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# The human functioning revolution: implications for health systems and sciences

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## Abstract

The World Health Organization (WHO) concept of human functioning represents a new way of thinking about health that has wide-ranging consequences. This article explicates this paradigm shift, illustrates its potential impact, and argues that societies can profit by implementing functioning as the third indicator of health, complementing morbidity and mortality. Human functioning integrates biological health (the bodily functions and structures that constitute a person's intrinsic health capacity) and lived health (a person's actual performance of activities in interaction with their environment). It is key to valuing health both in relation to individual well-being and societal welfare—operationalizing the United Nations Sustainable Development Goal (SDG) 3 principle that health is a public good. Implementing functioning as defined and conceptualized in the International Classification of Functioning, Disability and Health (ICF) could profoundly benefit practices, research, education, and policy across health systems and health strategies and help integrate health and social systems. It also offers a foundation for reconceptualizing multidisciplinary health sciences and for augmenting epidemiology with information derived from peoples' lived experiences of health. A new interdisciplinary science field—human functioning sciences—itself holds the promise to integrate research inputs and methods from diverse biomedical and social disciplines to provide a more comprehensive understanding of human health. To realize these opportunities, we must address formidable methodological, implementation, and communication challenges throughout health systems and broader society. This endeavor is vital to orientate health systems toward what matters most to people about health, to unlock the societal economic investment in health that is essential for individual and population-level well-being, and to drive progress toward achieving the SDGs.

## KEYWORDS

functioning, health, well-being, health system, sustainable development goals

## Key points

- The concept of human functioning integrates biological health (the bodily functions and structures that constitute a person's intrinsic health capacity) with lived health (a person's actual performance of activities in interaction with their environment).
- Functioning is the bridge that links health to individual well-being and societal welfare—thereby accounting for the value of health and potentially unlocking investment and progress toward achieving United Nations Sustainable Development Goal (SDG) 3.
- A paradigm shift implementing human functioning as the third indicator of health (complementing mortality and morbidity) could profoundly benefit practices, research, and policy across health systems and health strategies.
- Functioning also provides a basis for reconceptualizing multidisciplinary health sciences; a new interdisciplinary science field—human functioning sciences—itself holds promise to integrate diverse research inputs and methods to provide a fuller understanding of human health.
- To realize the opportunities offered by this rethinking of health we must address formidable methodological, implementation, and communication challenges within health systems and society.

## Introduction

At the core of the United Nations' 2030 Agenda for Sustainable Development adopted in 2015 are the 17 Sustainable Development Goals (SDGs) that provide a “blueprint for peace and prosperity for people and the planet, now and into the future”. Among these goals is SDG3 Good Health and Well-being: “To ensure healthy lives and promote well-being for all at all ages” (1). Progress in the implementation of SDG3 is measured in terms of targets to reduce mortality and morbidity through public health measures and health system strengthening. These targets are interdependent and consistent with the other Goals that seek global agreement and concerted action on fundamental 21st-century development concerns, such as global poverty, hunger and inequality, environmental degradation, and weakening institutions. In recent years, the global situation has been made more dire by the COVID-19 pandemic, growing pressure on health services, and increased disparities in health outcomes between and within countries (2).

Academic discussions regarding SDG3 have criticized the adequacy of the indicators of mortality and morbidity (3–5), but little has been said about the purported link between health and well-being. Scholars standardly distinguish subjective from objective well-being: the former is analyzed into a composite of positive affect and cognitive evaluation or life satisfaction (6) and the latter either as a capability, the material conditions to achieve an individual life goal (7), or more generally as an opportunity to flourish (8). Yet there is general agreement that health is either a component or a determinant of individual well-being. There is also

agreement that the provision of healthcare and public health are public goods that contribute to overall societal welfare. By contributing to individual well-being in the aggregate they enable everyone to realize their potential, thereby enhancing productivity, increasing social opportunity, and reducing inequalities, thus improving societal welfare (9, 10).

The wording of SDG3 nonetheless poses a challenge: why should we think that a robust public health and healthcare system that extends life and decreases the incidence of diseases, injuries, and other health conditions will alone significantly improve individual well-being and societal welfare? After all, living a long time is not necessarily living well: data suggest that living longer can mean living in worse health (11), and while the absence of disease and injury may be necessary, it is not sufficient for human flourishing or societal welfare. There is something else that health contributes. Intuitively, while living longer without diseases and injuries is obviously relevant to well-being, a key driver of both individual well-being and societal welfare is being able to do and become what we wish—achieving our aspirations, goals, and values and in general acting in ways that make our lives worth living. If we are to take seriously the claim that there is a bridge between health and individual well-being and societal being, we need to fundamentally rethink why health is important to us or, more precisely, what actually matters to us about our health.

