WORLD HEART FEDERATION

WORLD HEART VISION 2030

DRIVING POLICY CHANGE

CONTENTS

Introduction

"At 100, you still feel better than you did at 50, still because of exercise, plenty of sleep, and moderate habits as well as breakthroughs in antiglycosylation therapy, wholesale organ replacement in your eighties, and the nanolabs in your blood stream that manufacture pharmaceuticals as needed and constantly top up your telomerase, the enzyme that makes your cells immortal. With all of this help, your cardiovascular system ticks like a grandfather clock, and you never give it a second thought. You have given up on retirement. Who could afford it anyway, with so many Baby Boomers hanging on past 100?"[1]
– TECHNOLOGICAL ADVANCES AND THE NEXT 50 YEARS OF CARDIOLOGY (FLOWER ET AL, 2000).

Others before us have delineated possible futures for cardiovascular health. Even if Flower and colleagues' vision of fully fit 100-year old reflects a rather Western, biomedical approach to health and has been partly disproven since published, it was for example correct in predicting that *"the combination of demographic shifts and cost pressures and a flood of new technologies – both biological and digital – promise that the new century and the coming generation will see the creative destruction and rebirth of what we know today as healthcare"*[1].

Similarly, in 2004, the authors of the Atlas of Heart Disease and Stroke imagined a series of possible – and desirable – achievements that would contribute to improving cardiovascular health in the next decades. Their projection that by 2020, *"Six-drug 'polypills' would reduce cardiovascular disease (CVD) by more than 80% if taken by everyone aged 55 and older, and everyone living with CVD* [2]*"* – has not fully developed. Yet the fact that a four-component polypill can reduce CVD by 50% is a reality today and is now an achievable goal if adequately implemented. McKay and colleagues had also imagined that "Minuscule computers, with microsensors, automatically sensing and recording health data, becoming everyday wear" which, considering the rapid spread of mobile health applications and wearables, resonates with us today[2].

World Heart Vision 2030: Driving Policy Change has been initiated as a vision for global cardiovascular health which addresses strategic challenges and opportunities the cardiovascular health community will face over the next decade. *World Heart Vision 2030* is meant as an inclusive global vision for ambitious yet achievable steps for furthering work with key sectors and policymakers. It is intended to guide policy, advocacy, implementation, and communications efforts for the next decade to improve cardiovascular health, reduce cardiovascular health inequalities and contribute to reducing the global burden of CVD. *World Heart Vision 2030: Driving Policy Change* is therefore about depicting what the global cardiovascular community is expected to do, building on what we have, going to where we need to be, based on what we can and should deliver. Even though projections are hypothetical, we can use *World Heart Vision 2030* to favourably influence trajectories and provide the "nudges" that are needed to positively influence cardiovascular health.

To picture the future of cardiovascular health, we must think beyond our daily lives and routines, look beyond our own area of expertise, and imagine cardiovascular health as it would, could, and should be. Some future paths may be less predictable but with a clear vision, we could shape them and help achieve our own goals.

We live in a complex, multifaceted and uncertain world. Growing and ageing populations, the rise of non-communicable diseases (NCDs), pandemics such as COVID-19, climate change, biodiversity loss, resource scarcity, financial constraints, armed conflicts, migration, humanitarian crises, urbanisation, and digitalisation are all creating new challenges to future generations, requiring immediate global and coordinated action. Cardiovascular health is embedded in a much broader context of societal, environmental, and commercial factors, calling for an urgent shift from still dominant siloed thinking to an inclusive, society-wide, government-wide approach. In 2019, cardiovascular disease (CVD) affected 523 million people, almost double the figure of two decades earlier, with one in three CVD deaths occurring prematurely in people under 70 years of age [3]. Yet some remarkable successes in cardiovascular medicine have been achieved over the past 50 years, both in the area of public health and preventive interventions and in evidence-based treatments [4]. This is proof that the cardiovascular community has been successful in understanding root causes and risk factors for CVD, and in developing prevention mechanisms and treatments. Our community now has a critical role to play in implementing the solutions that will improve both human general and cardiovascular health as well as planetary health. The World Heart Federation (WHF), as the principal representative body of the global cardiovascular community, is well-placed to lead this discussion. As the only global CVD organization in official relations with the World Health Organization (WHO), WHF brings together more than 200 scientific societies, foundations, and patient organizations in more than 100 countries who, together, can promote

and implement solutions to connect and improve planetary health and cardiovascular health[1]. *World Heart Vision 2030* represents an aspirational yet actionable vision for the years to come. It has been developed through a series of discussions with various representatives of the global cardiovascular health community and through an extensive literature review. This report discusses a series of priority areas in four key domains and ends with a call to action to not only cardiologists but also all other stakeholders involved to unite in a society-wide, government-wide effort to improve cardiovascular health worldwide.

World Heart Vision 2030 is a forward-looking document that seeks to address key challenges and opportunities for the coming years. It is primarily intended for policymakers and governments but also addresses issues relevant to health professionals and advocates.

Our vision

The world population is **growing**. From an estimated 7.8 billion in 2020, the global population could reach around 8.5 billion in 2030, and 9.7 billion in 2050[5]. Sub-Saharan Africa alone could account for more than half of this growth.

The world population is **ageing**: from 1 billion individuals aged +60 in 2020, there will be 1.4 billion in 2030, and 2.1 billion in 2050[6], an increase from 12% to 22% of the total global population.

As a result, the **burden of non-communicable diseases** will continue to grow, both in terms of disability-adjusted life years and in terms of annual deaths – even if age-standardised deaths globally have declined thanks to improved prevention and treatment. This particularly applies to the burden of cardiovascular disease as the number of CVD deaths is projected to rise from an estimated 18,9 million in 2020 to over 22,2 million in 2030 and 32,3 million in 2050[7]. Every death from CVD leads to up to three other serious CVD events, generating additional medical and social costs[8]. The share of global GDP spent on healthcare globally will also continue to increase, from 8.6% today to 8.9% in 2030 and 9.4 in 2050[9]. Since early 2020, COVID-19 has brought a substantial stress test upon health systems, healthcare practice and science[10].

Furthermore, our planet is warming. Our climate is changing, the quality of the air we breathe tends to deteriorate, negatively affecting cardiovascular health[11]. The latest report from the Intergovernmental Panel on Climate Change (IPCC) warns that the window of opportunity to ensure a liveable future is now "brief and rapidly closing"[12].

In this challenging planetary landscape, our vision complements and strengthens other flagship initiatives such as the UN Sustainable Development Goals (UNSDGs), the WHO 5x5 NCD Framework and the objectives set by the Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC). Our vision for the future of cardiovascular health is both quantitative and qualitative as it considers both global population health and individual rights to cardiovascular health.

In line with target 3.4 of the Sustainable Development Goals (SDGs), we aim for a planet where age-standardised cardiovascular mortality and incidence are reduced by at least 30% by 2030. As a matter of particular focus, we will strive to significantly alleviate the burden of specific neglected heart conditions such as Chagas disease and Rheumatic Heart Disease (RHD).

In the long term, by 2050, we envision a world with a substantially reduced age-standardised incidence of CVD as well as a 50% reduction in age-standardised cardiovascular mortality. But we also envision a planet where, ultimately, premature cardiovascular mortality can be avoided worldwide and where everyone has an equal chance to optimal cardiovascular health. Ultimately, we envisage a planet where cardiovascular health is a personal right and responsibility for everyone.

Our global vision is to create healthy environments for cardiovascular health, connecting planetary health and cardiovascular health. Elements such as climate change, the way we produce and consume food, the quality of the air we breathe and of the water we drink, all form a part of our vision of healthy hearts in a healthy planet. To achieve this vision, we must act now.

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[1]For more information on the World Heart Federation vision and mission, see https://world-heart-federation.org/about-whf.

