring, and even mortality. Healthcare professionals across institutions recognized the severe and lasting consequences of persistent medication scarcities (Shukar *et al.*, 2021). The prevalence of pharmaceutical shortages rose globally, impacting both developed and developing nations and posing substantial challenges to healthcare systems. These shortages disrupted the availability of essential medications, including commonly used and high-demand drugs, leading to critical gaps in patient care. The multifaceted nature of the global supply chain, combined with procurement challenges, demand fluctuations, and limited manufacturing capacities, contributed to the escalating crisis. Reports indicated that inadequate stock management, stringent regulatory frameworks, and quality control failures further exacerbated supply constraints (WHO, 2016).

The expanding global population puts pressure on the supply of necessary pharmaceuticals. Drug shortages have resulted from a variety of interconnected factors, including insufficient raw material supplies, legislative challenges, manufacturing issues, and drug discontinuation. These shortages are not only caused by supply constraints but also by fluctuating demand, regulatory inefficiencies, and production challenges that disrupt the entire supply chain (Shukar *et al.*, 2021). For example, the just-in-time inventory model, commonly used by manufacturers to minimize costs, made the system more vulnerable to unexpected disruptions, such as sudden surges in demand or supply chain breakdowns. Economic factors further exacerbated the issue, as pharmaceutical companies often prioritized profitability over production capacity, leading to supply discontinuities, particularly for low-cost generic drugs. This was evident during Spain's amoxicillin shortage, where manufacturers cited financial disincentives as a barrier to scaling production (Biedermann, 2023). Moreover, the global shortfall of medical supplies, especially during the COVID-19 pandemic, intensified concerns and had widespread effects on public health. These shortages jeopardized patient safety, caused medication errors, and, in some cases, led to fatalities among patients (Burki, 2020; Vann Yaroson *et al.*, 2024). In response, organizations like the International Pharmaceutical Federation (FIP) urged the adoption of enhanced reporting mechanisms to improve the predictability and management of future shortages (FIP, 2024).

A significant factor behind these shortages is the global dependency on imported pharmaceutical ingredients. The US Senate Committee (2023) pointed out that over 90% of generic injectable drugs in the U.S. relied on key materials from China and India. In fact, India controlled 62% of global active pharmaceutical ingredient manufacturing in 2021. Similarly, Europe sourced 80% of its active

pharmaceutical ingredients (APIs) and 40% of finished medicines from China and India, a situation that worsened when India imposed export restrictions during the COVID-19 pandemic, intensifying the shortage (Scholz, 2020). Australia also experienced a 300% rise in drug shortages between 2019 and 2020, largely driven by global supply disruptions, as over 90% of its medicines were sourced internationally (Cameron & Bushell, 2021).

Regulatory measures, such as price capping, external price referencing, and tendering policies in Europe, also contributed significantly to these shortages. De Weerd *et al.* (2015) pointed out that these regulatory frameworks, along with non-compliance to manufacturing standards, created barriers to an efficient drug supply. Despite attempts to address these issues, such as France's 2011–2012 Act and the 2016 Health Law aimed at securing drug supplies, shortages persisted (Bocquet *et al.*, 2017). McGeeney *et al.* (2025) noted the fragmented pharmaceutical supply chain as another key issue, revealing that only 24% of active pharmaceutical ingredients were produced within the U.S., which led to delays and prolonged shortages, especially during the COVID-19 pandemic. These findings illustrate the complex and multi-dimensional nature of drug shortages, underscoring the need for a coordinated approach to address regulatory, economic, and logistical challenges across the global pharmaceutical supply chain. The nexus between drug shortages and various factors is summarized in Fig. (1).

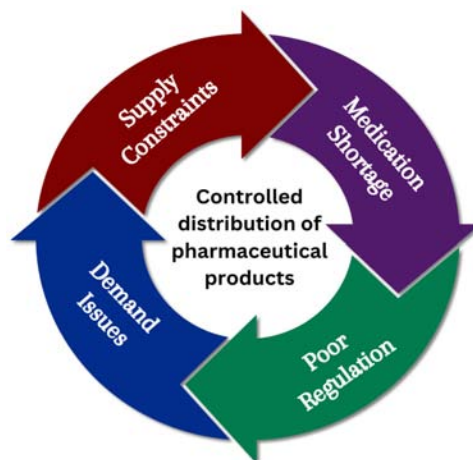


Fig. (1). Controlled distribution of pharmaceutical products and drug shortage (Author's own work, canva illustrator).

As a single cause has not imparted the global crisis but rather a confluence of factors, such as a growing population, pandemics, and efforts to mitigate the effects of climate change, trade barriers, trade war between great powers,

CHAPTER 6

Global Supply Chain Crisis Caused by COVID-19 and Currency Devaluation

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Abstract: The global supply chain crisis, triggered by the COVID-19 pandemic and deepened by widespread currency devaluation, significantly disrupted international trade, production systems, and macroeconomic stability. The pandemic exposed structural weaknesses in global logistics and just-in-time inventory models, leading to prolonged delivery delays, labor shortages, and interruptions in manufacturing and distribution. These disruptions created lasting imbalances in supply and demand, reshaping global consumption and production dynamics. Currency devaluation, particularly in emerging markets, intensified economic vulnerabilities by increasing import costs and amplifying inflation. In response, central banks adopted a range of interventions—including interest rate hikes, asset purchases, and foreign exchange operations—to control inflation and stabilize markets. However, the effectiveness of these measures varied, with many developing countries constrained by limited reserves, weaker monetary institutions, and tight fiscal space. Geopolitical shocks further compounded these challenges. The Russia-Ukraine war disrupted energy and food supply chains, fueling inflation. The Israel-Hamas conflict strained maritime trade routes, driving up global freight costs. Simultaneously, the U.S.-China trade rivalry accelerated the fragmentation of established trade networks, injecting new uncertainty into global production strategies. These overlapping crises contributed to heightened financial volatility, declining investor confidence, and increased policy uncertainty. Central banks were often forced into a delicate balancing act: managing inflation while avoiding growth slowdowns and further currency depreciation. This period highlighted the interconnectedness of global trade, monetary policy, and exchange rate dynamics, while underscoring the urgent need for more resilient supply chains, adaptive economic frameworks, and coordinated global policy responses to withstand future shocks.