The World Health Organization (WHO) has initiated just such a rethinking. WHO collects international comparable health information, understood biomedically and standardized in terms of the International Statistical Classification of Diseases and Related Health Problems (ICD) (12). This information is used to monitor the health indicators of mortality and morbidity. In recent decades, WHO has argued that another body of health information that is equally important both for clinical and public health must be systematically collected and used across all components of the health system. Conceptually, this is information about how a person's health state affects their daily life, i.e., information that describes the actual lived experience of health. In 2001, WHO released its International Classification of Functioning, Disability and Health (ICF) to operationalize this concept by capturing these essential data in an internationally comparable way (13).

The concept of human functioning—WHO's technical term—is at the core of the ICF. Functioning includes the functions and structures of the body that constitute the intrinsic health capacity of a person as well as the actual performance of simple and complex activities in interaction with the person's physical, human-built environment and social environment. In other words, functioning comprises the domains of both biological health and lived health, where lived health is fully contextualized as an outcome of interactions between a person's intrinsic health capacity and features of their environment (Figure 1). Across the lifespan, all of us experience pain, anxiety, fatigue and weakness, tight joints, skin sores, and other sensory, mobility, and cognitive impairments. These experiences are what matters to us and why we seek out healthcare in the first place. When we find that we cannot climb stairs painlessly, walk as far as we used to, clean or dress ourselves, read a book, make and keep friends, do all the homework we need to do, or perform our jobs, these concrete, real-life difficulties are the

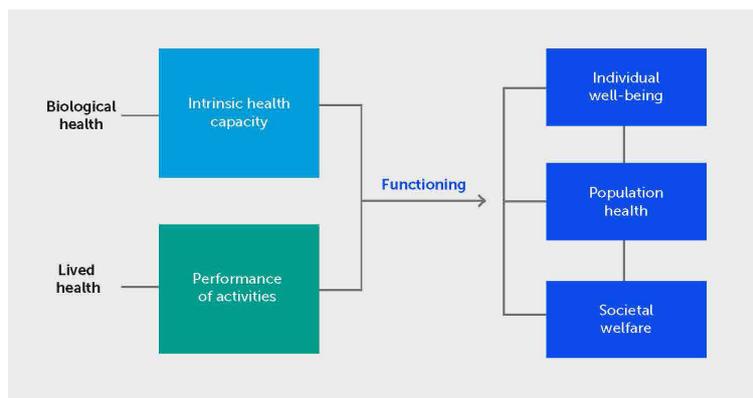


FIGURE 1

Human functioning is the bridge that links health to individual well-being and societal welfare. Functioning incorporates biological health (the physiological and psychological functions and anatomical structures of the body that constitute the intrinsic health capacity of a person to perform human activities) and lived health (the individual's actual performance of activities in interaction with their actual physical, built, and social environments). Functioning—both capacity and performance—is the bridge between health and individual well-being: objective human flourishing or subjective happiness and cognitive satisfaction. Functioning also drives overall population health and societal welfare. This link to individual well-being and societal welfare constitutes the value of health for individuals and society at large, operationalizing the underlying principle of SDG3 that health is a fundamental public good.

lived experience of health. Complementing the traditional biomedical understanding of health, this essential component of lived health creates a more meaningful operationalization of what health means to us.

WHO's concept of human functioning, we argue, constitutes a rethinking of health: a new understanding and conceptualization of health with wide-ranging consequences. Although domains of functioning have been used in health outcome measures for decades, this application does not fully capture the power of the concept of functioning. Functioning is not simply an outcome of health; by capturing the lived experience of health it is conceptually intrinsic to health and accounts for the value of health both for individuals and society at large.

From a public health perspective, functioning augments the biomedical view of health measured in terms of the indicators of mortality and morbidity. Functioning constitutes WHO's third health indicator of health (14). Avoiding premature mortality and controlling morbidity are obviously important to us, as individuals and as society at large, but only to the extent to which they are conducive to enhanced functioning and so better health. Population aging (15), adding more years to our lives, underscores the equal importance of adding more life to our years (16). The increased prevalence of non-communicable diseases and chronic health conditions—which lead to a decline in functioning—is concerning, and from the perspective of society they warrant increased investment in prevention and cure. But the impact of these trends also points to the need to prepare our healthcare systems to focus on optimizing functioning (17). Moreover, operationalizing health as human functioning completes the picture of health envisaged by SDG3 by explaining why health is a driver of individual well-being and, in turn, why population health contributes to societal welfare.

This article explicates more fully WHO's notion of human functioning, illustrates its potential impact on health and society at

large, and argues that societies can profit by implementing functioning systematically as the third indicator of health. Specifically, we first explain functioning as a rethinking of health, one that more clearly exposes the conceptual and empirical link between health and both individual well-being and societal welfare. Secondly, we illustrate the implications of this paradigm shift across all components of health systems and other social systems. Finally, we outline the broader scientific and social opportunities as well as the formidable methodological, implementation, and communication challenges that this new thinking about health entails.