We have defined four key domains in which we intend to focus our work in the coming years.

Paving the way for cardiovascular health equity	**Fostering timely implementation of knowledge**
Leveraging innovation and technologies for cardiovascular health	**Placing cardiovascular health at the heart of health and climate policies**
CALL TO ACTION: developing an inclusive, society-wide, government-wide approach to cardiovascular health	

Key domain 1: Paving the way for cardiovascular health equity

"Health inequalities and the social determinants of health are not a footnote to the determinants of health. They are the main issue."
SIR MICHAEL MARMOT

Introduction

WHF and its Members believe in a world where cardiovascular health for everyone is a fundamental human right. Regardless of country, region, origin, ethnicity, sex, age, education and income, each human being is entitled to cardiovascular health and well-being through health promotion, access to prevention, control and management (including rehabilitation) of cardiovascular disease [13]. Yet inequities in cardiovascular health and disease – defined as "systemic, avoidable, and often unjust societal factors, structural practices, and racism that create barriers to opportunity and result in avoidable adverse health status and outcomes[14] – are omnipresent, both within and across countries. There is significant variability in awareness of cardiovascular diseases, in exposure to risk factors, in health behaviours, and in access to healthcare services. These disparities are widespread. By highlighting the structural and other inequities and thus the disparities, especially among high-risk patient populations, the COVID-19 pandemic has brought the issue to the fore, however, evidence suggesting disparities in morbidity, mortality, access to guideline-recommended treatment and clinical outcomes existed long before that[14]. Equity in cardiovascular health will only be achieved if those gaps are closed.

Context

The world is ageing. Noncommunicable diseases (NCDs) are on the rise. So is inequity in cardiovascular health. There is currently a 18.1-year gap in life expectancy between the poorest and richest countries [15]. Even if age-standardised death rates have been going down in both high-income countries (HICs) and low- and middle-income countries (LMICs), in absolute numbers, CVD deaths are expected to increase by 4% in HICs between 2020 and 2030 (and by 19% until 2050), but by 44% in low-income countries (LICs) (and by 190% until 2050)[16] .

Healthcare spending is also distributed very unevenly. In 2018, more than 75% of global spending on health was in the World Health Organization (WHO) regions of the Americas and Europe. The Western Pacific region accounted for 19% of global spending, the South-East Asian and Eastern Mediterranean regions each for 2%, and the African region for 1%[17]. In 2016, the United States, home to 4.3% of the global population, accounted for 41.7% of global health spending, compared to only 0.4% for the lowest income countries, where 10% of the global population lives. And even within the United States, disparities exist[18]. The difference has grown over time, with cross-country inequality in health spending rising. Today, approximately half of the world's population is unable to access essential medicines[19]. This is partly due to the fact that out-of-pocket spending accounts for 41% of healthcare spending in LICs, compared to 21% in HICs[17]. Finally, health budgets in LICs have recently been disproportionately consumed by the COVID-19 health response[17].

Challenges and opportunities

Inequities are ubiquitous. They exist between and within countries, between sexes, and affect individuals throughout all stages of life, starting in the womb, ending in the tomb.

Socio-economic inequalities remain one of the main predictors of cardiovascular health and disease globally. Cardiovascular health outcomes are partly determined by social, economic and commercial determinants of health – the conditions in which people are born, grow, live, work and age[20]. Many people wrongly believe that CVD is a disease of the affluent. Within countries of any income group, the most vulnerable communities are more severely affected[21]. Individuals with a lower socio-economic status are more likely to be exposed to lifestyle, environmental and metabolic risk factors[22].

In the United States, exposure to atmospheric nitric oxide and PM2.5 is 38% higher in communities predominately inhabited by Hispanics, Blacks, and people with a lower socio-economic background[23, 24]. In Europe, the Gypsy/Roma community has a smoking rate that is two to three times as high as the European average[25, 26]. Access to healthy behaviours and choices are also unequal depending on socio-economic circumstances[27]. As an example, a study in Cape Town, South Africa, found that supermarkets in low-income areas tend to stock less healthy foods than those in wealthier areas, jeopardising access to healthy foods for low-income residents[28]. And when people from a lower socio-economic background are affected by CVD, the diseases push them back into poverty, causing a vicious cycle. Likewise, inequalities persist between countries. Adults living in low-income and middle-income countries (LMICs) are disproportionally affected: 40% of CVD-related deaths occur prematurely (before the age of 70), compared with 19% in (HICs)[29, 30].

Large parts of the population worldwide, especially in LMICs and in lower income groups, remain unaware of the significance of CVD and of the importance of risk factors. Levels of awareness, literacy and knowledge of CV risk factors are still influenced by sociodemographic factors[31] and remain particularly low in vulnerable communities[32, 33]. Furthermore, within countries, levels of undetected CVD risk factors are also higher among poorer populations[34-36]. In Latin America, the Brazilian Longitudinal Study of Adult Health found that levels of awareness, treatment, and control of high LDL-C were particularly low among men, individuals of mixed race and blacks, the poorer and less educated, and those without private health insurance[37].

Access to care remains highly unequal: currently, only a fraction of the people who need care receive adequate treatment[38]. Many patients do not have access to the care they need because of geographical barriers (physical distance), because of time constraints or because of availability and/or affordability issues[39-41]. In LMICs, fewer than one in ten people with diabetes receive comprehensive diabetes treatment based on guideline recommendations[42, 43]. In the USA, around 33 million Americans –from the most disadvantaged and marginalised groups—have insufficient or no healthcare insurance[25]. In England, the number of patients per general practitioner is 15% higher in the most deprived areas than that in the wealthiest areas [44]. Patients with low socioeconomic status tend to have poorer access, receive less information and be less willing to participate in cardiac rehabilitation[45-47].

Inequities persist between sexes. Age-standardised rates of CVD are higher in men than women, and CVDs have traditionally been perceived as a "man's issue[48]". Compared to men, women are more often treated for CVD in primary prevention, and less often in secondary prevention. Likewise, compared to men, women are less likely to undergo therapeutic invasive procedures after admission to hospital with a heart attack or to be treated with certain medical therapies upon discharge[49]. When treated however, they experience better outcomes[50]. Further, there is also growing evidence that lesbian, gay, bisexual, transgender, and queer or questioning (LGBTQ+) adults have worse cardiovascular health compared with their "straight," cisgender counterparts. Psychosocial stressors are thought to be a significant factor in driving these disparities[51]. Finally, inequalities also affect migrant populations[52] and refugees[53], as well as individuals based on age, disability, parental status, income, employment status or religion.

Inequities start even before a child is born. Even if common cardiovascular conditions are rare until middle age, the process that ultimately leads to CVD is initiated very early in the life-course[54]. There are growing indications that maternal cardiovascular health can affect offspring later in life[55, 56]. For example, lower birth weight has been associated with increasing rates of coronary heart disease (CHD)[57], as well as with higher blood pressure (BP) in adulthood[54]. A low socio-economic position (SEP) in childhood has been associated with CHD and with higher BP in adulthood, independently of how well the person fares as an adult[54]. Similarly, behavioural risk factors (smoking, diet, body mass index or BMI and physical activity levels) often also have their origins in early life[54].

Research and clinical trials are not equitable. To date, most data on risk factors and treatment outcomes for cardiovascular diseases have been obtained from studies conducted in high-income settings[30]. Within countries, minority groups are also often under-represented in clinical trials[58]. Women also tend to be under-represented in clinical trials and new drugs are more frequently tested on men[59]. Even if it is recognised that the prevalence of specific CVDs and risk factors may vary by race, ethnicity and geography, there is still little certainty as to what explains these variations, whether genetic, cultural, or environmental. Likewise, the evidence for therapeutic interventions has largely been derived from high-income settings and white populations, even though there may be some differences according to race, ethnicity, and sex. Further, the sociocultural context, cultural norms, and healthcare systems in which these therapies are delivered are not systematically considered.

