SCIENCE FOR GLOBAL TRANSFORMATION
HEALTH CHALLENGES: QUALITY, EQUITY, AND ACCESS
Task Force 4 - Preliminary Document

Introduction

Goal 3 of the Sustainable Development Goals (SDGs) outlines targets aimed at ensuring healthy lives and well-being for all, across all age groups, and target 3.8 specifically calls for countries to "achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all"[1]. The achievement of universal health coverage with an emphasis on equity, community involvement, and participation holds the potential to drive improvements in various aspects of health, spanning mental health, chronic disease management, maternal and child health, and child development.

Furthermore, SDG 10 emphasizes the significance of reducing inequalities and leaving no one behind in the pursuit of sustainable development. This underscores the critical need to address global health inequality, particularly in terms of sharing resources and technologies to combat health crises while fostering international solidarity. A robust health system relies on effective communication strategies to disseminate health information, conduct health campaigns, and counter disinformation. These strategies should embrace a "whole-of-society" and "whole-of-government" approach, encouraging international collaboration, strengthening global capacity building, and engaging communities and healthcare professionals at the forefront, such as community health agents, as key contributors to raising awareness and sharing knowledge with the population.

It is important to consider that, to achieve quality, equity, and access in health, challenges related to other dimensions of health, such as food security, housing, clean water and sanitation, and most of the SDGs, must be faced.

Data Science and Precision Medicine in Health and Surveillance

The evolving understanding of the complex interactions of genetic, environmental, and behavioral mechanisms in disease raises questions about the need for the development of personalized markers for risk stratification that can be used to recognize individuals at various risk levels for developing disorders, as well as approaches in disease prevention and treatment. On the other hand, precision medicine has as its principle the collection, processing, storage, and sharing of a large set of data obtained from patients, normal individuals, the environment, microorganisms, and others. This large set of data should induce a better knowledge of the biological processes involved in diseases, which may eventually lead to the development of more efficient therapies aimed at specific disease mechanisms. Precision medicine presents an ambitious task of understanding and applying knowledge about individual variability in genes, environment, and lifestyle. Furthermore, it has an enormous challenge in making the discoveries and applications accessible to all, aiming at the treatment and prevention of diseases. Precision medicine also includes genomic vigilance for infectious diseases, thus contributing to preparedness for future

[1] United Nations – Goal 3 of the Sustainable Development Goals (SDGs), Targets and Indicators (https://sdgs.un.org/goals/goal3#targets_and_indicators).

pandemics. Precision medicine relies heavily on Open Science and Big Data (large health information databases and prospective cohorts).

Digital health transformation is crucial for supporting strong universal health systems. Three issues are of utmost importance: (i) incorporate telemedicine to expand healthcare to remote and hard-to-reach areas; (ii) improve the collection and use of data to support better epidemiological and sanitary surveillance and response, health system planning, and performance evaluation; and (iii) promote data integration, so that death and birth registries, inpatient and outpatient records, and routine examination data are integrated (for example, through the use of a national ID number). In addition, linking administrative health data and social data from various information systems (such as on education, social protection, work, housing) allows the construction of large databases, adding value to population health studies with large sample size. Big data is a powerful tool to investigate social inequalities (including access to health services), identify vulnerable groups, and assess the impact of policies and programs. Efforts must also support the integration of molecular and epidemiological surveillance to better enable health systems to promptly detect and respond to the emergence, reemergence, and persistence of pathogens, as well as to antimicrobial (antibiotics, antiseptics, and antifungals) and antivirus resistance.

Gender and Health

Gender plays a significant role in health outcomes and experiences. Understanding the intersection of gender and health is essential for developing effective healthcare strategies, promoting equity, and ensuring that healthcare systems meet the diverse needs of individuals of all genders. Biological, social, and cultural factors contribute to differences in gender health.

Women have specific needs beyond their reproductive cycle, with disparities on risks of diseases/infections across the entire life course. In many countries, women are most of the health workforce, responsible for childcare, for assisting the elderly and sick people at a familial and societal level. Emerging and persistent infectious diseases such as Zika virus have substantial impact on the adverse pregnancy outcomes. Sexual and reproductive health services were greatly affected during the COVID-19 pandemic, including contraception, abortion, prenatal care, and childbirth.

Historically, medical research has not always included adequate representation of genders, leading to gaps in understanding health issues specific to each group. Achieving gender´s health equity should be a main goal of public health systems and policies.