## Human functioning as the new thinking about health

James Fries' seminal 1980 article highlighting “compression of morbidity” might in retrospect be seen as an important starting point for raising awareness of the need to assess the successes of preventive, promotive, and curative health interventions in terms of people's actual lived experience of health (18). Fries was in effect pointing to the need for a new outcome measure that captures what people actually care about when it comes to their health. Fries was one of the first to signal the importance of assessing health interventions and health states in terms of people's daily lived experiences. Since then, outcomes research has flourished, relying on a myriad of measures, from the Health Assessment Questionnaire (HAQ) that Fries himself was involved in to a variety of “functional status” measures: the Sickness Impact Profile (SIP), Nottingham Health Profile (NHP), Medical Outcomes Study Questionnaire Short Form 36 (SF-36), WHO's own Disability Assessment Schedule (WHODAS 2.0), and many others. The application of the functioning perspective has also informed health and social policy, most significantly in the development of econometric tools such as the Global Burden of Disease (19).

Recognizing the salience of the lived experience of health in people's lives was the starting point of a rethinking of health incorporated into WHO's development of the ICF. The foundational premise was that human functioning was not simply a consequence of health conditions such as diseases and injuries, but was actually *constitutive* of the lived experience of health states. More significantly, it was recognized that, as experienced, functioning is the result of complex interactions between intrinsic bodily states and the external world—the environment in all its dimensions. More recent work has emphasized that functioning incorporates two fundamental health phenomena, which can be called biological health and lived health (20). Biological health comprises all physiological and psychological functions, anatomical structures, and, by virtue of these functions in various combinations, the resulting “capacity” of the person to perform all human activities, from the very simple to the very complex. Lived health, while grounded in biological health, goes beyond it to include the actual performance of activities in the physical, human-built, attitudinal, and social environments that constitute the person's complete lived context. These environmental factors may make it harder to perform activities (e.g., poor air quality, inaccessible physical environments, or stigma and social exclusion) or easier (e.g., assistive technology, accessible buildings, supportive attitudes, and social arrangements) (21). The notion of functioning in effect brings health down to earth to the practical, everyday experience in which all of us live with health-related reductions in our capacity to carry out activities and, given the demands and assistance provided by environments in which we live, how we actually perform these activities.

This, then, is the revolution in our understanding of health represented by the notion of human functioning: from the perspective of lived health, the actual performance of activities in one's actual environment, functioning constitutes the bridge between biological health and our well-being, understood either as an objective good—human flourishing—or subjectively as happiness, both affective and cognitive. There is qualitative evidence in support of this proposition (22), but it is also highly intuitive: people care about their health when it impacts their lives, their ambitions, their plans, and their happiness. Well-being is achieved through functioning, and so health is a driver of well-being. In short, the ICF notion of functioning is the key to understanding the value of health in terms of individual well-being and societal welfare (21), operationalizing the underlying message of SDG3 that health is a fundamental public good.

## Implications for health systems and society at large

The novel conceptualization of health in terms of human functioning, operationalized by the ICF classifications, could profoundly change practice, education, research, and policy across health systems and wider social systems. It is difficult to precisely map all these implications since health systems are

complex adaptive systems (23). And each of these areas face implementation challenges that are unique to them, and often formidable: there is not enough research, the science is simply not there, relevant technologies are unavailable, and there can be economic and political obstacles that get in the way. That said, ongoing work provides insight into what we can expect.