Finally, lack of access to modern forms of communications in under-served populations further triggers inequities (see also key domain 3). Since the start of the COVID-19 pandemic in 2020, the gap between the wealthiest and the poorest in society has deepened[60]. Women, vulnerable groups and developing countries have been the hardest hit. Even though education is often a predictor of health[61], two-thirds of LMICs have cut their education budgets since the start of the pandemic[62]. In Mozambique for example, schools were closed for many months with no tele-education. Since the schools have reopened, the number of children/classes have been reduced and children attend class in shifts, meaning they only have 2 hours of class a day, compared to 6 previously. The gender gap has increased from 99 years to 135 years, meaning it will take an additional generation for women to attain gender equality[60].

Looking to the future, opportunities must be created by reallocating funds and taxes to spending on universal healthcare (UHC) and social protection, climate change adaptation, and gender equality programmes. Further opportunities lie in the reorientation of research agendas and protocols for more inclusiveness and equity, in the promotion of a sensible use of innovation and technology and in the training and employment of a diversified health workforce. Efforts toward strengthening cardiovascular health equity will contribute to the global development agenda and to the SDGs. Reducing inequalities in awareness, exposure to risk factors, and access to prevention and care, will therefore play an instrumental role in achieving our vision.
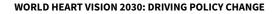
The way forward

The section above has depicted the situation today and outlined some of the main challenges that lie ahead of us on the path to better cardiovascular health worldwide.

To overcome these challenges, we propose focusing on selected actionable priorities:

• Develop and implement context-specific policies and programmes to overcome the lack of access to essential, high-quality cardiovascular health services and which conform as closely as possible to current best clinical practices. For every country, this includes

  o Delivering health services in an equitable way across populations, covering primordial prevention (eg. access to clean air, healthy food), screening and primary prevention, early detection, diagnosis, care and secondary prevention and rehabilitation.

  o Prioritising low-resource settings and under-served populations.

  o Strengthening efforts in favour of UHC and universal access to basic cardiovascular health services.

  o Relying on scientifically approved international guidelines that are contextualized for economic and social factors to achieve optimal "guideline directed medical therapies" in a given setting.

• Adopt a life-course approach[63] to cardiovascular health, with a particular focus on maternal health and early life. Specific actions may include educating future parents, providing antenatal and post-natal counselling, and rolling out early childhood programmes in schools to deliver information on the importance of healthy lifestyles[64]. This also entails recognising the importance of changes in risk factors throughout life, including and especially during pregnancy in women, and strengthening research efforts to identify points in the life-course where actions are most effective[64].

• Encourage innovative approaches to ensure essential health services are accessible and affordable everywhere, particularly in lower-income countries and in under-served areas. This includes fostering the development of innovative approaches but also facilitating their rapid adoption. Innovative approaches include making optimal use of available human resources, in particular non-physician health workers[65] as well as making meaningful use of new technologies to overcome geographical distance barriers by bringing essential cardiovascular prevention and care services closer to everyone and fostering a partial transition from traditional hospital and clinic-based services to services delivered at the patient home-- self-care apps and devices, remote consultations are some examples. (See also key domain 3).

• Adapt research agendas to guarantee more inclusiveness and equity. Both observational and experimental studies enrol diverse and representative populations[58]. This entails the need to ensure that interventional and observational studies are specifically designed and conducted to identify differences across ethnicities[30]. Likewise, it requires that the development and implementation of strategies for the prevention and treatment of CVD consider the genetic, cultural, and environmental factors affecting CVD risk by ethnicity[30].

• As a prerequisite to achieving these priorities, it must be recognised and accepted that widespread awareness of CVD and risk factors, including social determinants of health, are essential conditions to better prevent, control, and manage CVD. This will necessitate increased investments in grassroots education and awareness campaigns, with a specific focus on the most vulnerable populations.

Conclusion

Our ambition is to ensure that, by 2030, the wider determinants of cardiovascular health will be addressed to ensure cardiovascular health equity. Our further ambition is to ensure that awareness of CVD issues will be sufficient so that everyone, everywhere will have the opportunity to engage in a system which provides equitable access to essential cardiovascular health services, spanning prevention, screening, early detection, access to treatment and rehabilitation and support.

Key domain 2: Fostering timely implementation of knowledge

"I want to talk to you about one of the biggest myths in medicine, and that is the idea that all we need are more medical breakthroughs and then all of our problems will be solved."
QUYEN NGUYEN

Introduction

Over the past 50 years, there have been some remarkable successes in cardiovascular medicine, particularly in Europe and in North America, where total cardiovascular mortality has declined by 50%[4, 66]. The implementation of proven public health and prevention interventions has accounted for slightly more than half of this decline, whilst the other 40-45% of this mortality decrease can be attributed to advances in treatments[4]. Still, the CVD burden remains high; chronic disease in general and CVD remain primary drivers of life expectancy gaps. New challenges arise: in particular, delays between data generation, publication, dissemination through consensus-based guidelines and, finally, adoption in daily practice and policy work hamper further successes as do issues of applicability.

This section addresses the need to close or at least to narrow the gaps between new scientific evidence and implementation in the real world and the need to achieve a commitment to implementation that is commensurate with the burden of CVD.

Context

Knowledge translation describes the process of transferring evidence from research into clinical practice or policy to ultimately improve patient outcomes. In CVD management, information and adoption gaps occur between researchers and end-users at every level: patients, clinicians, and policymakers[67, 68]. These evidence-practice gaps lead to both a lack of adoption of proven effective strategies (under-use), and to inappropriate use of strategies whose effectiveness and safety are not sufficiently documented (over-use)[68].

In real-life settings, this translates to a lack of awareness, treatment, and control of all major cardiovascular risk factors. Hypertension, for instance, is a condition that is easy to diagnose, easy to treat, and easy to control, but worldwide, less than one in two people with hypertension know they have hypertension, even less are treated, and control rates are only about 20%[69-72]. In Kenya, the prevalence of hypertension among adults aged 18-69 was found to be 24%. Yet among individuals with hypertension, only 15% are aware of their elevated blood pressure. And among those aware, only 26.9% are treated, and among these, only one in two are well-controlled[73]. As a result, less than 5% of individuals with hypertension in Kenya are properly diagnosed, treated, and controlled. The same applies to the rates of undiagnosed, untreated or poorly controlled high cholesterol in countries at all stages of development: in a study of eight countries, the proportion of those treated whose cholesterol levels were controlled ranged from only 4% in Germany to 58% in Mexico[35, 74]. As a further example, only around 10% of the approximately 34 million people affected by familial hypercholesterolemia (FH) worldwide know about their condition and are adequately treated. As a result, cardiovascular events often develop in men by 30-50 years of age, and in women by 40-60 years of age[75, 76].

Due to factors such as lack of awareness, lack of availability, accessibility, affordability or acceptability of recommended diagnostics or treatments, actual clinical practice also deviates often from guidelines[77, 78], resulting in both under- and over-treatment[67, 77, 79]. Clinicians only irregularly assess the absolute risk of a heart attack or stroke in the next 5–10 years and even when they do, it does not systematically guide their management decisions[77, 79]. As a result, even though the effectiveness of statins to decrease the risk of coronary heart disease is well-documented, statins tend to be under-prescribed, depriving patients of beneficial treatment[67]. By contrast, studies have shown that up to 75% of high-risk patients might not receive recommended medication whilst 25% of low-risk patients might be prescribed medications they are unlikely to benefit from[77, 79].

Even though it is known that high adherence to preventive therapy, including combination therapies, is effective in significantly reducing risk, between 30% and 50% of patients do not take their medications as prescribed[80].

Finally, at policy level, even though the effectiveness of measures such as tobacco bans, taxation of unhealthy products or *trans fat* bans or, conversely, of programmes promoting access to healthy food and exercise, are well-documented, their implementation worldwide has been very limited so far.

