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Article

Control of Communicable Diseases as a Global Public Good

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ABSTRACT

The article aims at giving a comprehensive overview on controlling communicable diseases (CCD) and discusses the implications of providing CCD as a global public good (GPG). After a short introductory summary of the history of CCD, Sections "**PUBLIC (COMMON) GOODS**" and "**GLOBAL PUBLIC GOODS**" offer a concise definition of the concepts of "public goods" and "global public goods". Sections "**INTERNATIONAL HEALTH REGULATIONS (1969–2005) AS A GPG**" and "**IHR (2005) AND CCD**" critically analyse the International Health Regulations (IHR) (2005) as a means to provide CCD as a GPG, and argues that it falls short of that goal as (a) many countries are not able to provide the "Core Capacity Requirements for Surveillance and Response" because of severe deficits of their health systems, (b) the IHR do not include HIV/AIDS, tuberculosis, malaria, etc. which are a constant threat in infested regions (and to international transmission) and may be called "chronic infectious diseases" and (c) ignore the issue of fighting antimicrobial resistance. Therefore, full global health security (accepting the highest attainable standard of health as a human right) needs an integrated CCD which implied that CCD is provided as a GPG, including minimal standards of health everywhere, a "One-Health" approach, and the perspective of "Health in All Policies" (Section "**TOWARDS AN INTEGRATED CONTROL OF COMMUNICABLE DISEASES AS A GPG**"). Section "**FINANCE OF CCD**" discusses the dimension of financing CCD as a GPG and poses the question whether an enhanced transnational norm-building and solidarity can be expected. Improving CCD is not only one step towards the goal of "one healthy world", but also depends on a comprehensive improvement of health services.

KEYWORDS: global public goods; International Health Regulations; delivery of public goods; globalization; health as a human right; health in all policies; one health; national public health capabilities

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ABBREVIATIONS

CCD	Control of Communicable Diseases
ISC	International Sanitary Convention

WHO	World Health Organization
ISR	International Sanitary Regulations
IHR (2005)	International Health Regulations (of 2005)
GPG	Global public good
NCD	Non-communicable disease
CMH	Commission on Macroeconomics and Health
IGO	International Governmental Organization
CSO	Civil Society Organization
GPGH	Global public goods for health
GHD	Global health diplomacy
AMR	Antimicrobial resistance
UNDP	United Nations Development Programme
GHSI	Global Health Security Initiative
GHSA	Global Health Security Agenda
ICESCR	International Covenant on Economic, Social and Cultural Rights
GC 14	General Comment No. 14
PHEIC	Public Health Emergency of International Concern
GISN	Global Influenza Surveillance Network
SARS	Severe Acute Respiratory Syndrome
WPV	Wild Polio Virus
CDC	Centers for Disease Control and Prevention
XDR-TB	Extremely drug-resistant Tuberculosis
MDR-TB	Multiple drug-resistant Tuberculosis
LDC	Less developed country
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
CSDH	Commission on Social Determinants of Health
UHC	Universal Health Coverage
SDGs	Sustainable Development Goals
LICs	Low-income countries
DAH	Development assistance for health

INTRODUCTION: SHORT HISTORY OF THE CONTROL OF COMMUNICABLE DISEASES

Measures for the control of communicable diseases (CCD) did not start with the International Sanitary Conferences in the 19th Century—as is mostly told in the literature on Global Health—but they are as old as the recognition of the communicability of certain diseases. Concerning the plague epidemics in the late Middle Ages we dispose of an extended body of literature on political measures to fight the disease, in particular in the city republics in Northern Italy: Health offices and information systems (about cases of plague in neighbouring cities and along main trade routes) were established, later on cooperation among the cities concerned developed [1]. Isolating infected people to specific areas and remote hospitals was a common practice.

During the 19th century the increasing importance of international trade, the growing speed of travel and transport and the growing population in harbour cities with a still low level of hygiene (waste disposal, drinking water) resulted in a growing international concern about sanitary matters [2]. Between 1851 and 1938 fourteen International Sanitary Conferences took place to control the international spread of epidemics, primarily of Cholera, later on also including plagues and yellow fever with a minimal impediment of trade. At the 7th of these conferences in 1892 a first binding International Sanitary Convention (ISC) was signed, focussing on quarantine in the case of cholera, supplemented by another convention in 1897 on plague [3] and in 1912 also yellow fever was included [4]. In 1907 the Office International d'Hygiène Publique was established, the first global permanent health organization with the task to collect epidemiological intelligence and to implement the ISCs. In 1948 this mandate was officially transferred to the newly established World Health Organization (WHO) and the ISC renamed International Sanitary (since 1969 Health) Regulations (ISR/IHR). In 1951 new comprehensive ISR were adopted by WHO with the renewed aim of "successful control of international transmission of pestilential diseases, as well as removal of hindrances to international travel" through "immediate and complete information from all parts of the world" [5], while a WHO memorandum stressed "A community is more effectively protected…by its own public health services than by sheltering behind a barrier of quarantine measures" [5]. The ISR referred to six "quarantinable diseases": plague, cholera, yellow fever, smallpox, typhus and relapsing fever [6].

Various revisions of the ISR/IHR until 1983 did not strengthen their importance in global health. On the contrary, they were reduced to coordinating action in the case of only three diseases, smallpox being successfully eradicated and typhus and relapsing fever reduced in their international impact. This process mirrored the expectations of a generally reduced importance of infectious diseases (at least from the perspective of high-income countries, HICs) being seen "as the diseases of the poor" while the universal rise of non-communicable diseases created an increasing concern. Furthermore the idea of eradicating the most serious communicable diseases (smallpox, polio, and some others) played an important role. The rise of new communicable diseases, in particularly HIV/AIDS, and the realization that new infectious diseases transmitted from wild animals and adapting to human hosts (such as Ebola, West-Nile-Virus, Rift-Valley-Fever) will always constitute an important risk to human health.

Taking into consideration the growing mobility—including more intense and accelerated contacts with remote regions—as a risk for spreading diseases, and the assumed growing threat of bio-terror, new negotiations on IHR started in 1995. Assuming that, in principle, trans-border mobility is a necessary condition for economic welfare and personal freedom, and anticipating further that mobility might lead to an

unintended spread of infectious agents, the attainment of CCD as a *global public good (GPG)* has to be seen as an important goal of collective action in a global interconnected world. The international concern about these threats has also been expressed in the expanding discourse of global health security (see Section "**Health Security**").

Though the number of publications on CCD as a GPG has remained rather modest, in my view this link allows the most complete perspective encompassing the elements of CCD, specific goods for CCD and the problems related to its provision. I will use the most comprehensive publication on global public goods for health by Richard Smith et al. [7] as a starting-point (for general issues in particular chapters 1, 13 and 14). A short introduction to the problematic of public goods, their provision on the global level and with respect to global health will be given in the next two sections ("**PUBLIC (COMMON) GOODS**" and "**GLOBAL PUBLIC GOODS**"). Two sections on the IHR (2005)—negotiated in 2005 and in force 2007—as a GPG ("**INTERNATIONAL HEALTH REGULATIONS (1969–2005) AS A GPG**") and as a policy tool ("**IHR (2005) AND CCD**") will follow. This will lead to the argument that a comprehensive approach to CCD has to transcend the narrow perspective on controlling specific diseases and the threat of their transnational spread, but ought to include aspects of health systems, universal access to healthcare and the global impact of political instability and conflicts related to bad health, as e.g. in the case of HIV/AIDS and political instability in Africa [8] (Section "**TOWARDS AN INTEGRATED CONTROL OF COMMUNICABLE DISEASES AS A GPG**"), which is important for the discussion of financial needs (Section "**FINANCE OF CCD**"). What then, however, is specific to the control for communicable compared to that of non-communicable diseases? This is a complicated issue, in particular as research has increasingly corroborated strong links between communicable diseases (CDs) and non-communicable diseases (NCDs). One important aspect is the observation that while NCDs are rather closely linked to processes of modernization and changes in life-style caused by globalization, CDs produce unforeseeable threats to development processes, and the persistence of many CDs is closely related to the persistence of poverty and low-standard health systems in low income societies.