Bridging the Gap in Mental Health

Evidence indicates that around 5% of the working-age population grapples with severe mental health conditions, while an additional 15% are affected by more common mental disorders. Furthermore, it is estimated that one in two individuals will experience mental ill-health at some point in their lives, impacting their employment prospects, productivity, and wages. The direct and indirect costs associated with mental ill-health can exceed 4% of the GDP. The pandemic has further exacerbated the burden of mental disorders, necessitating policy changes to address this emerging challenge.

Epidemiological data reveal a high prevalence of mental disorders globally, particularly affecting vulnerable groups such as women, migrants, those with low literacy, individuals in low social classes,

unskilled workers, the unemployed, people living in deteriorated urban areas, those exposed to violence, and the socially excluded. Notably, social inequalities and violence play a significant role as determinants of poor mental health. Moreover, modern western culture, marked by competitive environments, social inequality, and loneliness, is contributing to the rising rates of mental disorders, including depression. Periods of isolation, social withdrawal, and the economic impacts resulting from health crises are expected to increase the prevalence of mental disorders and depression, particularly in low-income countries. By 2050, approximately two-thirds of the world's population will reside in large urban centers. The combination of frequent floods, landslides, heatwaves, and climate threats, coupled with the growth of impoverished social conditions, can foster a pervasive sense of insecurity, especially among the young and elderly living in urban areas.

Approximately half of adults with a mental illness developed the condition before the age of 15, emphasizing the importance of early identification and treatment to reduce costs and disease burdens. The pooled adolescent suicide rate has risen worldwide and was the fourth leading cause of death among 15-29-year-olds globally in 2019 (WHO). Bullying involvement in any form can adversely affect young people's social adjustment and result in lasting mental health consequences, underscoring the need to strengthen ties between the educational and health systems and develop preventive interventions in schools to reduce violence and prevent substance abuse. Social media has transformed the way information is created and consumed, with implications for contemporary culture.

Furthermore, a substantial portion of individuals with mental health conditions, including treatable disorders like depression and anxiety, lacks access to adequate mental health care. Epidemiological studies in Brazil estimate that the access gap for mental health services exceeds 50% for adults and adolescents. Individuals with mental illness often experience physical health problems that can lead to increased mortality, poorer health outcomes, and higher costs for the healthcare system. Notably, individuals with severe mental illnesses, such as acute depression, bipolar disorder, and schizophrenia, die, on average, 20 years earlier than the general population. Digital psychiatry, through the use of technology, such as apps, telemedicine, and other digital tools, can enhance mental health services and support, offering improved accessibility, personalized care, patient engagement, better communication, and increased efficiency.

Strategies to address the mental health challenges, which was made worse by the pandemic, should include: (i) to invest in prevention programs at elementary and middle schools; (ii) to adopt evidence based psychosocial interventions to keep an adequate environment for the development of children and adolescents; (iii) to target socially vulnerable populations and discriminated social groups; and training primary care teams to solve common mental health problems, needs based assessments and long-term support for the management of older patients in their own homes; (iv) to invest in technology developments such as telemedicine, mobile apps, and web-based algorithms to promote coordinated care; (v) to scale up remote and brief protocols of cognitive behavioral therapy, interpersonal therapy and psychoeducation for preventing and treating common mental health problems.

Investing more in primary care is one cost-effective way of treating mild-to-moderate mental disorders. Primary care practitioners are already expected to diagnose, treat, and manage these types of disorders and are often the first port-of-call. However, in many cases, primary care providers lack the resources,

time, and expertise to care for mild-to-moderate mental illness effectively. In addition, ending stigma and discrimination in mental health should be a priority. Despite the large burden that mental ill-health imposes on people and on economies, many countries continue to neglect mental health care, and the unmet need for treatment remains high. Making mental health care policy a priority would enhance people's well-being and have significant social and economic benefits.

Climate change, food and water security, and health

According to the WHO, "climate change is impacting health in a myriad of ways, including by leading to death and illness from increasingly frequent extreme weather events, such as heatwaves, storms and floods, the disruption of food systems, increases in zoonoses and food-, water- and vector-borne diseases, and mental health issues. Furthermore, climate change is undermining many of the social determinants for good health, such as livelihoods, equality and access to health care and social support structures. These climate-sensitive health risks are disproportionately felt by the most vulnerable and disadvantaged, including women, children, ethnic minorities, poor communities, migrants or displaced persons, older populations, and those with underlying health conditions"[2].