Challenges and opportunities

Almost 75% of CVD is attributable to modifiable risk factors[61] and the potential of prevention is immense. Primary and secondary prevention targeting the main lifestyle and biological risk factors for CVD at an individual level and using low-cost, generic drugs for high-risk populations is essential. Still, despite the effectiveness of such measures on cardiovascular health outcomes being accepted, their implementation is inadequate. The current lack of focus on implementing what has been proven to be effective represents a daunting challenge.

The disconnect between available evidence and patient awareness and behaviours is significant. There is a form of complacency among both lay people and some healthcare professionals: despite the evidence that most CVD is preventable, heart conditions are too often accepted as a "normal" consequence of growing older. There is confusion between what is statistical normality and biological normality ("healthy normality"). This often results in poor health-seeking behaviours: due to the lack of symptoms, patients do not seek help even when they need to. And even when they do and find they have a silent condition like hypertension, patients may also prioritise other things above buying their medication – people pay for what they value.

There is a significant gap between the evidence which is available and its adoption in clinical practice. Clinical practice lags several years behind research findings. Application of knowledge is, at best, patchy. The use of standardised treatment protocols is essential from a clinical viewpoint[81]. However, although robust evidence-based guidelines exist, clinicians tend to ignore their existence, do not clearly understand them, or do not implement them. A recent survey conducted by the World Heart Federation (WHF), for example, found that some of the main barriers to optimal patient care, particularly in

LMICs, were a lack of locally adapted guidelines and a lack of awareness or understanding of guidelines by healthcare professionals[69]. Respondents from higher-income countries found a lack of adherence to guidelines to be a hurdle[69]. Clinical guidelines are often lengthy and highly technical and are therefore not suitable for quick daily reference. Health professionals may also lack the technical knowledge to understand and apply these extended guidelines. Therefore, there are opportunities for simpler and high-quality protocols, training, and summaries for the daily practice of physicians, nurses, and, in general, all healthcare workers, ESC Pocket Guidelines being a good example.

The gap between patient needs and workforce availability is due to increase. The rise in NCDs is expected to generate demand for 40 million extra healthcare workers by 2030, entailing doubling the current workforce or completely changing the way healthcare works. A shortfall of 18 million healthcare workers, particularly in lower-income countries, is therefore projected[82]. As a result, the availability of clear and simple protocols, AI support and remote diagnostics, which can all facilitate task-sharing and task-shifting with a larger range of healthcare and community workers will be essential to ensure that interventions proven to be effective are implemented in an adequate and timely fashion.

Because of decades of trying to address a complex issue, fragmentation is a problem. This fragmentation runs through governments, healthcare providers and caregivers. It also runs through disease types: a holistic approach that encompasses unhealthy lifestyles, obesity, hypertension, cholesterol, and diabetes is not widely practised. In real life, patients affected by CVD are almost never treated for one single disease, and they take an average of 5-6 medications per day. Endocrinologists have their own priorities, so do cardiologists and diabetologists, often leading to fragmented care delivery, and reinforcing the need for a more integrated approach.

The gap between available evidence and its implementation at a policy level is also significant. Governments fail to grasp the size of the burden CVDs place on society. Even though CVDs are constantly presented as the main killer worldwide, there is no focused mission to eliminate CVDs, and if this will be the case there will be little innovation, little coordination, and little success. Policymakers still fail to realise that CVD prevention and management are not an individual responsibility but a collective political, economic, and social responsibility.

Recognition and implementation of concrete policies and recommendations to address the problem are missing in most regions of the world. For example, it is estimated that less than 1% of the more than $35 billion a year devoted to development assistance in health is spent on the prevention of CVDs[81]. Resources which go into the planning and financial backing of CVD policy are still insufficient for prioritising CVD. Similarly, legislation in many countries fails to reflect current evidence for protecting and promoting the cardiovascular health of their populations. In a positive trend, the European Union (EU) is currently looking into developing a CVD plan but there is still a long way to go.

Looking to the future, improved implementation of existing effective evidence-based drug therapies for CVD risk factors (hypertension, dyslipidaemia, atrial fibrillation for example) or combined in a polypill (fixed dose combination therapies), will have a greater impact on patient outcomes than most single new drugs, and is therefore a priority for tackling the global burden of CVD[68]. Clinicians and policymakers alike must urgently integrate the latest evidence. Additional opportunities will arise from strengthening inter-professional collaboration, notably with professionals dealing with diabetes, obesity, cholesterol, and hypertension to highlight the root causes of CVDs for people and to policymakers.

Finally, the recent COVID-19 pandemic has shown that the dissemination of research findings to clinicians who manage patients and to policymakers in charge of implementing policy interventions can be very fast. Replicating some of the tools and techniques used to accelerate knowledge dissemination and implementation during this global health crisis may be an opportunity to close or narrow the current evidence-practice gap in CVD policy and clinical management.

The way forward

The section above has depicted the situation today and outlined some of the main challenges that lie ahead of us on the path to better cardiovascular health world-wide.

To overcome these challenges, we propose focusing on selected actionable priorities:

• Address the failure to implement evidence-based proven prevention and treatments from both the policy and the clinical perspective. This includes:

  o Developing policies that create a favourable environment for implementation. It further includes ensuring that the sustainability of proven cost-effective interventions is considered a prominent policy priority.[83]

  o Fostering implementation research to identify context-specific best practices that will promote the systematic application of research findings and other evidence-based practices into routine practice(84). For example, this may be facilitated using routine data systems for research purposes and by providing tailored implementation frameworks and technical support.

  o Ensuring that the implementation of policies and programmes is tracked to monitor and measure their relevance and effectiveness.

• Facilitate fast and easy access to up-to-date accurate information to incentivise healthcare workers to provide quality care[85]. This includes ensuring adequate education and training opportunities for healthcare workers, and ensuring that robust, simplified protocols and guidelines are available to healthcare workers for use in daily clinical practice. A particular area of focus should be to ensure that all healthcare workers are trained on smoking cessation. This priority also entails facilitating the use of digital technologies to support fast and accurate knowledge dissemination and implementation among healthcare workers, policymakers, and patients. Finally, this priority includes the need to monitor gaps in access to information and services.

• Strengthen primary care and facilitate task-sharing and task-shifting through improved collaborative practices. Patient-empowering digital health technologies can alleviate the lack of workforce capacity, especially in low-resource settings, and help optimise workflows and task allocation, playing an instrumental role in achieving this goal.

• Facilitate the uptake of research findings in policymaking to establish new laws and regulations or improve existing policies. This entails developing mechanisms to ensure robust policy design with a strong focus on policy implementation, providing incentives for delivering quality care and fostering early stakeholder involvement. This priority involves the need to engage the cardiovascular community at the earliest stages of policy design.

• Address patients' lack of awareness and adherence by fostering increased patient engagement and empowerment. This includes, for example, co-designing solutions with patients and facilitating their adherence and control through fixed-dose combination therapies or polypills, as well as making combined, "beyond-the-pill" solutions available to patients. This also entails including patients in the design, execution, and evaluation of holistic public awareness campaigns on CVDs and risk factors for CVDs, such as World Heart Day.

Conclusion

Our vision is that, by 2030, the gap between the availability of preventive and curative measures and their implementation will be significantly lessened, and that measures and treatments that have been proven to be effective will be implemented more economically and with shorter delays.

Key domain 3: Leveraging innovation and technologies for cardiovascular health

"Universal health coverage cannot be achieved without the support of eHealth."[86]

WORLD HEALTH ORGANIZATION

Introduction

Innovation and transformation in healthcare are meant to facilitate the creation of efficient, effective, qualitative, safe, sustainable, and affordable solutions while promoting universal access to healthcare[87-90].