PUBLIC (COMMON) GOODS

The idea of a common good which may be "in the highest degree advantageous to a great society" but is "of such a nature that the profits could never repay the expense to any individual or small number of individuals" ([9], p. 559) has been raised by Adam Smith and in a similar understanding already by David Hume ([10], p. 383–384). The actually prevailing definition of a public good (being neither rival nor excludable once the good is provided) builds on contributions by Richard Musgrave [11,12] and Paul Samuelson [13] since the end 1930s. Providing public goods implies a collective action problem [14]. As access cannot be denied

to anyone, public goods will not be provided through market dynamics but will only be made available through collective action. This implies mechanisms to enforce the provision of the resources necessary to guarantee a secure availability of the respective goods. As there will always be the risk of free-riders, public goods are mostly provided by the state (at different levels of national societies) which disposes of the coercive means to make people pay according to rules politically determined. This still entails a tendency of public goods to be underfinanced due to a competition for a host of public services by different political constituencies, and a reluctance to contribute to financing state activities. While market failure constitutes the starting-point of the idea of public goods, there is the risk of government failure due to rent-seeking by policy-makers and bureaucrats which will lead to advantages for influential groups of the population (and a neglect of marginalized sections) or to a lack of public action due to political stalemates.

Furthermore, it has to be taken into account that there are "impure public goods" that are either non-rivalrous in consumption but excludable ("club goods", such as access to specific hospital services) or non-excludable but rivalrous in consumption (common pool resources, such as many forms of environmental resources, or services of a comprehensive national public health system, which depend on limited financial and human resources [14–17]. Another qualification refers to so-called access goods. These are (in principle) public goods, "that are only non-excludable to those who have the requisite private goods to access them." Examples are a computer to access the internet, the necessary infrastructure to access clean water or health services" ([18], p. 5f.).

"Health" as such is a private good because the individual person is the primary beneficiary of it; the health of a person depends on his/her individual constitution and health-related behaviour. The access to public health care can at best be non-excludable, but due to limited resources will be rivalrous in consumption (i.e., constitutes a case of common pool resources as pointed out by Rocco Palumbo [19]). Improving the overall health status of a community, however, is a public good: Woodward and Smith point out that there are externalities of the health status of individuals in the field of communicable diseases (preventing one person from getting the disease reduces the risk of infection of others, reduction of disease in one country reduces cross-border transmission, see below, Section "**GPGs for Global Health: Role of Global Health Governance—Variety of Actors, Self-Organization, Flexibility**") and with respect to the cumulative impact on economic development ([18], p. 10–13). This is also implicitly highlighted in the Report of the Commission on Macroeconomics and Health (CMH) which made the point that while on the one hand the level of healthcare depends on socioeconomic development, on the other hand, health also constitutes an important determinant of macroeconomic growth [20].

The early discussion on the provision of public goods was primarily linked to the need of public delivery and finance, but public goods can be (co-)financed by other actors. This can take various forms: (1) contributions from actors willing to pay in spite of the option of free-riding, i.e., in general co-financing with non-profit/civil society groups (philanthropy) [21,22] which voluntarily contribute to their delivery with ethical/solidarity-oriented motivations; (2) outsourcing the provision of goods to private providers which can be for-profit enterprises, but also private partners of health partnerships (PPPs) [23]; (3) cooperation with other states with the aim of producing international public goods. All three types of sources play an important role in financing global public goods (see following section).

In the earlier discourse it has been assumed that the scope of a public good available to a community results from the sum of individual contributions (basically in form of taxes if the good is provided by the state). The aggregation of contributions, however, varies according to the aggregation technologies used which again are linked to the type of public good required [22,24,25]. The eradication of diseases e.g. requires on the one-hand a so called best-shot technology (allowing the development of one most effective vaccine), but on the other hand a weakest-link technology (allowing all countries including the poorest) to implement successful vaccination campaigns. Taking into account that the provision of CCDs is a complex good requiring many different inputs by diverse actors (see Sections "**GPGs for Global Health: Role of Global Health Governance—Variety of Actors, Self-Organization, Flexibility**" and "**Control of Communicable Diseases: A Classical Global Public Good?**"), the overall aggregation of contributions for CCD cannot be dealt with in this article, which focusses on the attempt to give a comprehensive overview on the wide range of issues involved in CCD.

GLOBAL PUBLIC GOODS

GPG: Definition and Discussion

Kaul et al. postulate that, besides being non-rivalrous in consumption and non-excludable, the benefits of GPGs "are quasi universal in terms of countries (covering more than one group of countries), people (accruing to several, preferable all, populations groups) and generations (extending to both current and future generations, or at least meeting the needs of current generations without foreclosing development options for future generations)" ([17], p. 2f.). The third aspect draws on the definition of sustainable development provided by the Brundtland Commission [26].

While in general, related to national societies, the state is considered to secure the delivery of public goods, based on a legitimate coercive power to raise taxes and to secure the implementation of the necessary regulations, on the global level there is no world state to fulfil this role. International agreements as the IHR could provide a foundation to the

delivery of GPGs. There is an extended literature in international relations theory on the possibilities and limitations of international agreements and organizations which cannot be summarized here. A concise overview of IR theories and their view on international cooperation is given by Anne-Marie Slaughter [27]; a thorough discussion of the growing role of law in world politics can be found in a volume edited by Slaughter, Judith Goldstein, Miles Kahler and Robert O. Keohane [28].

In a historical perspective, GPGs had been provided mostly in limited technical fields such as postal and other communication services, the protection of the Ozone Layer and the Antarctic Treaty System as limited environmental agreements, and, as referred to above, international sanitary regulations to control the spread of some particularly severe infectious diseases. These are fields where specific common interests among nations prevailed because of limited costs to observe agreed rules. Concerning international/transnational norms in more complex and sovereignty-affecting policy fields, such as international peace-keeping, however, implementation will depend on a strong hegemonic dominance of one nation or a stable alliance of nations [29–31]. The US hegemony, largely supported by the EU and Japan, allowed the establishment of the international monetary regime and the WTO trade regime, but this regime has been losing effectiveness when hegemony structures became embattled through the growing power of emerging economies. This relates to health issues in particular in the field of intellectual property rights and access to medicines [32,33].

Providing GPGs related to reducing economic and social inequality, constitutes the most difficult field, as this would imply significant structural changes in the working of the world economy (reverting the flows of benefits in world trade and investment) and the readiness to transfer huge amounts of financial resources. Due to these barriers, human rights are a field where binding international norms (international human rights compacts and a number of other conventions) are implemented to a very limited degree: In the case of civil and political rights this is primarily a matter of defending sovereignty, in the case of economic, social and cultural rights mainly an aspect of the distribution and interaction of economic resources. This also refers to fundamental changes in global health and in the control of communicable diseases as will be shown in the following sections.

In recent decades, due to the increasing global interdependence and greater role of transnational communities of shared norms and political goals [34,35], globalization has brought a growing awareness of conflicts and social problems linked to the inequality of global development and has established new transnational political spaces that transcend the aggregation of interests at the national level. The transnational interaction of state and non-state actors produces dynamics and opportunities that tend to limit the political options of nation states. While in the so-called Westphalian system (referring to the “Peace of Westphalia” (1648), an

important landmark in the development of an international system of sovereign nation states) nation-states were the main institutions involved in formal norm-setting, we now observe a complex structure of new modes, spatial levels and institutions that have an impact on global norm-building. The “old” actors of the Westphalian system remain relevant, but their roles are transformed by the challenges to their political monopoly through the emergence of new, genuinely transnational actors such as IGOs, CSOs, and transnational corporations.