Climate change, loss of biodiversity, and pollution have a direct and indirect impact on human health and the sustainability of societies worldwide. To address the global crisis of climate change, biodiversity loss, and pollution for a sustainable future, we urgently need transformative interventions in institutions, governance, and social systems at all levels, from local to global. Investigating the interplay between socio-economic factors and environmental hazards, including climate change, should be a top priority.

Historically, environmental changes, including climate change, occurred gradually over millions of years, shaping humanity's stable relationships with their environments and food production. However, since the industrial revolution, this balance has been disrupted, giving rise to a new environmental era known as the Anthropocene. This period is characterized by rapid population growth, pollution in various forms (water, land, air), and increased greenhouse gas emissions, especially carbon dioxide, leading to significant temperature anomalies. These environmental changes directly impact food and water security and, in turn, human health. Extreme weather events caused by climate change reduce agricultural productivity, leading to higher food prices, particularly in economically disadvantaged countries, exacerbating food insecurity. It is crucial to acknowledge the neglect of populations highly dependent on their local environments for sustenance. Climate change also affects the quality and availability of water, a critical resource for food production and human health.

Climate change has far-reaching effects on zoonotic diseases and arboviruses. As global temperatures rise and weather patterns become increasingly unpredictable, these changes create favorable conditions for the expansion and altered distribution of disease vectors, such as mosquitoes and ticks. This expansion, in turn, heightens the risk of transmission of zoonotic diseases, like Lyme disease, West Nile virus, and Zika virus, to humans. Additionally, climate-related shifts in habitat and migration patterns of wildlife can bring humans into closer contact with animal reservoirs of diseases, facilitating spillover events. The warming climate can also extend the transmission seasons for arboviruses, making outbreaks more

[2] World Health Organization – Climate Change (https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health).

frequent and severe. These trends underscore the urgency of addressing climate change as a critical factor in mitigating the risks associated with zoonotic diseases and arboviruses and highlight the need for proactive strategies in public health and environmental management.

In summary, climate change, food and water security, and health form a critical triad that must be carefully managed to ensure a good quality of life worldwide. Neglecting the robust scientific information on environmental protection puts present and future generations at risk.

Communicable and Non-Communicable Diseases

Infectious diseases, also referred to as communicable diseases (CD), arise from microorganisms like bacteria, viruses, parasites, and fungi that can spread from person to person, either directly or indirectly. Some are transmitted through insect bites, while others result from consuming contaminated food or water, like some types of hepatitis. Also, sexually transmitted infections (STIs) like HIV and viral hepatitis spread through exposure to infectious bodily fluids such as blood, vaginal secretions, and semen are considered as CDs.

Among the CDs, we need to consider the group of Neglected Tropical Diseases (NTDs), that correspond to a set of 20 infectious conditions that affect the poorest populations, predominantly in tropical and subtropical regions[3]. NTDs account for around 11% of the global disease burden, affecting more than 1 billion people worldwide. Many neglected tropical diseases result from unsafe water, inadequate housing conditions, and poor sanitation in the region. Over the last decade, the number of people requiring interventions against NTDs has decreased by 25%, with an 80 million decrease between 2020 and 2021 alone. The burden of disease, measured in disability-adjusted life years, is steadily decreasing. It is most relevant to acknowledge this achievement as preconized by the "Ending the neglect to attain the Sustainable Development Goals: a road map for neglected tropical diseases 2021-2030"[4].

Collaboration Strategies for an Inclusive and Equitable Shared Future:

- Adoption of whole-of-society and whole-of-government approaches, enabling strong international collaboration, global capacity building and engaging communities and community health agents as protagonists in sensitizing and sharing knowledge with the population.
- Strengthen networks and foster collaboration between research groups among countries and regions.
- Reinforce global surveillance capacity, open science and information sharing for early detection of health emergencies and public health events of international concern.
- Technology transfer for collaborative development of priority health technologies.
- Invest in research for low-cost treatments for communicable and non-communicable diseases.
- Invest and share in research for AI in health.

[3] Hotez PJ, Aksoy S, Brindley PJ, Kamhawi S (2020) World neglected tropical diseases day. PLoS Negl Trop Dis 14(1): e0007999. https://doi.org/10.1371/journal.pntd.0007999.

[4] World Health Organization – Ending NTDs: together towards 2030 (https://www.who.int/teams/control-of-neglected-tropical-diseases/ending-ntds-together-towards-2030).