The management of diseases like tuberculosis or HIV and the impact of COVID-19 on the delivery of care are good examples to consider when looking at the opportunities and challenges innovation represents for cardiovascular health. The pandemic shed light on tensions between the number of people needing medical support and the number of people serving their needs. This has led to an increased demand for innovative treatments, treatment delivery methods and new technologies with people performing more self-measurements at home, and health professionals starting to manage patients at a distance.

As an example, amid the crisis, many chronic care and rehabilitation services across the globe were closed and patients had little access and the response was to go online. Some very imaginative developments happened in a very short time such as apps or health professional portals to manage patients virtually. This emergency contributed to an acceleration in the delivery of preventative care. It also empowered patients to take a more active role in their own health, by measuring and monitoring their weight and blood pressure. These crisis-induced developments are proof of the potential and ability of innovation and technology to deliver care.

Context

Innovation in new CVD medicines and related circulatory diseases, in particular obesity and diabetes is stalling; investments in research are lagging behind other disease areas, affecting innovation in cardiovascular treatments. In 2019, only two new CVD medicines with a new active substance were approved by the European Medicines Agency (EMA). In 2018, none were approved (compared to 11 for cancer and 21 for orphan medicines [91]. Aside from the need to develop drugs that can efficiently tackle CVD and related circulatory diseases, innovative drug delivery models that ensure a broader access to medications are urgently needed.

By contrast, innovation, and research in new technologies for CVD are thriving. According to the management consultant company McKinsey, health was one of the least automatable sectors[92]. Yet about one third of activities in healthcare can be automated, predominantly data-collection and processing. A 2020 analysis of over 60 recently FDA approved artificial intelligence- and machine learning-based medical devices and algorithms showed that one in four approvals related to cardiology, for example, in stroke detection on CT, ECG analysis support and cardiac monitoring[93].

Mobile health is also progressing swiftly. By the end of 2019, 66% of the global population were using a mobile phone, and 49% were using mobile internet[94]. Of these, 1.6 billion individuals used mobile phones to improve or monitor their health – an increase of over 900 million people since 2015. This includes remote diagnostic services and the distribution of health programmes via mobile technology to allow people to monitor their health and well-being[94]. In 2021 more than 350'000 health-related mobile applications were available to consumers – 90'000 more than in 2020[95], even if it is likely that only a minority of them are being used in practice. The global market for wearable healthcare devices market is expected to increase from 18.4 billion USD in 2020 to 46.6 billion USD in 2025[93].

Challenges and opportunities

Innovation and transformation in healthcare include new or improved technologies, products, reformulations, but also health practices, services, delivery methods such as polypills and policies (taxation of harmful products such as alcohol and tobacco, incentives, product labelling) that lead to improved health outcomes. Innovation can stem from the policy sector, private sector, and public health

or through medical, community, or individual-level approaches. Newly developed and rapidly evolving technology-based innovations are already playing an essential role in cardiovascular healthcare and will expand exponentially in the coming years. These include digital health services, wearables, smartphone-based apps, sensor-based technologies, big data and artificial intelligence, and machine learning as well as precision-health approaches[87-90]. Yet several challenges will need to be overcome to leverage the potential of innovation and technologies to improve cardiovascular health.

Even though new technologies, tools, and treatments can help diagnose problems, treat diseases, improve efficiency, and disrupt business models, the implementation of such novel treatments is not equitable, and there is a wide variation in the use of modern tools and treatments both within and among countries[96].

There is a significant gap between the availability and the use of digital technologies. Significant investments in digital health technologies have not yet been translated into solutions that have improved health outcomes. There is currently a disconnect between the number of technologies available and how much they are used by patients and supported by governments. There is also an imbalance between need and access. Even though mobile cellular networks now cover most of the planet[97], only 53.6% of all households currently have internet access. In emerging countries, this proportion is only 15%[98]. And despite the fact that mobile broadband (4G) networks already reach 84% of the population of LMICs, the mobile usage gap is seven times greater than the mobile coverage gap[99]. In many LMICs, internet-enabled handsets and data became less affordable due to the economic impact of the COVID-19 pandemic[99]. In the United States, just 17% of households earning less than $50,000 per year had tried virtual care, compared to 31% of households earning more than $100,000[100].

There are issues related to digital health literacy, different languages and dialects, how elderly people use smartphones, and how they cope with teleconsultations. There are also significant differences between young and senior doctors. Some are concerned they will lose their jobs due to technological advances through AI and automatic echo-machines. The health community must also learn to cope with rapidly evolving technologies and to quickly assess their potential negative and positive impacts both on the health of their patients and on their interactions with patients.

Issues related to data safety, data privacy, ways to collate information in health systems and to avoid isolated datasets are yet to be solved[93]. Although highly promising, the large-scale implementation of AI/machine-learning also faces issues, particularly in regulatory areas as well as everyday clinical practice[93]. Many countries today have national digital health strategies but most lack national digital health architectures, health information exchanges, and data standards.

Regulatory approval cycles and reimbursement criteria of new technologies are also barriers. For example, amid the COVID-19 crisis, remote monitoring was not reimbursed in some countries. Many regulatory authorities are not ready for these new technologies and processes.

Unfavourable regulatory frameworks negatively impact innovation in CVDs. The complexity, size, length, and cost of clinical trials are higher because assessments must be based on large populations. This has led some pharmaceutical companies to lower their priorities for developing CVD medicines or to even stop developing them as a result of this cost[91].

Only few digital cardiovascular health tools are scientifically validated. Scientific validation would enable those tools to confirm their benefit towards cardiovascular health, not intuitively, but rather, evidence-based.

Looking to the future, the rapid spread of new technologies, tools, and treatments can be a game-changer in preventing, detecting, and treating CVDs. Opportunities will arise, among others, through new forms of immunisation, such as mRNA-based universal flu vaccines, polyshots combining vaccines against influenza, RSV and SARS-CoV-2 or "vaccines" for other chronic diseases (hypertension, diabetes and dyslipidaemia), which could offer substantial cardio-protection, akin to established interventions such as statin therapy[101-103]; through wearable technologies which will help individuals monitor their own CV health and maintain their health by flagging risk factors and providing motivation to adopt healthier lifestyle; and through automation, big data analytics and AI which will lead to improved algorithm-based diagnostics and robotic surgery[92].

In addition, research and development in precision medicine and medically applied AI is rapidly advancing. By combining work in these areas, progress can be made towards precision health, bearing the potential to promote equity in cardiovascular health by using data on individuals' biology, lifestyle, and environment to improve prevention, diagnosis, and treatment of CVD.

The way forward

The section above has depicted the situation today and outlined some of the main challenges that lie ahead of us on the path to better cardiovascular health world-wide.

To overcome these challenges, we propose focusing on selected actionable priorities:

• Foster innovative approaches which can improve cardiovascular health services. This encompasses new or improved technologies, products, reformulations, health practices, services, delivery methods and policies. Depending on the setting, this can include, for example:

  o Innovative food policies, fiscal policies

  o The re-organization of tasks between healthcare providers (eg: task-sharing)

  o The routine integration of AI into CV healthcare and the use of big data to manage cardiovascular health at both a population and an individual level

  o The use of digital data to facilitate patient inclusion into clinical research trials

  o The use of hand-held echocardiography or the replacement of stethoscopes with ultrasounds

  o The use of new forms of vaccines for the secondary prevention of CVD

  o The use of 3D printing to produce polypills or structures with live cells or biocompatible polymers to create replacement valves and vessels, if not complete organs.

In all cases, this priority entails the need to adapt regulatory processes and reimbursement criteria to account for the specific needs of CVD research and for the rapid pace of innovation and technology in the fields of medical devices, software, 3D printing, nanotechnologies, and others.

• Foster patient engagement and empowerment through integrated digital technologies. This priority seeks to foster people's use of digital technologies to actively monitor their health as well as for compliance and prognosis purposes.