The greater the density of global social relations, the more important are result-oriented policies that improve effectiveness, and the more dysfunctional an international system focusing on national power becomes. In times of globalization social action is increasingly orienting towards people affected by a specific problem in any part of the world. In such a process of “global socialization”, national governments might be seen as important allies by specific actors, but not necessarily as representing the “national interest” of a specific country. In the absence of a world state, however, nation states still play a central role in the creation of binding legal norms; the implementation of international agreements basically depends on their effective integration into national legal systems, and even most norms created by non-state networks depend in some way on the shadow of state authority.

The discourse on global health governance (GHG) has stressed the growing role of non-state actors in global health, concerning political advocacy and direct financial support. Whether global governance institutions could be strong enough to install themselves as effective elements of an emerging system of public rule in the transnational space to provide global public goods in a reliable and impartial way constitutes an important question ([33], p. 28; [36]). The following sections will look in more detail at this role, in particular in consideration of the stability and reliability of this support in contributing to the provision of CCD as a GPG.

GPGs for Global Health: Role of Global Health Governance—Variety of Actors, Self-Organization, Flexibility

The importance of the GPG concept for understanding processes in global health has been thoroughly analyzed by Richard Smith et al. [7], which is still the most comprehensive text on GPGs for health. There are only a few more recent texts by other authors which use the GPG concept within the context of GHG, in particular Scott Barrett ([37]; [25], chapters 2 and 7), Suerie Moon [38], Joshua Michaud [39], David Gartner [40], David Gleicher and Inge Kaul [41], Clint Peinhardt and Todd Sandler ([42], chapter 6).

In order to approach the meaning of CCD as a complex GPG, it is necessary to look at the most important components, which Woodward and Smith call Global Public Goods for Health (GPGH). They distinguish three main areas of GPGH ([18], p. 14f.): (a) knowledge and technologies, which in principle are non-excludable and non-rival in consumption, but

need pre-conditions for their effective use, such as a developed health infrastructure and technical expertise, which are frequently not given at country level, and are excludable in their practical application (pharmaceutical products: patent law); (b) policy and regulatory regimes (including or excluding groups by regulations); and (c) health systems creating or preventing opportunities to access the respective goods. Furthermore the authors contrast horizontal and vertical approaches and analyse the respective issues involved in the provision of GPG ([18], p. 15–17). All these aspects are important for understanding CCD as a GPG (see below Section "**Control of Communicable Diseases: A Classical Global Public Good?**"). What is missing, however, is a more thorough discussion of the impact of GHG and the dynamics of post-Westphalian global politics on the provision of GPGHs. This is reflected in the definition of GPGs proposed by the authors: a GPG is "a good which it is rational, from a perspective of a group of nations collectively to produce for universal consumption, and for which it is irrational to exclude an individual nation from its consumption, irrespective of whether that nation contributes to its financing" ([18], p. 9). This appears more precise than the definition by Kaul et al. [17], but it relates only to "nations" as units and thus is rather a definition of international, not of global public goods.

Providing GPGH, however, has been increasingly based on a large number of very different actors (IGOs, states, CSOs, private finance (philanthropic organizations), and hybrid organizations (global health partnerships)) and therefore requires an effective coordination within the global health system, in particular among state and non-state actors [43,44]. This is basically a matter of global health diplomacy (GHD) as defined by Kickbusch et al. as

> "*…multi-level negotiation processes that shape and manage the global policy environment for health…, improving the relations between states and strengthening the commitment of a wide range of actors to work towards a common endeavour to ensure health as a human right and a public good*" ([45], p. 4).

Taking into account that responsibilities and entitlements to social human rights are not justiciable in the global space, the principle of "Intended Nationally Determined Contributions", established in the Paris Agreement on Climate Change, should be considered a path to further explore for GHD. This would imply a general international acceptance of a comprehensive catalogue of measures for a global control of infectious diseases (including cost estimates), possibly based on the authority of a WHO-led "Framework Convention on Infectious Diseases" (led by WHO or an inclusive global health partnership). In periodic Conferences of the Parties, members (nation states as well as large non-state actors) would have to declare their contributions to implement these measures. These contributions would be voluntary but pushed by the urgency and the broadly assumed benefits of an effective disease control, which would

reach far beyond the limitations of the IHR. This will be explored further in the conclusion.

Control of Communicable Diseases: A Classical Global Public Good?

Woodward and Smith point to the continuously devastating impact of communicable diseases (in 2000 about 30% of the global burden of disease, measured in Disability Adjusted Life Years (DALYs)) ([18], p. 11). In the concluding chapter, these authors present a checklist for the correct identification of GPGs for health ([7], p. 247/8). On the one hand, there is a list of collective problems addressed (such as: prevention, treatment, control of cross-border transmission of CDs, disease vectors, health system costs), on the other hand, there are different forms of solutions to various problems (governance arrangements, knowledge, interventions, health systems). This also concerns the geographical scope of the respective goods important for qualifying as global public goods, variations in the reach of different infectious diseases (from local to global), and of institutions (national, regional, global).

With respect to acute diseases/epidemic outbreaks, the IHR (2005) (see in detail Sections "**INTERNATIONAL HEALTH REGULATIONS (1969–2005) AS A GPG**" and "**IHR (2005) AND CCD**") are certainly conceived as a GPG in the field of governance arrangements; programs to combat chronic CDs and eradication programs aim at realizing collective goods, which are global as far as the respective diseases constitute a global threat. Disposing of access goods, in particular access to medical care, might be a precondition for benefitting of GPGs. In some cases, however, "the cost-effective supply of access goods may itself be a public good (…), as the cost of providing the access goods to those who do not have them may be no greater than the externalities arising from the additional consumption of the public good" ([18], p. 6), e.g., in the case of vaccination programs.

The access issue points to problems of controlling communicable diseases which cannot be seen in isolation from many framework conditions of global health. At least two aspects are important:

(a) The global map of CDs is constantly changing due to conditions which are transforming locally restricted communicable diseases into threats for other world regions (mobility, climate change) and to the appearance of new pathogens with an epidemic potential, mostly of zoonotic origin [46]. The West Nile Fever, Chikungunya, Dengue Fever and the Hanta Virus constitute examples of diseases which have become (or have the potential to become) endemic in regions with a temperate climate [47,48]. Also some types of Malaria had been endemic in Central Europe until quite recently (1940s). Thus, the control of many infectious diseases—which does not only mean the prevention of infections, but also an effective treatment of infected persons—should be seen as a GPG even if the current prevalence is regionally limited.

(b) The quality of national health systems has important externalities with respect to providing the GPG of CCD: on the one hand, improving national health in general will have a positive impact on the prevention of CDs (healthy immune systems), on the other hand, functioning local health systems are a precondition for preventing the spread of disease and could make international health interventions unnecessary (see Section "**Tuberculosis, Malaria and HIV/AIDS Control as in Rich Countries—How Can This Be Implemented?**"). This also relates to the control of antimicrobial resistance (AMR) which—besides the impact of the irresponsible use of drugs in the livestock sector—is due to the inappropriate use of antimicrobial treatments. Under the condition of a high international mobility, the issue of the fight against AMR is a crucial element of CCD, as it closely links the problem of inadequate health systems in many poor countries with the international spread of communicable diseases, and—as medical innovation is still concentrated in a few countries—furthermore to the problem of access to patent-protected medicines.

Until recently, common actions to prevent the international spread of communicable diseases have focused on the ISR/IHR, and on the successive eradication of diseases. The importance to improve the general hygienic conditions and local health systems has been recognized for long (see Introduction, [5]), but the growing role of vertical/disease-oriented programs had led to a certain dissociation between programs of communicable disease control with a (not always explicit) focus on GPGs and the support of national health systems as a form of health development aid (scientific cooperation, political cooperation to adjust national programs, cooperation to support poorer countries).

Taking into account the importance of certain health system standards and the improvements in the treatment of many diseases during recent decades, I propose the following definition of CCD as GPG: The collective good provided by CCD can be defined as "systematically reducing the impact of infectious diseases on health in all world regions", which should be seen as a composite GPG, composed of a number of specific GPGs related to global governance arrangements, knowledge, interventions and health systems.