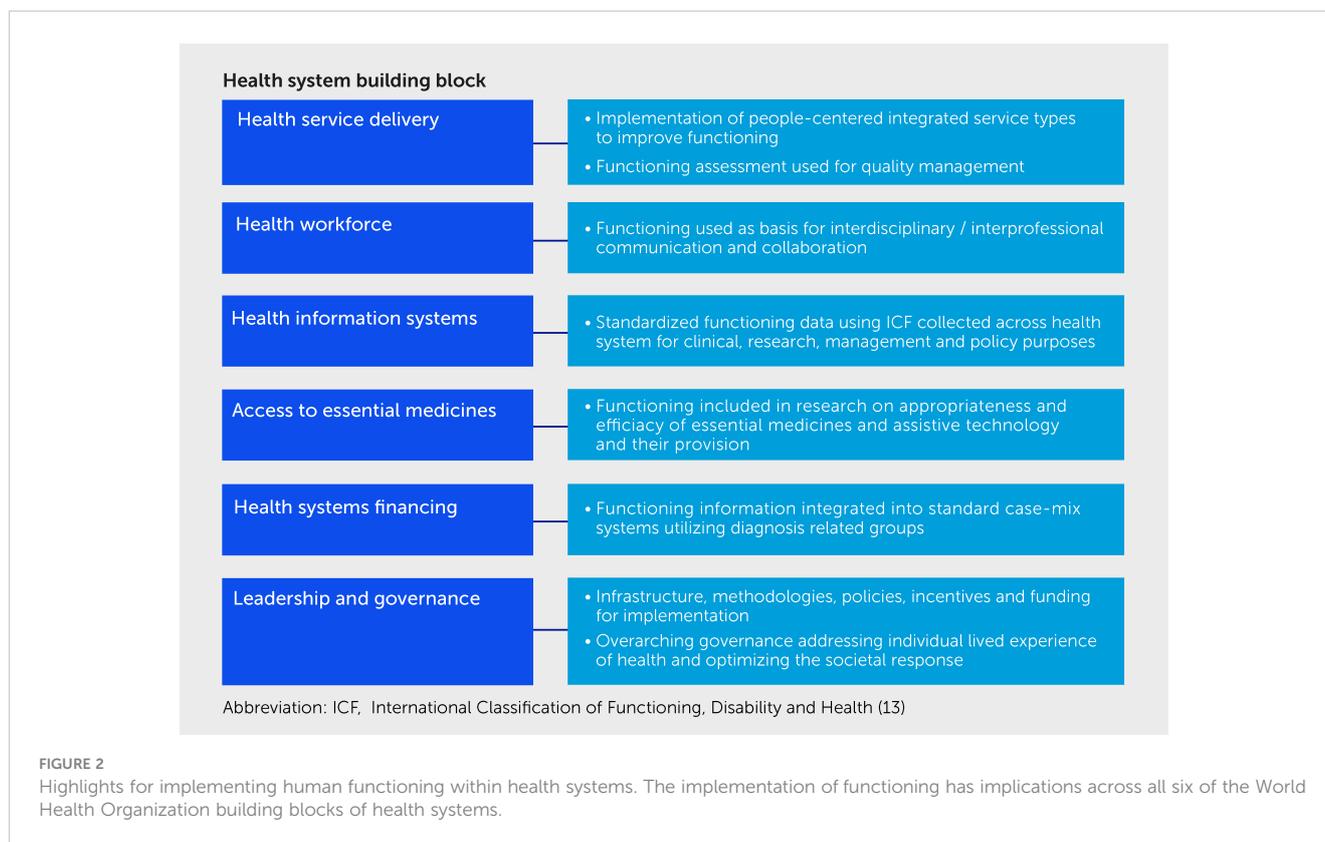
## Integrating human functioning across health system building blocks

The implications of functioning across WHO's six building blocks of health systems are shown in Figure 2 (24), and an overview of use cases of functioning information across these six functions of the health system is displayed in Table 1. Rather than discuss the role of functioning in each function, we take a step back and focus on WHO's own interest in formalizing the classification of functioning.

From WHO's perspective, ICF is most relevant to the health information component of health systems, complementing its two other data classifications, ICD and the International Classification of Health Interventions (ICHI) (37), which together allow for the routine collection of data concerning all three indicators of health status—mortality, morbidity, and functioning. To be useful at all levels of the health system—i.e., to health professionals, managers, policymakers, and global health agencies—health information must not only be reliable but comparable and thus standardized and interoperable.

Considerable advances have already been made to standardize human functioning data for optimal use across the health system, using ICF as a reference system for routine reporting of functioning information for clinical, research, management, and policy purposes. Considerable effort has gone into developing and validating ICF-derived ICF Core Sets for perspicuous reporting of functioning for many health conditions and application areas (38) as well as minimal generic sets for basic health data reporting requirements (39–41). The ICF is widely used in the development and validation of both specific and general measurement instruments that can be tailored for clinical use (42, 43), as well as population-level data collection questionnaires and clinical intervention monitoring and quality management. Linking rules have been developed that map data on functioning collected with any standard patient data collection tool—HAQ, SF-36, and Functional Independence Measure (FIM)—onto ICF categories (44–46). These and other developments give us confidence that applications of functioning information in the context of health will not be confronted with unsurmountable methodological obstacles in the future (30, 47).