• Ensure that relevant home and mobile devices and applications are available, accessible and affordable to facilitate a transition from the current focus on diagnosis to a new focus on prevention, screening and early detection. Ensuring that affordable and simple systems, in particular through smartphones, are available for screening a wide range of risk factors such as high blood pressure, high blood glucose levels, or atrial fibrillation, is particularly important in low-resource settings where people cannot afford

expensive devices. This priority entails seeking collaboration with providers and manufacturers, in order to standardise the integration of reliable health apps and tools into mainstream smartphones and other wearable technologies. As a prerequisite, achieving this priority implies a strong commitment – both from governments and private actors – to bring high-speed internet to every citizen in the world.

• Remove geographical barriers to access by increasingly relying on virtual and augmented reality technologies, to provide teleconsultations with any medical specialists everywhere, including in the most remote communities. Teleconsultations with virtual teams, for follow-up appointments, must become a routine part of healthcare, saving both doctors' and patients' time. In addition, faster network connections between hospitals must enable experts in different places to collaborate during procedures — and even to operate on patients remotely. Ultra-high-speed internet should also be used to democratise the use of drones for medical purposes, for example to deliver medical supplies such as medications and defibrillators, in remote areas. This priority also implies that adequate reimbursement schemes are available for new services that rely on technology.

• Solve issues related to the use of health data. It includes ensuring that health data are integrated rather than being dispersed across settings with different standards and being owned by providers; rather, heath data are of individuals who can decide how their data is used and who can access them. It entails agreeing on standards and requirements that are applied by all healthcare providers to ensure the interoperability of health data that are well coordinated and comprehensively accessible. It further encompasses the need to conduct digital health tool implementation studies to confirm their clinical usefulness, scientifically based. Finally, it includes tackling concerns about data privacy and security through clear and transparent regulations.

[2](see also key domains 2 and 4)

Conclusion

Our ambition is that, by 2030, everyone, everywhere will be empowered to access all aspects of cardiovascular health prevention and control: screening and primary prevention, early detection, diagnosis, care and secondary prevention and rehabilitation through targeted use of innovation, technologies and digital tools supported by agile policies and financing mechanisms.

Key domain 4: Placing cardiovascular health at the heart of health and climate policies

"The future of health must be built on health systems that are resilient to the impacts of epidemics, pandemics and other emergencies, but also to the impacts of climate change, including extreme weather events and the increasing burden of various diseases related to air pollution and our warming planet [104],"

DR TEDROS ADHANOM GHEBREYESUS, DIRECTOR GENERAL, WORLD HEALTH ORGANIZATION

Introduction

Global climate change, chronic diseases and syndemics[3] are among the largest threats to humankind. Cardiovascular health is embedded in a much broader context of societal, environmental, and commercial factors. These interconnections are now known and better understood and dealing with CVDs in isolation is therefore likely to fail. Traditional biomedical models alone can no longer deal with CVDs effectively.

Collaboration across a broader range of sectors is necessary to reduce the burden of CVD. To avoid any further fragmentation, World Heart Vision 2030 must complement and reinforce other global health initiatives, in particular the Sustainable Development Goals (SDGs), the WHO 5x5 NCD framework, the Framework Convention on Tobacco Control (FCTC) and the objectives set by the Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC).

Now is the time to build up synergies and this section focuses on the integration of cardiovascular health into a wider context. Integration entails striking a balance between disease-specific approaches and others that are less CVD-specific but that, nonetheless, affect cardiovascular health. Urgently needed are coordinated approaches to enhance partnerships across sectors such as health, environment, urban planning, agriculture, development, and the private sector.

Context

Globally, over 70% of CVD cases and deaths – and even 80% in low-income countries – can be attributed to modifiable risk factors and could therefore be prevented. As a cluster, behavioural and environmental risk factors contribute most to deaths (26,3%)[61]. However, all have their roots outside of the field of CV health, and of health generally.

Tobacco – including primary smoking, second-hand smoke, and use of chewing tobacco - is the most significant cause of premature death in the world, causing 8.71 million deaths in 2019, 36.7% due to CVD[3]. Over the past 40 years, cigarette consumption has decreased in the WHO European and American Regions (minus 33% and 44% respectively). By contrast, it has increased by 65%, respectively 52% in the Eastern Mediterranean and African WHO regions, which include most low-income countries. Smoking prevalence in those countries is likely to keep increasing because of population growth, but also income growth, increased affordability, and aggressive marketing[105, 106]. The introduction of new nicotine products has also emerged as a new threat in the field of tobacco. Tobacco also has a negative impact on air quality, land use, and produces substantial toxicity to land and water ecosystems [107-109].

Food – contributes significantly to human health and environmental sustainability, however, food is currently a threat to both[110]. In 2017, according to the Global Burden of Diseases, poor diet accounted for 11 million of adult deaths and over 250 million DALYs globally[111]. Of these, the WHO estimated that some 3.9 million deaths worldwide were attributable to not eating enough fruit and vegetables for example [112, 113]. Suboptimal diets are also one of the main drivers for overweight and obesity, an important risk factor for cardiovascular diseases, which currently kill almost 3 million people each year[114]. Furthermore, food consumption is closely linked to planetary sustainability, and bears the potential to be a driver for a healthy planet and prosperity for all.

Insufficient physical activity, another leading factor for CVD, affects more than a quarter of all adults worldwide, women being generally more affected than men. In 2016, 37% of women in HICs were found to be insufficiently physically active, twice as much as in LICs (16%)[115]. More sedentary occupations and personal motorised transportation can explain these differences [115]. These behaviours are changing rapidly, notably due to rapid urbanisation in certain countries[115-117].

Additionally, people's lives and livelihoods are also increasingly affected by **climate change and air pollution**. Record temperatures in 2020 resulted in a

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3 "a co-occurring, synergistic pandemic that interacts with and exacerbates their existing NCDs and social conditions . The term "syndemic" was developed by Merrill Singer in the mid-1990s. Singer MC. A Dose of Drugs, a Touch of Violence, a Case of AIDS: Conceptualizing the SAVA Syndemic. Free Inquiry in Creative Sociology 1996;24:99-110.

new high of 3.1 billion more person-days of heatwave exposure among people older than 65 years and 626 million more person-days impacting children under the age of one[118]. During any given month in 2020, extreme drought affected up to 19% of the global land surface and warm temperatures throughout 2020 reduced the yield potential of the world's major staple crops with a negative impact on food security[118]. Temperature has a U-shaped association with CVD mortality. At usual temperatures below 20 degrees C, every 1 degree increase in temperature is associated with a 2 % *decrease* in CVD risk. At usual temperatures >20 degrees C, every 1 degree increase in temperature *increases* CVD by 5%. Mitigation strategies such as household ventilation, fans, and air- conditioning can help considerably.

In 2016, an estimated 12.4 million people died as a result of living or working in an unhealthy environment – nearly one in four deaths [119]. Globally, household air pollution from solid fuel use for cooking affects 2.5 billion individuals[120]. Nine out of ten people worldwide breathe polluted air, and those living in low-resource settings are disproportionately affected[11]. More than 20% of all CVD deaths are caused by air pollution — more than three million deaths every year — and these numbers will continue to rise unless the global community acts[11].

Further, an estimated 83% of the world's population and >99% of the US and European populations live under light-polluted skies[4][121] which can cause a moderate increase in systolic and diastolic blood pressure and an increased risk in coronary heart disease[122]. Noise pollution is also a growing issue. The European Environment Agency for instance recently estimated that long-term exposure to transportation noise (noise pollution) could result in 6.5 million people suffering from chronic sleep disturbance, 12,000 premature deaths, and 48,000 new cases of ischaemic heart disease per year in EU countries[123].

Overall, the health-related costs of climate change account for around one-third of the total costs of addressing the impacts of climate change[93].