The Eradication of Smallpox—Nurturing a False Hope

With respect to GPGs, the eradication of specific diseases constitutes a quite particular case ([18], p. 11f.). While the costs are time-limited, the benefits are permanent, which of course provides a strong incentive to its provision.

The assumption of a limited number of killer diseases which are particularly prone to transmission through international travel and transport underlay the idea of the international sanitary agreements. Progress in research on vaccines let the eradication of life-threatening

infectious diseases appear feasible, in particular when the disease is worldwide considered a serious threat. This was the situation which allowed the successful eradication of smallpox through a broadly supported WHO campaign; even temporary ceasefires were negotiated to allow vaccinations, e.g., between India and Pakistan during the conflict, which led to the foundation of Bangladesh [49], in Afghanistan [50] and in a number of other countries [51]. Other CDs are on the list of eradicable diseases, i.e., malaria, yaws, guinea-worm (Dracunciliasis).

So far, smallpox is the only CD affecting humans which has been successfully eradicated, the campaigns against polio and the guinea-worm are close to successful. The Global Malaria Eradication Program was launched in 1955, but suspended in 1969 due to the environmental impact of DDT, and the growing resistance against the broadly-used chloroquine. In 2007, a consultative process to renew the strategy for malaria eradication was initiated [52]. In the case of polio, there are only three countries with a significant number of endemic cases (Pakistan, Afghanistan, and Nigeria) which are connected to a lack of trust in the vaccination campaign supposedly sparked by information about the CIA using fake vaccination campaigns as a cover to gather DNA samples from Osama Bin Laden's relatives [53].

In spite of some progress, in recent decades it has become clear that eradication campaigns can only lead to limited progress in the control of communicable diseases. Various origins of communicable diseases can never be eradicated, such as diseases spread from wild animals (HIV/AIDS; Ebola). The effectiveness of medicines cannot be secured forever, mutations of pathogens create anti-microbial resistance (AMR), but also new disease patterns (e.g., in the case of influenza). AMR is a rather new issue in the field of CCD. This supports the proposal that CCD as a public good should not be narrowly defined as the eradication of communicable diseases and controlling the threat of a trans-border spread of outbreaks.

INTERNATIONAL HEALTH REGULATIONS (1969–2005) AS A GPG

Health Security

In recent years, the international control of communicable diseases has been increasingly linked to the issue of *health security*. WHO defines "health security" as activities that "require, both proactive and reactive, to minimize vulnerability to acute public health events that endanger the collective health of populations living across geographical regions and international boundaries" [54]. The IHR (2005) are considered an important instrument to strengthen health security in the field of CDs ("vulnerability to acute public health events"). There are, however, many concerns expressed about the securitization of health because of its close association to "national security" seen as protection against an external threat [55–57]. The history of quarantine seems to confirm this viewpoint, as well as the role of the *Global Health Security Initiative (GHSI)*: The GHSI

is an informal, international partnership among “like-minded countries” (Canada, France, Germany, Italy, Japan, Mexico, the United Kingdom, the United States and the European Commission) to respond to threats of biological, chemical, radio-nuclear terrorism and pandemic influenza founded in November 2001 [58]. In 2005, full support to the WHO in the implementation of the International Health Regulations was declared [59].

In the national context, however, the term “security”, also relates to the issue of individual security against violence as well as against social deprivation (“social security”). This is broadened by the concept of “human security”, developed in the UNDP Human Development Report 1994 [60]. The concept of human security does not only relate to states as guarantors of security in international relations, but also to global social norms and transnational activities of non-state actors as important determinants of health. Informal transnational norms are often more effective in the implementation of international agreements than negotiations on precise international rules, e.g., in the case of access to treatment of infectious diseases [32]. Though it has been criticized that within the concept of human security “anything and everything could be considered a risk to security” ([61], p. ii), it is significant that it addresses “humanity”—everybody can be the cause of a threat and an object of protection. “Human security” positions “security” close to the field of social and economic human rights.

During the 2010s the perspective of global health security broadened, in 2014 the Global Health Security Agenda (GHSA) was launched, with a membership of over 50 countries “to actively engage with other committed partners around the globe to develop and implement mechanisms to build and sustain health security capacity in all countries” [62]. The Sidney Conference “Global Health Security 2019” still focused on the threat of biological pathogens (including their use as weapons), but discussed links to more general dimensions of global health (“one health concept”, “universal health coverage”, “health in all policies”) which approximates it to issues of human security [63] (see also below Section “**CONCLUSION**”).

“Health” as a Human Right

Discussing “health security” in terms of human rights, refers to the basic dilemma of providing security against outbreaks. There is the legal obligation to protect the right to health of the public, but on the other hand, there is a need to respect the individual rights of patients and their family members. This reflects another perspective than the idea of “security”, which does not deal with potential conflicts of values.

The International Covenant on Economic, Social and Cultural Rights (ICESCR) includes “the right of everyone to the enjoyment of the *highest attainable* (emphasis, W.H.) standard of physical and mental health” (art. 12.1).

On 11 May 2000, the UN Committee on Economic, Social and Cultural Rights (ESC rights) adopted the "General Comment No. 14 on the Right to the Highest Attainable Standard of Health" (GC 14) [64], which has the status of an "authoritative interpretation" of the legally binding ICESCR. GC 14, links the issue of controlling infectious diseases with the obligations of states for the provision of universal health care and access to the "underlying determinants of health", as well as with the acceptance of other human rights (GC 14, art. 3):

> "*The right to health is closely related to and dependent upon the realization of other human rights, as contained in the International Bill of Rights, including the rights to food, housing, work, education, human dignity, life, non-discrimination, equality, the prohibition against torture, privacy, access to information, and the freedoms of association, assembly and movement. These and other rights and freedoms address integral components of the right to health.*"

GC 14 refers to Article 12.2 (c) of the ICESCR (The right to prevention, treatment and control of diseases), which requires individual and joint efforts of States "to, inter alia, make available relevant technologies, using and proving epidemiological surveillance and data collection on a disaggregated basis, the implementation or enhancement of immunization programmes and other strategies of infectious disease control." (GC 14, art. 16)—aspects later-on taken-up in the IHR (2005). Even in times of severe resource constraints, the vulnerable members of society must be protected by the adoption of relatively low-cost targeted programmes (GC 14, art. 18).

The General Comment stresses the obligation of states to

> "*…ensure provision of health care, including immunization programmes against the major infectious diseases, and ensure equal access for all to the underlying determinants of health, such as nutritiously safe food and potable drinking water, basic sanitation and adequate housing and living conditions*" (ibid., art. 36)

as well as to provide international cooperation to "comply with their commitment to take joint and separate action to achieve the full realization of the right to health" (art. 38, referring to provisions of the Covenant on ESC Rights (arts. 12, 2.1, 22 and 23).

IHR as a GPG: Acceptance, Realization of Self-Interests and Solidarity

ESC rights can be interpreted as demanding the provision of basic healthcare and some other aspects of health protection as global public goods, though the aspect of implementation (financing in particular) is not operationalized. "Securitization" might strengthen the motivation to contribute resources for global health and to accept the duties of international regimes because of a specific self-interest, but it entails the risk of not considering the right of others where the own security does not

seem to be affected. The perspectives of the "human right to health" and the provision of GPGH are thus complimentary. Assuming that global socio-economic inequalities have led to different levels of health services in different countries, the globally "highest attainable standard" can only be reached through transfers of resources from rich countries for globally adjusting health standards linked to a common definition of GPGs. The ongoing globalization requires linking the use of state authority to global norms as a precondition for implementing international agreements. This could reconcile the orientation towards self-interests with a sense of solidarity within a nascent human society and the acceptance of a common minimum standard of health as a basic human right including the mobilization of resources necessary for providing global public goods for health [65,66].

