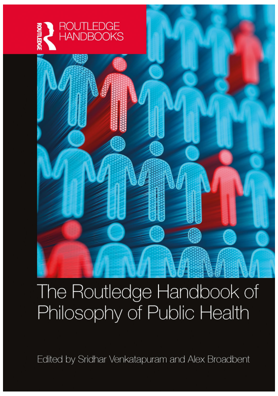

The Routledge Handbook of Philosophy of Public Health

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Concepts of health and disease in public health

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CONCEPTS OF HEALTH AND DISEASE IN PUBLIC HEALTH

Benjamin Smart

Introduction

Given that notions of health and disease ground the practices of all medical sciences, it is unsurprising that analyzing these concepts has always been a core component of philosophy of medicine. Christopher Boorse (1975, 1977, 1997, 2014), Rachel Cooper (2002), Jerome Wakefield (1992), and many others have written papers discussing the nature of disease, but all of these focus on the domains of clinical medicine and pathology. Some work on the philosophy of public health has been published (Nijhuis and Van der Maesen 1994, 2000; Valles 2018; Weed 1999), but little in the way of detailed analysis of the concepts of health and disease within this context of public health has been presented.

Harry Nijhuis and Laurent van der Maesen identify two ontological categories characterizing the nature of "public" in public health. The first emphasizes the individual over the collective, and the second the collective over the individual. In this chapter, I will discuss the nature of disease in the context of both the individuals that make up a population, and in Section "Conclusions," consider how the "health" predicate can meaningfully be applied to the collective.

Let us use the term "public health" broadly as "the science of protecting and improving the health of people and their communities [...] by promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing and responding to infectious diseases" (CDC Foundation 2021).

Nijhuis and Van der Maesen, in a 1994 editorial on the philosophical foundations of public health, suggest four "categories of ontological interpretations of public health," two pertaining to "public" and two to "health."

> [Public] Category [PC1] emphasises the individual. In this view, the public is primarily comprised of the actions and motives of discrete individuals. "Public" category [PC2], on the other hand, emphasises the collective over the individual. "Health" category [HC1] is a mechanistic view that emphasises the traditional medical distinction between disease and non-disease in the individual, whereas [Health] category [HC2] views health as the degree to which an individual reaches an equilibrium state with somatic, psychological, and social influences.
>
> *(Weed 1999: 99)*

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Nijhuis and Van der Maesen claim that "The great majority of scientific and other public health work, including epidemiological research and preventive programmes … is based on the concepts in categories [PC1 and HC1]. Most of the policy statements of 'health promotion' seem to be founded on perspectives [PC1 or PC2 and HC2]" (1994: 2).

Drawing on work published in the *Journal of Evaluation in Clinical Practice* (Smart, Stevens, and Verbakel 2018), I show in this chapter how these four categories can be applied to existing analyses of disease in the context of clinical medicine and pathology, and then apply these analyses to public health. I conclude with a plausible, comparative account of health that can be applied to populations as a collective (as opposed to the individuals comprising the collective).

The context-dependency of the disease concept

The literature on "what is health/disease?" is rapidly growing, broadly speaking covering two related but distinct philosophical projects. The first concerns disease as an ontological category, where the goal is to determine what types of particulars and/or processes and/or properties constitute diseases (for example, Whitbeck 1977; Fuller 2018). The second is a project in conceptual analysis. This second project comprises an attempt to discover the meaning of the term "disease," in other words, to work out the necessary and sufficient conditions for an individual to be diseased (assume diseases pertain only to individuals for now), without recourse to "not healthy."[1] If one interprets this as "what do 'we' mean when we use the term 'disease'"—and this is a dangerous interpretation—then one finds oneself in a quandary. "We," as a proxy for a definite description of a particular group of persons, is not, without qualification, particularly useful. Does "we" refer to all (alive) persons? Does it refer to all (alive) persons in academia? Does it refer to all (alive) persons working in the medical sciences? And so on. If one takes "we" to refer to the class of all (alive) persons, then there is the further question of "does the term 'disease' always mean the same thing, or can it change its meaning when used in different contexts or at different times?" This chapter is concerned primarily with the second category of conceptual analysis, although as we (all readers of this chapter) shall see, reference to the ontological category is inevitable.