Challenges and opportunities

CVD has reached a pandemic level but is not treated as one. Prevention and treatment are still approached from a traditional medical model (with a stronger focus on acute communicable diseases than on chronic non-communicable diseases) as many still fail

to understand the development of CVD across the life-course and its interplays with a broad range of factors that sit outside of health.

Efforts to reduce by one-third premature mortality from non-communicable diseases through prevention and treatment by 2030 are not on track to achieve SDG target 3.4. Succeeding will require a combination of prevention, early detection, and treatment. Successful strategies must include tobacco and alcohol control, detection and treatment of hypertension and diabetes, primary prevention of cardiovascular diseases in high-risk individuals[124] and secondary prevention in those with established diseases (including access to mental health services) without neglecting high quality care, including treatment of acute CVD in primary, secondary and tertiary care[124]. Opportunities for the CV health community will arise from playing a leading role in achieving this target, but also from contributing to several other goals and targets, such as reducing inequalities and poverty, or advocating for strong climate action. Similarly, other communities, including educators, urban planners, or environmental activists, must play a part in achieving goal 3 and target 3.4. In short, multisectoral work is required to advance towards the reduction of premature mortality in NCDs. Through the 2030 agenda, health is recognised as a prerequisite for achieving sustainable development in its three dimensions: environmental, social, and economic. Combatting inequalities regarding health and promoting cardiovascular health for everyone is thus an integral part of the global striving towards sustainable development.

> **Examples of SDG targets which directly affect CV health**
> • By 2030, end all forms of malnutrition (2.1)
> • By 2030, empower and promote the social, economic, and political inclusion of all (10.2)
> • Protect labour rights and promote safe and secure working environments for all workers (8.8)
> • By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management (11.6)
> • By 2030, provide universal access to safe, inclusive, and accessible, green, and public spaces (11.7)

The immense potential of robust population-based prevention remains largely untapped. Population-

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4 **Light pollution** refers to excessive, misdirected, or obtrusive artificial (usually outdoor) light. Source: https://www.globeatnight.org/light-pollution.php

based prevention encompassing societal factors, clean water and clean air policies, tobacco control, physical activity, and healthy diet, would be the most cost-effective way to make progress. Progress in diagnosis, genetic research and new CV drugs may help treat CVD in the future, but as the disease itself is largely preventable, more emphasis must be placed on lifestyle and non-pharmacological approaches to help people stay healthy.

Although the commercial determinants of health[5] are now well-identified, the implementation of adequate measures is still very limited. Solutions to implement effective primordial prevention often clash with corporate interests and will necessitate constructive discussions between public and private entities involved.[6]

Healthcare must avoid binary thoughts and adopt more holistic approaches. Common disconnections between the infectious diseases and the NCD communities fail to account for interplays between infectious diseases and CVDs. For example, the risk for heart disease has recently been shown to rise after COVID-19, even with a mild case (125). Similarly, heart conditions are being increasingly observed in HIV patients as they live longer and are therefore exposed to CVD. These factors necessitate stronger collaborations between CVD and infectious diseases professionals.

Climate change and air pollution and their impact on cardiovascular health is a new challenge that the CV health community urgently needs to address. Investments are needed in this field, which is one of the most pivotal areas for CV health. Recently, the 2021 Conference of the Parties (COP) to the UNFCCC has been ground-breaking for the global health community. Recognising that health, climate, and sustainability are intrinsically linked, health had, for the first time ever, been selected as one of three science priority areas, with an official presence of the World Health Organization (WHO). Breaking down the siloes that have too long divided the health and environment communities and developing concrete policy proposals for local, regional, and national implementation, will be essential to progress towards a healthy climate for healthy hearts.

Opportunities will arise from an alignment across disciplines and coordination across sectors. Additional opportunities may arise from the COVID-19 crisis, which has exposed the dramatic impact of NCDs,

particularly CVD, on COVID-19 patients. This has served as a reminder to politicians that CVD is a significant burden. Traditionally, health systems and political systems do not deal well with chronic problems and respond only to acute crises. COVID-19 has turned CVD into an acute situation, which may offer an opportunity. This pandemic has shown that priorities need to be rebalanced and the seriousness of CVD must be considered. It has also shed light on the interplays between infectious diseases and CVD, highlighting the need for more collaborative research and practice with infectious diseases specialists.

The way forward

The section above has depicted the situation today and outlined some of the main challenges that lie ahead of us on the path to better cardiovascular health world-wide.

To overcome these challenges, we propose focusing on selected actionable priorities:

• Reorient health systems from a current biomedical approach towards a more holistic approach to CVD, which offers a broader perspective that encompasses social, commercial, occupational, and environmental factors and should therefore increase cooperation with actors from other sectors. This includes the need to lessen the gap between spending on preventive and on curative measures (currently 3% vs over 90%[126, 127]). This priority encompasses the need to focus efforts on whole-person health by strengthening both interdisciplinary and intersectoral collaboration. Collaboration with other medical disciplines, both in infectious diseases and non-communicable diseases must be strengthened, and the siloes that have too long separated the cardiovascular health and environment communities must be broken down.

• Integrate CVD with other global health policy priorities (such as climate change and emergency preparedness) and initiate and lead concerted efforts towards achieving the goals and targets set in different global initiatives, including the UN SDGs, the WHO 5x5 framework, the Framework Convention on Tobacco Control (FCTC), the UNFCCC COP agenda and the WHO Global Air Quality Guidelines, with the ultimate ambition to progress towards healthy hearts in a healthy planet.

• Secure adequate funding for CVDs and their root causes at all levels: from governments, international institutions, and private actors. In particular,

5 a) unhealthy commodities that are contributing to ill-health; b) business, market and political practices that are harmful to health and c) global drivers of ill-health, such as market-driven economies and globalisation.
6 Such discussions should always include careful consideration to avoid any undesirable interference from private corporations, in particular from the tobacco industry.

governments are encouraged to leverage sin taxes to secure adequate funding. This priority encompasses the need to foster multi-stakeholder, cross-sectoral partnerships which recognise that public-private partnerships can be beneficial, whilst ensuring that all policymakers are aware of the potential harms of industry interference (in particular from the tobacco industry).

• Recognise the limitations of self-responsibility in making healthy choices. Time has come to acknowledge that changes in the environment to reduce the causes of CVD will help control CVD in the same way that improving sanitation led to a better control of infectious diseases[24]. Achieving this priority means that the urgency of creating supporting environments and settings is recognised.

• Substantially increase investments in primordial prevention to tackle all social, environmental and commercial determinants of cardiovascular diseases[128], notably by regulating the availability and accessibility of unhealthy products and by promoting the availability and accessibility of healthy products. This priority entails the need to consider not only short-term budget impact of measures taken, but also longer-term costs and savings – prevention is considered as an investment rather than a cost. This priority encompasses the need to equip doctors, cardiologists, and other healthcare professionals, as well as organizations on the ground, with health advocacy skills. In particular, addressing this priority includes:

  o Recognising that the adverse health effects of pollution exposure can be seen, even at the lowest, observed levels of pollution concentrations and implementing the latest WHO guidelines on Air Quality[129]. This entails implementing ambitious programmes to reduce air pollutant emissions across sectors such as transport, energy, industry, agriculture, housing[130]. Additionally, this includes recognising that indoor pollution from unclean fuel use for cooking and heating is as important as outdoor pollution.

  o Recognising the critical role of tobacco control in ensuring sustainable health systems and in addressing climate change and the future of agriculture and food security. This entails strengthening efforts to implement FCTC.

  o Supporting transformation towards healthy diets to account for the fact that diets rich in plant-based foods and with fewer animal source foods are beneficial for both human health and the environment and are a step toward achieving the SDGs and the Paris Agreement[131, 132]. This

entails encouraging the development of local dietary recommendations based on the principles of a planetary healthy diet and fostering their implementation in public settings such as schools and healthcare institutions.

  o Developing effective policies to foster physical activity such as providing cycling and walking infrastructure, sports and recreational facilities, and opportunities for physical activity in public open spaces and parks, in workplaces, and in other community settings[115-117].

  o Developing effective policies to foster healthy home, workplace, and school environments.

  o Effectively regulating the marketing, availability, and pricing of unhealthy commodities.