One of such health standards would be the effective control of communicable diseases. Seen from this perspective, IHR would be an instrument for improving "health security for all", and not only the security of hitherto non-affected world regions from the spread of diseases from infected regions to them. This implies a focus which is not only concerned with preventing the spread, but which also accounts for the global availability of a minimum standard of health services to detect and fight infectious diseases at the source and to reduce the prevalence of endogenous persistent diseases. "The new Regulations incorporate intertwined concerns of public health, security, international trade, and human rights." ([45], p. 45). The IHR (2005) are ambiguous in this respect, building on the old focus of fighting the spread, but including (though only reluctantly implementing) elements of improving health systems conditions of fighting communicable diseases in general. Considering the IHR as a GPGH, the critical aspect is the capacity of the surveillance of disease outbreaks also in areas with the least developed health systems, i.e., requiring a weakest link aggregation technology ([42], p. 175f.). From this viewpoint, Section "**IHR (2005) AND CCD**" will have a closer look at the provisions of the IHR (2005) and the experiences made with their implementation.

IHR (2005) AND CCD

The IHR (2005) as a Post-Westphalian Type of International Regulation

The IHR (2005) define their purpose similar to the ISR of 1951: "to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade" (art. 2). Due to its concrete provisions, however, the new IHR can be seen as a Post-Westphalian type of international regulation which is transcending national sovereignty in a move towards a regime that recognizes global

interdependence and valuable contributions of non-state actors. David Fidler strongly emphasized the limitations of national sovereignty by the role which is given to WHO in the management of the IHRs and the authority to decide on emergency actions and to collect and use surveillance information from sources other than national governments such as the Global Outbreak Alert & Response Network GOARN and other international governmental organizations (IGOs) and non-state actors [67,68].

The new Regulations do not relate only to specific CDs, but to all Public Health Emergencies of International Concern (PHEIC) including bio-terrorist threats. In the case of an emergency situation the WHO Director General convenes an Emergency Committee of independent experts (from a roster of IHR experts, with "due regard to the principles of equitable geographical representation", art. 48) and, based on their advice decides about declaring a PHEIC or not. A PHEIC is defined by Article 1 of the IHR as "an extraordinary event which is determined to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response" [69]. In cooperation with other IGOs the Director General recommends concrete measures among others on the control of persons and the restriction of mobility and trade, which again authorise member states to decide on corresponding actions.

The Director General also establishes a Review Committee, with the functions to (a) make technical recommendations to the Director-General regarding amendments to these Regulations; and to provide technical advice to the Director-General; (b) with respect to standing recommendations, and any modifications or termination thereof; (c) on any matter referred to it by the Director-General regarding the functioning of these Regulation (art. 50). Member States, the United Nations and its specialized agencies, and other relevant IGOs or NGOs in official relations with WHO are invited to designate representatives to attend the Committee sessions (art. 51). Standing recommendations of the Review Committee shall be submitted to the subsequent Health Assembly for its consideration (art. 53).

Every WHO member state has to establish an IHR Focal Point which has the obligations to exchange information on issues relevant to the IHR, to inform about disease outbreaks which are potential PHEICs and coordinate measure during PHEICs.

Furthermore the IHR requires every member state to dispose of "Core Capacity Requirements for Surveillance and Response". The Core Capacity Requirements provide a link to health systems capacities. Annex 1 of the IHR determines the requirements which all State Parties have to meet, which include (at "the local community level and/or primary public health response level") "clinical descriptions, laboratory results, sources and type of risk, numbers of human cases and deaths, conditions affecting the spread of the disease and the health measures employed". According to

Article 44 IHR, WHO should collaborate "in the provision or facilitation of technical cooperation and logistical support to States Parties"; and "the mobilization of financial resources to support developing countries in building, strengthening and maintaining the capacities provided for in Annex 1".

As could be expected, there have been a number of incidents producing conflicts between national reactions and international measures to fight health emergencies, such as excessive interference with international traffic, the unauthorized use of PHEIC to take excessive measures motivated by other interests (such as the killing of pigs raised by the Coptic community in Egypt) and the conflict on *Virus Sharing*. Some developing countries expressed the fear that the avian flu (H5N1) virus samples they shared with the WHO's Global Influenza Surveillance Network (GISN) would be used to develop high-cost patented vaccines that they would be unable to afford, and Indonesia, which has reported the highest number of H5N1 infections and deaths since the first outbreak in 2003, decided to withhold flu samples from WHO in 2006. Finally, in 2010, members of the World Health Organization (WHO) reached agreement in principle on a framework that created a unified mechanism for the sharing of pandemic influenza viruses in the case of a pandemic, and ensuring that poor countries have better access to vaccines [70].

Experiences with PHEICs: SARS as a Prelude, Swine Flu as a Flop, Ebola as the Nadir?

SARS (Severe Acute Respiratory Syndrome): While the negotiations on IHR (2005) were reaching their final stage, the SARS epidemics starting in China put the mechanisms proposed in the negotiating commission to a strong test. "It is assumed that the economic losses associated with SARS were in the region of perhaps 2 per cent of East Asian regional GDP in the second quarter of 2003, but emergency measures were successful, so that only about 800 people ultimately died from this disease" ([71], p. xiii). The effective control of SARS was seen as a great success of WHO. SARS, however, was an "ideal case" in terms of the acceptance of control measures: The severity of the symptoms legitimized extensive control measures and stimulated immediate efforts by many pertinent research institutions. The fact that the most seriously SARS-affected countries had rather sophisticated public health systems, while at the same time doing everything to prevent a spread into poorer regions, can be seen as a factor promoting the success of controlling the disease ([67], p. 183). The control of SARS speeded up the completion and the adoption of the new IHR by the WHA in 2005, and supported an initially high level of international acceptance for them.

Pandemic influenza H1N1: The first PHEIC declared by the WHO Director General with the IHR (2005) in force, was less successful in political terms. The swine-flu virus A/H1N1 had been known to cause infections in humans before, but until 2008 only few cases without severe

symptoms had been reported. When in April 2009 Mexico informed about an outbreak of a severe form of swine flu causing an increasing number of deaths, there was the general fear of a new severe influenza pandemic [72]. As the virus was rapidly spreading to other countries and—at least in terms of geographical spread—had reached pandemic proportions, a PHEIC was declared. WHO and several member states had been criticized for that because of three reasons: (a) The "swine flu" turned out to be a rather mild form of flu, (b) there was an overreaction in form of quarantines, travel warnings and other measures which were not recommended by WHO, and (c) the declaration of a PHEIC rapidly led to a stock-piling of anti-viral medicines (such as Tamiflu) by many countries and thus resulted in considerable revenues for the respective pharmaceutical corporations [73].

Wild Polio-Virus (WPV): By 2013, the annual number of WPV cases had decreased by more than 99% since 1988. In 2013, a total of 416 WPV cases were reported globally from eight countries, an 86% increase from the 223 cases reported from five countries in 2012. This was caused by an increase of cases in Pakistan, and by outbreaks in five previously polio-free countries resulting from international spread of WPV. In 2014, as of May 20, a total of 82 WPV cases had been reported worldwide, compared with 34 cases during the same period in 2013 [74]. On 5 May 2014 the WHO Director General declared the international spread of wild poliovirus in 2014 a PHEIC. Considering the low absolute number of infected persons, this is certainly not related to the direct impact of a new polio epidemic, but to the risk of a broader spread of wild polio virus for the success of the eradication campaign ([75], p. 1). Compared to all other PHEIC, the polio-case has received very little public attention.

Ebola: The late international response to the *Ebola epidemic* in West Africa (2013–2016) has been broadly criticized by many authors. This criticism refers in particular to a reluctant reaction of WHO and other top international health actors, such as the United States Centers for Disease Control and Prevention (CDC) [76,77]. A similar criticism was made by the WHO Ebola Interim Assessment Panel [78]. Only some months after the recognition of the virus and more than 800 deaths in Liberia, Sierra Leone and Guinea as well as some cases in Nigeria, on 8 August 2014 a PHEIC was declared, but the disease could only be stopped after 11,325 people had died [79]; on 29 March 2016, the emergency was declared to have ended. In terms of the IHR, the Ebola crisis led the international community to recognise the need to supplement and possibly to revise the IHR (see below). Since August 2018 there has been a new outbreak of Ebola in the eastern part of the DR Congo; with so far 3080 people infected and about 2100 deaths [80]. Again WHO hesitated to declare a PHEIC (done in 17 July 2019) as the outbreak was limited to DRC territory. Due to the availability of effective vaccines, so far the impact seems to be less severe than West Africa. Still, violent conflicts restrict access to the vaccines, and there is no perspective for an imminent end of the epidemic.