But the recognition of the importance of the concept of human functioning has implications beyond health information encompassing every other component of the health system (Figure 2). Leadership and governance provide oversight, regulation, and design of health systems, including setting priorities, scaling up interventions, and implementing sustainable and accountable policies. For example, WHO has argued, health systems governance has the responsibility to create the



infrastructure, methodologies, and financial support to ensure the systematic collection and use of functioning information in order to move beyond a purely biomedical understanding of health to one that more fully reflects societal requirements (33, 48). Among other things, the COVID-19 pandemic showed the importance of governance to fully address the individual lived experience of this pandemic (35). Functioning also directly impacts service delivery, both in terms of analysis of service types (25, 49, 50) and as a basis for quality management (26, 51, 52). In the case of the health workforce, one of the first applications of the ICF was to provide a “language” in which interdisciplinary teams of health professionals could communicate (28, 53). It is a common theme that interprofessional collaboration, demanded by increasingly complex treatment plans that cross health disciplines, is often stymied by communication obstacles that a functioning-based common language can remove (54). This is particularly relevant to WHO’s consistent call for “people-centered healthcare” (55), which encourages health professionals and healthcare systems to ensure that services are designed and delivered in ways that are directly relevant to people’s lived experiences. The appropriateness and efficacy of many essential medical products and certainly all assistive technologies depends on the degree to which they contribute not merely to survival or patient satisfaction, but also to improvement in functioning, as is increasingly being recognized (56). Finally, for health financing, adding functioning information into standard case-mix systems utilizing diagnosis-related groups improves the capacity of these financing structures to capture the differences in patient needs for services in the acute care setting and influence financial priorities (34).

## Human functioning and the health strategy of rehabilitation

Functioning is relevant across all five of the health strategies (14). Health promotion and disease prevention need information on biological health to create and provide public health interventions. The curative strategy depends on information about biological health for treatment planning and information about lived health for outcomes to assess treatment efficacy. Palliation relies on appraisals of levels of functioning to make sense of quality of life near and at the end of life. But it is the health strategy of rehabilitation that depends most strongly on functioning information; indeed, functioning is at the core of the *raison d’être* of rehabilitation.

The ICF has fundamentally transformed our understanding of the aim and rationale of rehabilitation. The ICF insight that at the core of health is an experience shaped both by states of the body and mind and by features of the person’s environment and personal attributes is directly aligned with the core aim of rehabilitation. Accordingly, rehabilitation professionals were quick to recognize the significance of the notion of functioning as a core element of rehabilitation science and practice. Although rehabilitation traditionally relied on cognate terms such as “functional loss,” “functional limitation,” and “functional incapacity,” it was only after ICF was introduced that it was possible to succinctly define rehabilitation as the health strategy that aims to optimize patients’ functioning in the context of their personal capabilities and in interaction with the physical, human-built, attitudinal, and social environment (17, 20, 50, 57–61).

TABLE 1 Human functioning information in the World Health Organization's six building blocks of the health system.

Building block	Use case	Context	Description	Key reference
Health service delivery	ICF implementation in clinical quality management for rehabilitation	Malaysia and Europe	Europe: the ICF has been used to categorize rehabilitation service types and clinical assessment schedules to identify patient groups for quality management since 2015, under leadership of the Physical and Rehabilitation Medicine Section (PRM) and Board of the UEMS Malaysia: the Department of Rehabilitation Medicine at the University of Malaya Medical Centre, Cheras Rehabilitation Hospital of the Ministry of Health, and the Social Security Organisation Rehabilitation Centre together initiated a similar project in 2017	(25–27)
Health workforce	ICF implementation by multiprofessional rehabilitation teams	Switzerland and Europe	Switzerland: an ICF-based framework was proposed in Switzerland to guide the rehabilitation process by facilitating interaction between health professionals and the patient Europe: UEMS-PRM developed the Individual Rehabilitation Project for Europe (EUR-IRP), a multi-element, person-centered rehabilitation management scheme in which rehabilitation is provided by a multiprofessional team	(28, 29)
Health information systems	ICF-based and interval-scaled standardized reporting system (StARS) for functioning information to optimize current national practice for quality improvement in rehabilitation clinics	Switzerland	StARS has been used for national quality reports for neurological and musculoskeletal rehabilitation in Swiss rehabilitation clinics; the common metric made it possible to compare data between clinics that use different assessment tools and to calculate the valid change scores for patients between hospital admission and discharge	(30)
Access to essential medicines	ICF-based model applied to assistive technologies and as outcome measure in rheumatology	International	Essential medicines include assistive technologies (AT), which are environmental factors in the ICF and the goal of the “biopsychosocialtech” approach was to achieve an individualized and customized solution to people’s AT needs In the context of rheumatology, the ICF was introduced as an outcome measure reference system in the 8th meeting of OMERACT in Malta	(31, 32)
Financing	Value of integrating functioning information in reimbursement systems and stakeholder perspectives	Germany	To investigate the value of integrating functioning information into case-mix reimbursements systems in Germany, a study collected data from experts on the DRG systems to identifying potential benefits and costs Literature suggests that integrating functioning information into case-mix reimbursement systems improves predictive ability and fosters homogeneity in case-mix groups with respect to costs and length of stay	(33, 34)
Leadership and governance	Functioning information and the case of missing COVID-19 data	International	As the COVID-19 pandemic shows, data on mortality and morbidity must be complemented by data on functioning to inform evidence-based public health delivery and planning; the Clinical Functioning Information Tool (ClinFIT) for COVID-19 is an ICF tool for collecting data on the pandemic As a syndemic, the COVID-19 pandemic involves a complex interaction of health and social forces; the ICF is optimal for capturing these impacts	(35, 36)

ICF, International Classification of Functioning, Disability and Health; OMERACT, Outcome Measures in Rheumatology; UEMS-PRM, Physical and Rehabilitation Medicine Section and Board of the European Union of Medical Specialists.