Conclusion

Our expectation is that, by 2030, the current biomedical approach to managing CVD will have been replaced by a holistic approach that will facilitate multi-stakeholder partnerships involving state actors, NGOs, industry and civil society members across sectors such as communicable and non-communicable diseases, environment, agriculture, urban planning, education, and development.

CALL TO ACTION: developing an inclusive, society-wide, government-wide approach to cardiovascular health

As described in the four key domains of this report, the story of heart disease is a story of gaps, divides and disconnects: there are cardiovascular health disparities between rich and poor, between those with access to quality education and those who have no options for education and development, between affluent and poorer countries. Access to cardiovascular treatments and care is not equitable. The gap between the available workforce and the needs of the patient population is growing. The digital divide exacerbates inequities in self-monitoring and care, access to treatments, and CV outcomes. Globally, there are alarming gaps in awareness, many people have no knowledge of CVD risk factors or of their own cardiovascular health status. The impact of CVDs on societies and the political attention and funding they receive, are also at odds. Information between patients and health professionals as well as between health professionals and policymakers, is asymmetric. Professionals who work in CVDs and those who work in other NCDs as well as in infectious diseases are often disconnected from each other. So

are the cardiovascular health and the environment communities. In short, there is currently a chasm between what should happen and what does happen to promote cardiovascular health in populations and to prevent and control CVD in individuals.

To achieve our goal of "cardiovascular health for everyone," we must close gaps and transcend divides. We need to recognise the extent of the problem and address it with the attention it deserves. We need to focus on whole-person health and join forces in a society-wide, government-wide approach in which everyone, young and old, man or women, layperson, health professional or policymaker, physician, or community health worker, public or private actor, pharmaceutical, medical device, or tech provider, has a part to play. We need to allocate the right resources to the right patient, at the right place and at the right time. To ensure cardiovascular health for everyone means also addressing the challenges of neglected diseases. All sectors who influence health delivery and policy-setting must invest more in capacity for care provision, training, and awareness drives. Multi-stakeholders must partner and collaborate closely to identify and promote the tools for prevention, detection, and treatment access.

To elevate the prevention of CVDs on the global health agenda, and to actively engage all stakeholders, a broad vision for collaboration and partnership is essential. Recognising that multi-stakeholder partnerships are critical, governments, the private sector, non-governmental organizations, and civil society across sectors such as health, environment, agriculture, education, and development, are called upon to work together. Multistakeholder partnerships play an important role in bringing about policy changes, pooling resources, and creating innovative solutions by leveraging each partner's strengths[133]. Such approaches will be the most effective way to approach issues such as policy design, pricing, quality, efficiency and provision of specific services, access to medicines and technological innovations.

Therefore, governments are called upon to:

- Invest in the strengthening of healthcare systems as a whole and allocate a sufficient proportion of these resources to the prevention and control of CVDs, including neglected cardiovascular diseases.
- Promote and develop policies that support cardiovascular health, follow the scientific evidence, and are free from conflicts of interest.
- Invest and develop public health policies with the

aim to promote cardiovascular health for everyone and prevent CVD in both risk groups and the entire population. This in turn requires a multisectoral approach to enable healthy lifestyles spanning physical activity, nutrition, tobacco smoking and air pollution.

- Adopt and implement national plans and strategies that encompass primordial prevention in populations, screening and primary prevention, early detection, diagnosis, access to treatment and care, secondary prevention and rehabilitation and support after a CVD event.
- Adopt and implement health-related international resolutions, conventions, and initiatives, in particular the UN SDGs, the WHO 5x5 framework, the FCTC, the UNFCCC COP agenda and the WHO Global Air Quality Guidelines.
- Respect the right for everyone to be able to access essential cardiovascular health services, covering screening and primary prevention, early detection, diagnosis, access to treatment and care, secondary prevention and rehabilitation and support.
- Broaden the workforce beyond physicians and nurses and delegate effective, simple, proven strategies to those who can handle them to optimise workflows. This can include removing legislative barriers related to scope of practice (eg: authorisation to prescribe)
- Remove any barriers such as financial and legal ones to innovation and development for CV drugs.
- Promote cross-sectoral approaches to CVDs that consider the SDGs and climate change issues.
- Remain watchful of the potential harms of industry interference, in particular of the tobacco industry.
- Allocate sufficient resources to basic education in recognition that awareness and empowerment imply a sufficient level of health literacy.

Health professionals are called upon to:

- Strengthen their engagement in preventing and combating CVDs.
- Bridge the current evidence-practice gap that characterises CVD management. Engagement is fostered through adequate access to training opportunities, through task-sharing and task-shifting, and robust access to adequate digital technologies.
- Deliver optimal prevention, detection and treatment services to their patients that follow scientific evidence and are free from conflicts of interest.
- Engage actively in the prevention, detection, and treatment of all CVDs, including neglected cardiovascular diseases.

- Learn from those living with CVD and at risk for CVD.
- Tighten collaboration with communities focusing on other preventable chronic conditions such as diabetes.
- Tighten collaboration with the infectious disease community to acknowledge the interplays between CVD and infections.
- Tighten collaboration with the environment and climate community.
- Become health advocates.

Civil society is called upon to:

- Form patient communities to make their voice heard. Patient communities in other diseases, such as diabetes or obesity, are called upon to integrate CVDs in their priorities, and vice-versa.

- Advocate for the implementation of measures at local, national, or global level. This can include, for example, nutrition, demands for food reformulation, for healthy meals in schools and other public settings; for tobacco, demands for bans and taxes; and for air quality, demands such as active architecture and transportation, investment in clean sources of energy and transport, and stricter emissions controls(11).

- Include cardiovascular health considerations in all advocacy messages and demands. This applies particularly to groups working outside of health, such as environmental and climate change groups, clean energy, urban planning, food sustainability or active transportation advocates.

The private sector, in general, is called upon to:

- Contribute to the fight against CVD, and not to its development, according to their own resources, capabilities, and expertise.

- Reorient activities and products to ensure their compatibility with a healthy body, healthy heart, healthy life, and healthy planet.

- Prioritise people over profits.

The pharmaceutical, med-tech and medical device industry, in particular, is called upon to:

- Develop a broad vision of access to essential and proven therapies.

- Develop a holistic approach based on the needs of real-life, often multi-morbid, patients.

- Engage actively in delivering solutions to prevent, detect and treat all CVDs, including neglected cardiovascular diseases.

People and patients are called upon to:

- Move from a passive role to a central, pro-active role, taking control of their own cardiovascular health and demanding policy environments that allow them to live a heart healthy life.

- Engage in preserving their own cardiovascular health and taking more control of their health readings. This is fostered through increased awareness and education, equitable access to information, diagnostics, treatment and care, and equitable access to digital technologies. Patient-centredness and trust relationships between patients and healthcare workers further facilitate behaviour change.

The academia, research and education community are called upon to:

- Further our understanding of the epidemiology of CVD, its aetiology, incidence, clinical course, and prognosis in understudied populations around the world to inform national strategies for prevention and control.

- Transform observational and interventional studies to account for real-life patients treated for several conditions and for differences across sexes and ethnicities while considering genetic, cultural, and environmental factors affecting CVD risk.

- Increase collaboration with patients and be more inclusive of patients in their research and scientific communications.

- Initiate multinational knowledge translation (science implementation) studies, which will close the gap between what we know and what we do for CVD prevention.
- Promote lifelong medical education and training opportunities in the field of cardiovascular medicine.

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