Zika: Zika fever is a mild febrile illness caused by a mosquito-borne virus which in early 2016 had spread to more than 50 countries. The WHO labeled Zika an international emergency in February 2016 [81], probably also in view of the expected high risk of transmission during the Rio Olympic Games. Since then, there has been a slow-down of the spread of the virus. The Emergency Committee meeting on 18 November 2016 concluded "that Zika virus and associated consequences remain a significant enduring public health challenge requiring intense action but no longer represent a PHEIC as defined under the IHR". This was criticized by Lawrence Gostin in the Washington Post: "The decision to 'call off the global emergency' could prompt governments and donors to 'pull back even more' from what Gostin described as a 'lethargic' international response" [82].

The Ebola crisis led to the most basic critical debate on the IHR so far. Reforms were demanded in basically three fields: (1) Strengthening national public health systems and core capacities [77]. The *Commission on a Global Health Risk Framework for the Future* (an international, independent and multi-stakeholder expert commission managed by the National Academy of Medicine, Washington, DC, USA) calls national public health capabilities as "the first line of defense against infectious-disease outbreaks" ([83], p. 1284); (2) improving transparency and coordination in particular through an *Independent Oversight and Advisory Committee for the WHO Health Emergencies Programme* [84,85]; and (3) strengthening the financial basis of the IHR, among others through a Contingency Fund for Emergencies to improve the capacity for immediate action [86]. With the 10-year anniversary of the IHR's entry into force on 15 June 2017, a full and formal IHR review conference addressed these issues as well as the problems of virus sharing and the application of IHR to animal diseases (among others) [87].

Acute and Chronic Infectious Diseases

There are significant differences between international reactions to acute outbreaks and persistent infectious diseases. The IHR/PHEIC concept relates to infectious diseases which like Cholera, Influenza, SARS, Ebola and Zika are characterized by a rapid international spread prone to become pandemic. However, HIV/AIDS, tuberculosis, malaria and many tropical diseases, which may be called "chronical communicable diseases", are not considered as public health emergencies (see above the WHO explanation for ending the Zika PHEIC). They are progressing more slowly, but then are a constant threat in an infested region as well as of international transmission. The IHR, however, have not been designed to act on such risks even though many countries imposed travel restrictions on people with HIV/AIDS (and thus interfered with international traffic).

This threat has been considerably enhanced through the emergence of drug-resistant strains of pathogens. In the case of the alarming spread of extremely drug-resistant tuberculosis (XDR-TB) in the mid-2000s, a WHO

Global Task Force on XDR-TB argued "the IHR Emergency Committee and temporary recommendations are really intended for outbreaks of acute disease, rather than the 'acute-on-chronic' situation of MDR-TB and XDR-TB" ([88], p. 1).

There is no comprehensive program focussing on the control of communicable diseases in general. The HIV/AIDS pandemics has been perceived globally as the most fundamental health crisis after the Second World War and played a pivotal role in transforming the institutional structure of international health politics since the 1990s [89], but it was not an issue for the IHR. CDs which primarily affect LDCs are normally treated as an ongoing business, such as Malaria, Tuberculosis and other tropical diseases. The TDR, the Special Programme for Research and Training in Tropical Diseases, a partnership of WHO, the World Bank, UNDP and UNICEF for scientific collaboration that supports efforts to combat diseases of poverty, dates back to 1974.

Attention to these diseases has been growing with the discourse on neglected diseases since the end-1990s, now basically with respect to R&D on new medicines [90,91]. There is now a considerable number of Global Health Partnerships to fight specific diseases. These partnerships mostly bring together WHO, other intergovernmental organizations, individual states, and non-state actors, and have played a significant role in the development of Global Health Governance. Most prominent are the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), Roll Back Malaria, and Stop TB. After the heydays of the fight against HIV/AIDS, linked in particular to the conflict on access to medicines, these partnerships did not reach a similarly high level of public attention as the IHR emergency responses.

TOWARDS AN INTEGRATED CONTROL OF COMMUNICABLE DISEASES AS A GPG

The attention of CCD on chronic and acute diseases shares one central characteristic that is the vertical, i.e., disease centred approach. This is based on a (mostly implicit) perspective of the eradication of specific diseases as GPGH. During the recent decade, however, the international health community "re-discovered" the importance of Primary Health Care [92] and the support of health system development [93]. As has been mentioned in the previous sections, a comprehensive control of CDs depends on the universal availability of basic health services. The success of countries with a well-established health system in controlling infectious diseases supports this argument.

Tuberculosis, Malaria and HIV/AIDS Control as in Rich Countries—How Can This Be Implemented?

During the 19th century, in most of today's high-income countries, TB was the most deadly disease. Systematic case detection (reliable TB tests, notification requirements for physicians, improved hygiene, isolation and

a conservative treatment (before effective medicines were developed) led to a slow, but continuous reduction of open TB cases. After the discovery of antibiotics in the first half of the 1950s, the introduction of systematic, observed treatment for at least six months, and the introduction of compulsory vaccination (even though available vaccines are not fully effective), the number of new TB cases sunk rapidly. Since the 1980s, TB was no longer present as a serious health risk in most High Income Countries ([94], p. 42f.). In England and Wales, the number of TB notifications (respiratory and non-respiratory) fell from a high of 117,139 in 1913 to 5086 in 1987 [95]. This means that—in spite of a recent increase on TB incidence to 8659 cases in 2012 [95]—due to national control policies and treatment possibilities in a developed health system, TB can be controlled, and about 95% of TB patients can be cured. While in 1918 the death-rate was about 120/year per 100,000, in 2016 it was down to around 0.6 [96].

In 2014 there were 1022 imported Malaria cases in Germany, of them 38.9% of the species Malaria Tertiana [97], which could be transmitted by mosquito species endemic in temperate regions of Europe, favoured by rising temperatures. However, the high standard of health care will quite probably interrupt the reproduction cycle of parasites ([98], p. 31). The examples of Tuberculosis and Malaria, in combination with the framework conditions to control outbreaks of acute CDs, indicate that the threat of infectious diseases can only be effectively controlled—including the aspects of international transmission and of treatment—if basic healthcare is provided everywhere. Health systems are, if comprehensively organized and the respective norms implemented by state authority, national public goods, but minimal standards of health everywhere are an essential component of CCD as a global good.

In the case of HIV/AIDS the situation is more complicated. Since the late 1970s—before the HI-Virus was discovered in 1983—the pandemics had already spread from Sub-Saharan Africa to the US and Europe. Due to prevention measures, effective testing and the early introduction of anti-retroviral therapies in the 1990s had allowed slowing down the spread of the virus compared to developing countries in sub-Saharan Africa. While the number of new infections in all Western European countries in 2015 was estimated at 12,890, the estimate for South Africa alone was 529,670 [99]. The international transmission of HIV/AIDS has played an important role in the spread of the virus; in spite of travel restrictions imposed, in 2010, 35% of all new HIV infections occurred among migrants from sub-Saharan Africa. UNAIDS, however, assumes that the majority of those infections were acquired while in Europe due to restricted access to treatment for undocumented migrants ([100], p. 103), i.e., due to gaps in universal health care in European countries.