Keywords: COVID-19, World order, Currency appreciation, Currency devaluation, Inflation, Developed countries, Developing countries, Central bank, Economy, Broken supply chain.

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INTRODUCTION

A crisis could be an unexpected/unfavorable event that exhibits high levels of uncertainty and affects citizens' lives, business operations, and the economy around the world; for example, the 9/11 terrorist attacks, the first dot-com bubble burst in 2000, the 2007–2009 financial crisis, the aftermath of the Brexit vote, the climate catastrophe, and COVID-19. COVID-19 was declared a worldwide pandemic by the WHO in March 2020. WHO urged to impose restrictions on travel, social interaction, and supply chain activities to minimize COVID-19 spread. These limitations interrupted business operations and produced significant levels of uncertainty for business conglomerates around the world, resulting in a significant blow to the global economy and one of the worst recessions since the 1930s (Khan, 2022; Klöckner *et al.*, 2023). Along with the pandemic, Russia's invasion of Ukraine raised concerns about the prospect of globalization. The conflict has strained international relations, precipitating the risks of economic interdependence among countries with opposing ideologies and security concerns. This conflict has had an impact on the global economy, with supply chain disruptions causing price increases and jeopardizing supplies of energy and essential commodities. And Russia and Ukraine, two major food-producing countries, have also raised concerns about food scarcity, prompting some countries to ban food grain exports. The pandemic and the Ukraine crisis, according to BlackRock's (leading providers of investment, advisory, and risk management solutions) CEO and Chairman, have put an end to the globalization that we have known for the past three decades (Giglio, 2022).

The combined impact of the COVID-19 pandemic and the Ukraine war led to severe global economic disruptions, driving inflation and financial instability. The Ukraine war, following the COVID-19 outbreak, worsened global supply chain disruptions by adding new geopolitical tensions, energy shortages, and trade route blockages. This dual crisis caused sharp increases in fuel, food, and raw material prices, destabilizing economies (Allam *et al.*, 2022). The war also led to a dollar crisis, as global risk aversion pushed investors toward the U.S. dollar, causing its rapid appreciation and inflating debt burdens in emerging economies (Chortane & Pandey, 2022). The conflict intensified inflation, forcing central banks in the Global South to adopt contractionary policies, worsening financial instability. The war also pressured global exchange rates, especially for currencies in energy-importing countries, due to rising commodity prices and disrupted trade routes (Xu *et al.*, 2023). Similarly, the COVID-19 outbreak triggered a global dollar crisis, causing liquidity shortages and escalating import costs, contributing to rising inflation (Amit & Kafy, 2024). Gunay (2021) noted that the pandemic's impact on currency markets was far greater than the Global Financial Crisis (GFC) of 2008, with global lockdowns and health measures exacerbating the

crisis. Lastly, Hamza *et al.* (2024) observed that both crises—pandemic supply chain disruptions and the Ukraine war—pushed inflation to peak levels across both advanced and developing economies by late 2022.

Since the mid-2010s, supply shocks have increasingly driven inflation rates across major economies—especially in Germany, the U.K., and the U.S.—which faced significant inflation increases post-COVID-19 pandemic. Through an analysis covering 1998 to 2022, it was highlighted that commodity prices heavily influenced inflation, with energy prices rising sharply during 2022, leading to inflation in these economies reaching 8.5% in Germany, 9.1% in the U.K., and 8.1% in the U.S., while Japan's inflation curiously remained stable at 2% (Diaz *et al.*, 2024).

As the war in Ukraine upended maritime stability in the Black Sea—choking off critical shipping corridors and compounding global supply chain disruptions—the eruption of the Israel-Hamas conflict unleashed a parallel crisis in the Red Sea, deepening the strain on international trade flows. By August 2024, the Red Sea disruption had driven a dramatic 250% spike in shipping costs, with container freight rates from Shanghai to Rotterdam soaring to nearly \$8,000. Simultaneously, global shipping reliability deteriorated sharply, with on-time arrivals declining from 60% in 2023 to just 50% in 2024, signaling mounting logistical volatility across interconnected trade routes (Balci, 2025). Concurrently, the intensifying U.S.-China rivalry undermined global supply chain stability, as American protectionist tariffs aimed at reshoring industry inflated consumer prices, strained exports, and prompted Chinese countermeasures—most notably, restrictions on rare earth exports—thereby fragmenting trade networks and escalating manufacturing costs (Asia Pacific Task Force, 2025). This rivalry fostered economic decoupling and spurred the emergence of rival trade blocs, eroding global trade norms. In parallel, extreme climate events—floods, wildfires, and heatwaves—persistently disrupted global transport and industrial systems (Leslie, 2022). As these geopolitical and environmental threats converged, they collectively intensified global shortages and price spikes across sectors, from agriculture to electronics, underscoring a fragile and fracturing global supply chain ecosystem.

General Consequences of Supply Chain Breakdown

Any disruption—whether stemming from geopolitical trade conflicts, shipping delays, industrial shutdowns, shortages of raw materials, or natural disasters such as earthquakes and tsunamis—poses a significant threat to the integrity of supply chains. Supply chain disruptions significantly weakened economic output by stalling production, inflating costs, and delaying global trade flows. The global

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