For rehabilitation practice and science, the concrete implementation of the ICF has primarily meant integrating functioning information into existing health information systems as an important way to advance WHO's Rehabilitation 2030 Initiative aimed at strengthening rehabilitation in national health systems (62). Technical developments and guidelines (20, 63) help to identify, for particular rehabilitation interventions or services, what ICF domains to use, how to link existing data collected from standard questionnaires, measures, and instruments to ICF domains, and how to quantitatively align scoring systems from different instruments into a single common metric (30, 47) to provide standardized and internationally comparable functioning information. Although much additional technical and implementation research is required, and many practical challenges have yet to be overcome, or even identified, enough has been accomplished in the last decade to begin the development of guidelines for applying the ICF as a standard reference language

for reporting rehabilitation interventions in the clinic and in research studies.

## Societal gains from human functioning

Rethinking health in terms of human functioning can underpin economic arguments supporting and defining adequate levels of social investment in health and healthcare. All countries are concerned about health systems performance and the economic efficiency of healthcare service delivery, and WHO's flagship initiative of Universal Health Coverage (64) addresses the necessity for equitable distribution and availability of healthcare resources. It is well recognized that there are indirect socioeconomic benefits of healthcare, such as avoiding productivity losses associated with ill health and the associated loss of functioning. These benefits, the added societal value of healthcare, have been

argued to be a component of well-being that can lead to higher gross domestic product (GDP) per capita in the long run as a result of increased labor force participation and productivity (65). Measuring the contribution of health to well-being has been challenging since the relationship between the two has been under-conceptualized (66). Yet the notion of human functioning can support the economic case for the social investment in health because it bridges health and well-being and accounts for the intrinsic and instrumental value of healthcare (8). Recently, functioning has provided the value-base for economic investment in specific service areas, such as rehabilitation (67).

The repeated calls for “value-based” healthcare, championed by Harvard Business School professor Michael Porter, urge a transformation of the healthcare system away from competition over ways to shift or limit costs and restrict services to maximize profit to a competition of increasing value for patients (68). The goal of healthcare, Porter argues, is what matters for patients and what should unite the interests of all actors in the system, namely good health outcomes (69, 70). A strategy of healthcare reform, in short, needs to identify and rigorously measure not only survival and recovery but sustainability and optimization of functioning.

The notion of functioning may also help to bridge another gap in our understanding of the impact of health on societal welfare overall. We have known for decades that individual and population health outcomes are shaped by a complex interaction between our genes, age and sex, features of our physical, social, and economic environment, and our own behaviors. Healthcare itself accounts for only 10–20% of the modifiable (i.e., non-genetic) contribution to positive health outcomes (71), while the remaining 80–90% consists of health behaviors, socio-economic conditions, and physical environmental factors (72). This suggests that while health system improvements will undoubtedly improve population health, a far greater benefit might be achieved by systematic societal actions in other areas of social policy (education, employment, transportation, social welfare, and the environment).

The political, administrative, and policy bifurcation between “health” and “social” hampers policy action to improve population health. Recently, the United Kingdom’s Health Foundation has suggested that local National Health Services (NHS) should be empowered as “anchor institutions” to broker non-healthcare inputs into local communities from social sectors—transportation, environment, and social services (73). Nevertheless, this approach does not dismantle the entrenched health vs social structural dichotomy; rather, it trades on the fact that the NHS can oversee employment-related health determinants as an employer, as a source of procurement strategies, and as a land and capital asset holder and environmental advocate. A true resolution would find a path to integrate health and health-related social sectors so that the collaboration between them is fluid and facilitates policy reforms that can only be achieved by means of cross-sectorial cooperation. Rethinking health in terms of human functioning has the potential to, finally, bridge the traditionally separate “health” and “social” cultures in order to improve our understanding of the determinants of health to society’s considerable benefit.

## Opportunities for health sciences, education and training

We can envisage many opportunities from rethinking health in terms of human functioning and focus here on two broad areas: health sciences and education and training.