Health Environment and the Control of Infectious Diseases: Prevention and Treatment

It has been shown that CCD has many dimensions. While the IHR, strategies to eradicate diseases, as well as health partnerships are dominated by vertical orientations towards fighting and controlling specific diseases, an effective CCD depends on a number of elements which are essential for improving human health in general. This implies a growing attention towards horizontal issues of health care and a healthy environment [101]. In recent years the horizontal perspective has again been strengthened in global health: An important step in this direction had been done by the Commission on Social Determinants of Health (CSDH), established by WHO in March 2005 and delivering its report in 2008 [102]. The CSDH referred again to the goal of "health for all" (Alma Ata declaration 1978) and the promotion of Primary Health Care (PHC) as the central means towards good and fair global health ([102], p. 33). Though the analysis presented here points to the importance of the horizontal perspective for CCD, the CSDH Report and the World Health Report 2008 [92] seem to keep these topics apart, the CSDH Report referring only at one place to infectious diseases ([102], p. 62). Only a few years later, however, the perspective has been widened towards "universal health coverage" (UHC), to provide universal access to all basic health services [93]. Furthermore, the launch of the Sustainable Development Goals (SDGs) as well as the rising awareness on the links between communicable and non-communicable diseases have resulted in a more integrative approach, as has been stressed by various publications [103,104], including a WHO publication on the SDGs.

> "*The target on UHC underpins all other targets and provides an opportunity to refocus efforts on a more sustainable approach through system-wide reform, based on the principles of efficiency and health service integration and people-centred care. The SDGs also fundamentally call for intersectoral action, acknowledging that the attainment of health goals is dependent not only on actions within the health sector, but also on economic, social, cultural and environmental factors.*" ([105], p. 41)

The interactions with other sectors are also stressed by the concept of "Health in All Policies" ([102], chapter 10), [106], ([107], p. 256f.). In a number of fields links with CCD are obvious: Hygienic conditions imply the access to clean drinking water, but also clean rivers and lakes and a certain level of cleanliness in the living environment (waste disposal!) which reduce the threat from disease vectors and pathogenic agents. Healthy food and nutrition, good housing conditions and condition at the work-place contribute to improve the health status of people and to strengthen their immune system; education plays an important role for disease prevention, and structures of good governance are important for improving access to medicines.

"Systematically Reducing the Impact of Infectious Diseases on Health in All World Regions": Challenges to the Global Community

The definition given above (Section "**Control of Communicable Diseases: A Classical Global Public Good?**") aims at a comprehensive strategy to prevent the spread and the impact of diseases in one composite GPG. The experience of IHR has shown that the successful control of PHEIC demands a certain level of health services universally provided, such as laboratories, diagnostic capacities and access to treatment. This also pertains to the control of chronic CDs, and the global threat posed not only by the trans-border transmission of CDs, but also by political instability caused by a high burden of disease. UHC should be "universal" not only with respect to healthcare within national societies, but in all national societies. This includes access to medicines [38], as also the EU Council concluded:

> "*This [EU] support shall ensure that the main components of health systems—health workforce, access to medicines, infrastructure and logistics, financing and management—are effective enough to deliver universal coverage of basic quality care, through a holistic and rights based approach.*" [108]

Thus, an appropriate conception of the GPG of CCD should take into account the need to globally guarantee the basic preconditions of UHC. It should be noted that a conceptualization of CCD as a composite GPG points much more explicit as the IHR to the need of much larger and better trained global health workforce in particular in the World's poorer regions. The 2006 World Health Report ("Working together for health") focusses on this issue and estimates that there is a shortage of about 4.3 million health workers, but also points out that the knowledge about the workforce has to be urgently improved ([109], p. 15). A decade later, considering the goals set by the SDGs and the deepened discussion on UHC, and following the report of the UN Commission on Health Employment and Economic Growth a shortfall of 18 million health workers, primarily in low- and lower-middle-income countries, is projected for 2030 ([110], p. 8).

Furthermore, attention should also be paid to the so-called "One Health Initiative" that aims at linking human, animal and environmental health as a strategy to fight communicable diseases and thus to strengthen the GPG of CCD, based on the observation that 70% of emerging and re-emerging diseases are vector-borne or zoonotic [111].

Comprehensive CCD should be seen as a composite GPG composed of many specific GPGs related to the spread and general control of many infectious diseases, to medical knowledge and to health system development. Considering this in combination with the significance of CCD in the fight against poverty and political instability, and with the multiplicity of actors in GHG, constitutes the starting-point for a final discussion of the problems of financing CCD.

FINANCE OF CCD: A TYPICAL COLLECTIVE ACTION PROBLEM

One of the basic characteristics of public goods is their tendency to be underfinanced (see Section "**PUBLIC (COMMON) GOODS**"), which is exacerbated in the case of GPGs due to the lack of state enforcement. Otherwise, limited means to provide access to all will endanger the status of CCD as a public good. With respect to vaccination campaigns for the eradication of diseases it has been pointed out that they require a weakest-link technology, the same is true for a full implementation of the IHR (2005) as well as for UHC. If socially efficient results are to be reached, actors have to put the collective interest of world health ahead of their specific individual (national or organizational) interests ([42], p. 154f.). Discussing these collective interests in terms of public goods, puts actors under pressure to accept binding obligations to take over specific contributions necessary for implementing the common good (financing investments in their community or supporting poorer communities to take the necessary steps). It is frequently difficult to reach such binding agreements beyond the institutions of the sovereign nation state, even more so in the complex field of GPGs. In this situation, the term (global) governance is obviously more flexible even when it is defined closely linked to the concept of collective goods, slightly modified from a definition Richard Smith proposes: "governance is taken to refer to the actions and means adopted by communities (original: societies) to promote collective action and deliver collective solutions in the pursuit of common goals" ([44], p. 124). Typically, contributions to financing "global health" or to reach specific health goals are called "development assistance for health" or "grants", are presented as a basically voluntary form to "promote collective action" and are discussed in the framework of global health governance. "Binding commitments" at the level of intergovernmental organizations are normally highly insufficient to finance GPGs.

Inge Kaul and Pedro Conceição published in 2006 an extensive volume on The New Public Finance [112] starting from the issue of financing global public goods in an increasingly open world economy (in spite of challenges to openness, basic features of 2006 do still prevail) and new policy approaches towards preference aggregation at the intergovernmental level. Observing that many international agreements remain poorly funded, they raise "the question of how ell global public policy and expenditure priorities are matched" ([112], p. 57). The volume contains contributions on financial tools in fields such as "blending external and domestic policies", public-private cooperation, instruments of enhancing the efficiency of international public finance. These aspects cannot be reviewed here, therefore I will concentrate on a short overview of finance for global health, which points to basic problems of providing CCD as a global public good.

The Institute for Health Metrics and Evaluation (IHME), established in 2007 with support by the Bill & Melinda Gates Foundation (BMGF) and the

US state of Washington “with the goal of providing an impartial, evidence-based picture of global health trends to inform the work of policymakers, researchers, and funders” [113], provide detailed information on funding of global health (see Figure 1 for example) [114,115]. Besides that extended data sources are published by WHO [116].

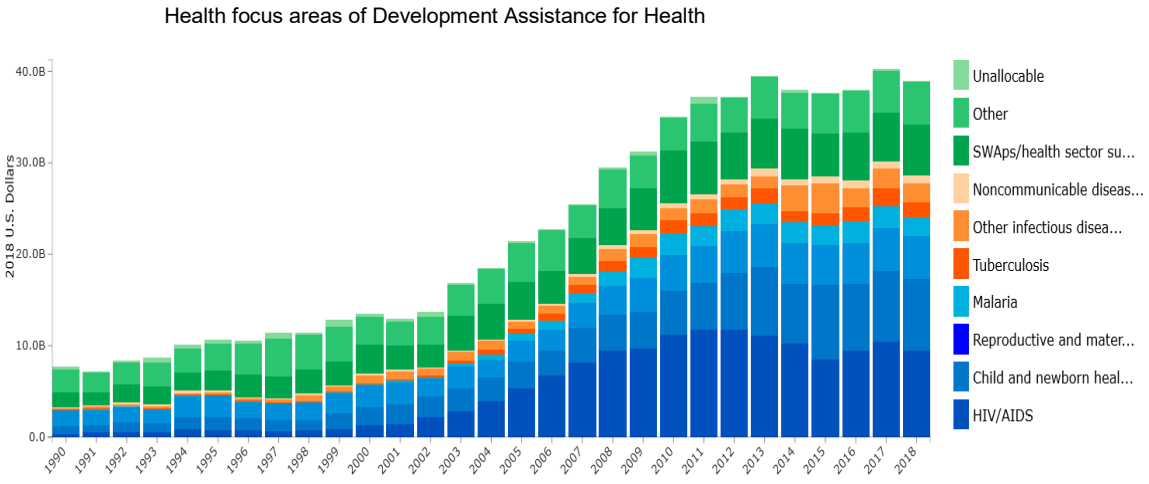

Figure 1. DAH by health focus area, 1990–2018 [114]. Chart reused under Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (https://creativecommons.org/licenses/by-nc-nd/4.0/).