### Health sciences

Fundamentally, the concept of human functioning could be the basis to reconceptualize multidisciplinary health sciences as an integrated and coherent scientific field of study. This reconceptualization opens the door to a broader understanding of epidemiology by moving beyond its traditional focus on mortality and morbidity and incorporating functioning. An emerging “functioning epidemiology” could pave the way towards the recognition of the need for human functioning sciences as a distinct component of health sciences. At this point, although we can only glimpse these potential developments, they clearly signal both the opportunity and the need to expand academic capacity accordingly.

It is not an understatement to say that health research has expanded astoundingly over the last century, thanks to the contributions of numerous scientific disciplines, from the biological and natural sciences to social sciences, humanities, and engineering (74). The field of health sciences faces a challenge in encompassing and integrating diverse scientific disciplines to comprehensively understand and respond to individual and population-level health needs within a single field of study. The concept of human functioning—particularly the distinction between biological and lived health—can help here by identifying the relevant sciences that comprise health research and how they contribute to the societal response to health needs. A scientific description of biological health depends on biological and other natural science tools to account for a person’s intrinsic ability to perform activities. The description of lived health, on the other hand, involves sciences that explain the interaction between the biological and the environmental. Finally, explaining society’s response to the individual’s health needs depends on scientific understanding of institutions and social processes involved in society’s health and health-related systems that respond both to underlying biological needs and environmental determinants of health and lived health.

The comprehensive, multi-dimensional model of human functioning therefore offers a foundational understanding of health sciences that takes account of biological, social, and other environmental determinants of health and the societal response to health needs.

### Integrating lived experience into epidemiology

Currently, the scope of epidemiology mirrors the conventional understanding of health as primarily explicable in terms of normal biological processes disrupted by disease, injury, and other sources of

impairment or infirmity, manifested at the individual and population levels. As such, it is the study and analysis of distributional patterns, causes, and effects of disruptive health conditions on clinical or general populations. Mortality and morbidity are the conventional health indicators capturing (albeit to a limited degree) the effects of health conditions through premature death and impairments or morbidities. Even the relatively new sub-disciplines of social epidemiology and life-course epidemiology, which more fully appreciate the significance of the wider social context and human health trajectories, restrict their investigations to the impact of context and time on health conditions as primary outcomes. This traditional epidemiology is a robust science grounded in powerful statistical and other highly credible methodologies. However, it is of limited value in comprehending people's lived experience of health, which demands consideration of health states in light of personal resources and in interaction with a contextual environment, broadly construed. There is, therefore, an opportunity to augment traditional epidemiology with a "functioning epidemiology" to fully account for the lived experience of health (75). The first step to doing this is the recognition that functioning is the third health indicator after mortality and morbidity (14, 36).

Functioning also paves the way for a new interdisciplinary science field, human functioning sciences, that holds the promise of integrating research inputs and methods from diverse biomedical and social disciplines to provide a fuller understanding of human health (Figure 3). Although there are undoubtedly challenges to address, the aim of the human functioning sciences is clear: to understand the lived experience of health at the personal level. It would explore the links between health and individual well-being, identifying and implementing the societal response to functioning needs so as to secure the bridge between healthcare and public health and societal welfare. It is not inconceivable that human functioning sciences might emerge in much the same way that neuroscience did in the 1950s and 1960s (76) with the recognition of an integrative conception of brain and behavior that relied on the results of anatomy, biochemistry, neurology, physiology, and pharmacology but which went beyond this and was more than the sum of those sciences. Human functioning sciences, in short, not only respond to the call to reject reductivism in health research (and "putting the patient back together" (77)) but also to use functioning as the integrative conception of health as the basis for a truly interdisciplinary health science.

## Human functioning sciences: an emerging distinct scientific field

Human functioning, as we have argued, can provide a multidimensional foundation for the field of health sciences.

## Teaching and training capacity

Concomitant with the emergence of human functioning sciences is the need to develop a new generation of researchers and policy entrepreneurs who will constitute the research and