In spite of acknowledging a significant growth of contributions to global health between 2000 and 2005, authors criticize a persistent insufficiency of funding to meet poor countries’ basic health needs, and, in addition, severe problems in the global health architecture concerning the quality and effectiveness of existing aid and the efficiency of current public spending [117] and a smaller relative role for the UN system and the World Bank, which “runs the risks of undermining their crucial role as trusted neutral brokers between the scientific and technical communities on the one hand, and governments of developing countries on the other.” ([118], p. 2122).

Globally there exists an enormous mismatch between countries’ health financing needs and their current health spending. Developing countries account for 84 percent of global population and 90 percent of the global disease burden, but only 12 percent of global health spending ([119], p. 2).

There is a certain bias towards a purely disease-oriented form of financing. Taking into account the financial needs estimated for specific aspects of CCD, such as funds to fight health emergencies (see Section “**Experiences with PHEICs: SARS as a Prelude, Swine Flu as a Flop, Ebola as the Nadir?**”), R&D on neglected tropical diseases, estimated at $150 billion USD for 2008 to 2015 [120], vaccination of children, estimated at $40–60 billion USD for 2011 to 2020 [121,122], access to medicines with a proposal for a Global Innovation Fund of $2 billion USD ([123], p. 31) and basic health services, there is still a significant lack of funding, in

particular with respect to financing minimum standards in poor countries. Data on per capita total health expenditure show a picture of extreme inequality: While (in 2014) Madagascar spent $13.67 USD, and the average for Low Income Countries (LICs) stood at $36.5 USD, Switzerland spent $9,673.52 USD, the US $9,402 USD, and the average for High Income Countries was $4,538.7 USD [124]. The World Health Report 2010 on Health System Financing suggests that to ensure access to critical interventions, LICs will have to increase per-capita health spending from $32 USD in 2010 to $60 USD in 2015, supported by development assistance; the results fell far short of this goal. In fact, due to the intersectoral links pointed out above, significant additional resources are also needed to comply with the goal of "health in all policies", considering the extreme level of social inequalities in many countries [125].

If—driven by the objective of a universal realization of human rights or simply by the global repercussions of bad health in poor countries (communicable diseases, but also political instability)—a minimum standard of healthcare is to be achieved as a GPG, this requires a significant global reallocation of financial resources. This has proven difficult already with respect to limited goals such as financing emergency operations as well as the core capacity requirements demanded by the IHR (2005). Even though a large part of finance for global health has been attributed to controlling communicable diseases, CCD—in the extended understanding as discussed in Section "**TOWARDS AN INTEGRATED CONTROL OF COMMUNICABLE DISEASES AS A GPG**"—has fallen short of necessary means. At the global level, negotiated commitments by governments and non-state actors cannot be enforced by coercive means. Therefore, a research focus on the preconditions and mechanisms to implement such commitments is needed which would include analysing the acceptance by a general public of costs not directly linked to a specific benefit for the local population. This is related to an emerging global society [126] characterized by a certain transnational convergence of discourses and elements of transnational norm-building and solidarity expressed through public opinion, mass media, civil society, and political parties [32,127].

CONCLUSION: GLOBAL PUBLIC GOODS FOR THE CONTROL OF COMMUNICABLE DISEASES—COMPONENTS OF A STRATEGY TOWARDS "HEALTH FOR ALL"

This contribution aims at providing a comprehensive view of policies to control communicable diseases through the lens of a GPG approach. The demand for GPGH responds to growing needs in a world characterized by globalization, but providing them, faces great obstacles due to the fragmentation of authority in global politics—in spite of tendencies towards growing international cooperation and transnational communities.

In two ways, globalization has led to refocussing CDs: In the "developed" world the illusion that these are becoming exclusively "diseases of the poor" had vanished definitely with the spread of HIV/AIDS, and in developing countries the persistent burden of CDs had been recognized as an element of underdevelopment, impeding growth and competitiveness with the "developed" world. These perspectives correspond to two approaches towards controlling CDs: the fundamental remoulding of the IHRs as a mechanism to control the global spread of emerging epidemics and to prevent primarily the emergence of new CDs in Northern countries (and therefore frequently seen under the lens of "health security") and the rise of global partnerships to fight "chronic" CDs in the South as a form of health development aid. This has been accompanied for decades—with varying priorities—by strategies to improve overall healthcare in developing countries, from "Primary Health Care" via "Health System Strengthening (HSS)" to "Universal Health Coverage".

The experiences with the IHR (2005), in particular after the Ebola crisis and obvious deficits in the field of core capacity requirements in poor countries, had been at best mixed. Global Health Security as it is aimed at by the IHR cannot be secured without a basic surveillance and early response capacity in the poorest countries (weakest-link), but the "positive synergies" with HSS and UHC are quite limited [128]. UHC is a human rights-based concept with potentially vast societal externalities; to link this to the political support for GHS/IHR [129] ignores these much more far-reaching social obligations.

The long-term effective control of chronic communicable diseases implies a broader field of measures in global and national public health; it is an essential component of the goal of "health for all", including complex interactions between NCDs and CDs. Research on the "Interactions among contributing causes of death" ([103], p. 3) has shown that the strict differentiation between CDs and NCDs cannot be upheld. Supposed NCDs (e.g., cervical cancer) are in fact transmitted through viruses, while many CDs are triggered by NCDs (weakened immune system), by environmental and nutritional factors facilitating infections.

Providing a comprehensive CCD as a GPG (systematically reducing the impact of infectious diseases on health in all world regions) implies the recognition of "one health" as part of a "global responsibility" (contrary to falling back into nationalism). This would lead to a hierarchical structure of GPGs: from global justice via UHC (as "GPGs in construction") to specific forms of international regulation (such as the IHRs) to fight CD transmission and to campaigns to eradicate specific diseases. Raising sufficient financial means for providing CCD as a GPG will remain a great challenge for decades to come; a differentiated discussion of this issue surpassed the frame of this contributions.

The analysis of GPGs for health is basically an analytical endeavour linking the large field of health topics to their inter- and transnational

connections, concerning the impact of developments on the local, national and regional levels on the global society on the one hand, of global processes on the local and national spheres and the growing consciousness that many health goals require a global approach and can only be reached through a joint effort. According to Smith and Woodward, the GPG concept "is not appropriate as an organizing principle or a prioritization mechanism—while it can tell us how to achieve desired outcomes in particular areas, it cannot, by itself, tell us what we should do" ([107], p. 279). Recently, the link between various prioritary WHO programmes (UHC, controlling "threats from high-impact health emergencies", i.e., strengthening the IHR, ...) and the SDGs produced a new demand for a more comprehensive view of interdependencies between policy fields and for intensifying cooperation in particular to improve the financial basis for these programmes. The concept of (global) public/common goods for health has been "rediscovered" as a useful tool to better analyse the benefits of and the political environment for UHC and to push for a health financing reform: the WHO has recently established a "Financing Common Goods for Health technical expert group" [130], which in December 2019 published a special issue of the review Health Systems and Reform on "Financing Common Goods for Health: Fundamental for Health, the Foundation for UHC" [131]. By looking through the lens of a global public good at the frequently narrow and fragmented analyses on controlling infectious diseases, this article intends to contribute to a more comprehensive treatment of this field of global health. For fully exploiting this approach a much more detailed analysis of specific public goods for infection control is needed.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

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