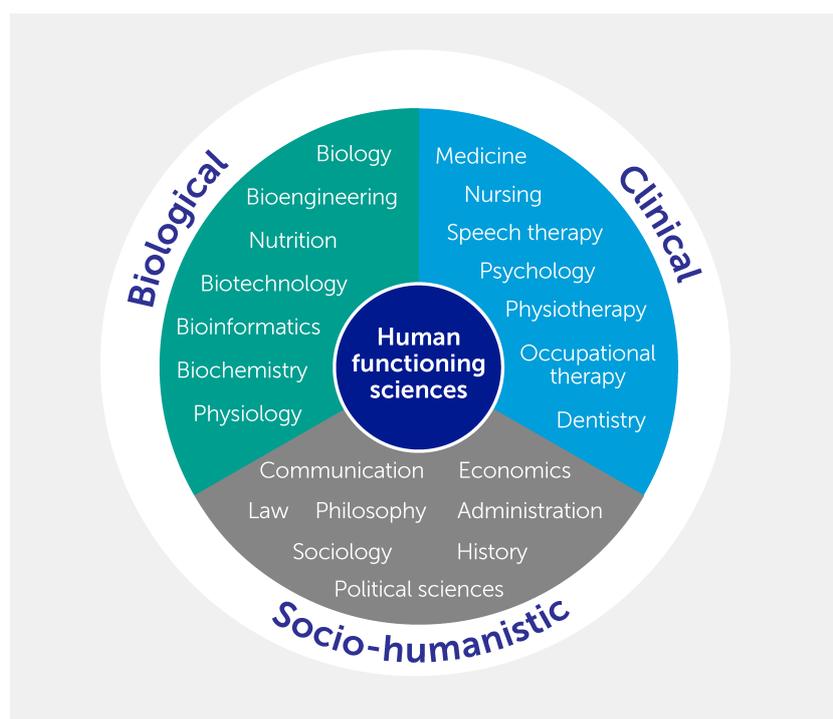


FIGURE 3

Examples of scientific disciplines rooted in the biological, clinical, and socio-humanistic traditions engaging in the new field of study termed human functioning sciences.

academic workforce for the implementation of the new thinking in healthcare, health science and society at large. This opportunity entails potential transformative academic changes requiring innovative curriculum and program development as well as institutional and organizational changes to degree programs that include collaborative or cross-faculty arrangements (78). Training in human functioning sciences, from bachelor's degrees through to doctoral degree programs and beyond, should emphasize interdisciplinary research with an implementation orientation. The conceptual model of functioning can clarify how we describe the adaptive processes constitutive of changes—not only changes in individual health capacity but also changes in performance arising from alterations to the person's environment to better accommodate individual needs. Realistically, these academic arrangements would likely be structured around focal applications of particular societal interaction, such as rehabilitation (79) and healthy aging (80).

## Communication challenges in rethinking health

The recognition and implementation of human functioning as a new way of thinking about health entail communication challenges that need to be addressed. This challenge is at the heart of moving from theory to practice, from a shift in conception to new institutions, new actions, and a new cultural understanding of health.

First, for a new paradigm to become effective practice, it is fundamental to agree on the appropriateness, value, and benefits of the terms, concepts, and operational guidance that it proposes. Knowledge translation from evidence to practice must spread at the macro-, meso-, and micro-levels of health systems and along the continuum of care. This requires an awareness of the role of functioning from truly interdisciplinary work and, at the same time, a focus on functioning as a promising language to enhance interdisciplinarity in healthcare, in light of what really matters to patients. All this can be achieved by promoting communication around the notion of functioning and increasing awareness among health professionals using successful implementation cases and scientific evidence gathered during the last two decades. System communication has the important but difficult task of preparing for the global implementation of functioning as a bridge between health and well-being, which is an essential conceptual issue with practical implications.

Second, the question of how to inform the public about human functioning (public dissemination) is another challenge. There are benefits to achieving public understanding: knowledge about functioning, health, and well-being can help the public better understand and accept health investments and resource allocation, especially when other social goods are in competition for limited resources. Participatory democracies flourish when, putting the important distinction between “lay” people and “experts” aside, people understand what can influence optimal

health policies. Targeting the public is a task embedded in institutional communication and requires strategies for public campaigns centered on functioning.

Third, at the level of healthcare provider-patient interaction, there is strong evidence that the use of the functioning framework and the ICF during the interaction facilitates goal-setting and intervention management (81, 82). ICF provides a common language between health professionals and patients for shared decision-making. In light of this, knowledge of functioning constitutes an important topic to enrich patients' health literacy. Patient education on functioning holds the promise of a “language” to bridge the gap between the point of view of the health professionals and the lived experience of the patients.

## Conclusion

The conceptual and evidence base exists to support the implementation of human functioning as the third indicator of health, complementing morbidity and mortality. This requires coordinated action across health systems, including the scaling and extension of use cases. Significant challenges in implementing this new paradigm exist: while the methodological challenges are well on the way to being resolved, true implementation is in its infancy and the communication challenge has yet to be fully comprehended. Addressing these challenges and associated inertia is vital to orientate health systems toward what matters most to people about health based on their lived experience of health. Moreover, by bridging health and well-being, human functioning offers a basis for the societal economic investment in health that is essential both for individual and population-level well-being and for progress toward achieving all of the SDGs to which all countries are committed.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

## Author contributions

JB and GS conceived the underlying concept and designed the manuscript together with SR and CB. JB, with assistance from CB, wrote the section on the application of functioning information in the six building blocks of WHO's health system. SR wrote the section on communication. JB wrote the overall manuscript with support from CB, GS, and SR. All authors provided critical feedback. CB coordinated the project. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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