It will become clear during the course of this chapter that "disease" is a fluid concept—its meaning changes depending on who is uttering the term, and under what circumstances. The search for necessary and sufficient conditions for *the* concept of disease will therefore always be fruitless, since those conditions are subject to change. One should thus adopt a pluralist approach. That is not to say that attempts to cash out notions of health and disease are necessarily fruitless, only that one must specify the context prior to presenting one's analysis. Boorse does exactly this. He states that his analysis is one of disease qua "pathological condition" (Boorse, 1977: 542)—the theoretical concept of disease employed by the pathologist. Others are guilty of being less explicit in this regard. Cooper (2002) criticizes Boorse on the ground that disease cannot be a value-free concept, but Cooper's analysis is, at least on the face of it, entirely inappropriate for the pathologist with no direct access to the patient (it is often impossible for the pathologist to determine whether the patient considers the condition to be a "bad thing to have," so how *could* the value assessments of the patient play any role?). In this chapter, I consider three contexts in which the concept of disease is employed within the medical sciences: pathology, clinical medicine, and the health of a human population as a collective.

PC1 considers the "public" in terms of a collection of individuals. This, the individual organism, is where the majority of literature on concepts of health and disease has focused.

PC2 considers the collective over the individual, and in the final section, I outline what "healthy populations," in this sense, might look like. In the following sections, I provide an overview of a number of analyses of health and disease from the PC1 perspective, since public health draws on concepts of health applied to both PC1 and PC2.

The pathologist

Pathology is the branch of medical science that describes the study of physiological subsystems (fluids, cells, tissues, organs) for the purpose of diagnosing and establishing the cause(s) of disease. The job of pathologists is thus, at least in part, to examine surgically removed tissue and/or fluids (or perhaps an entire body, in the case of an autopsy) and identify the abnormalities typical of specific diseases. It is this focus on discovering abnormalities that motivates the biostatistical theory (BST). Over the course of these debates, Boorse has set out BST in a number of different ways. I will assume, however, the most recent schema at the time of writing. It runs as follows:

1 The *reference class* is a natural class of organisms of uniform functional design, specifically, an age group of a sex of a species.
2 A *normal function* of a part or process within members of the reference class is a statistically typical contribution by it to their individual survival [or] reproduction.
3 *Health* in a member of the reference class is a normal functional ability: the readiness of each internal part to perform all its normal functions on typical occasions with at least typical efficiency.
4 A *disease* [later, pathological condition] is a type of internal state which impairs health, i.e. reduces one or more functional abilities below typical efficiency (Boorse 2014: 684).

Boorse takes a physiological subsystem to be diseased if and only if it performs its function subnormally, relative to the reference class to which the organism in question belongs. This is often illustrated by a graph such as in Figure 4.1.

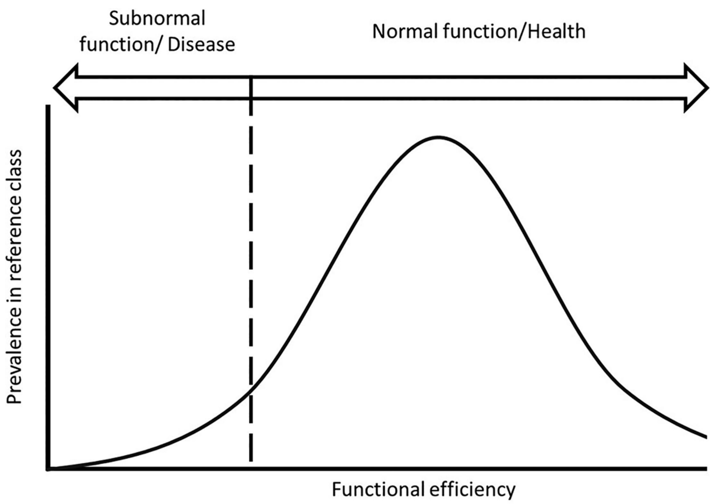

Figure 4.1 The biostatistical theory

Most physiological subsystems have a "natural function"—subsystems *do* something specific that positively contributes to the health of the organism.[2] Let us take Figure 4.1 to represent the functional efficiency of lungs for some reference class *R*. Some members of *R* have incredibly healthy lungs that perform their function (of absorbing oxygen into the bloodstream) extremely efficiently, whereas other members of *R* have lungs that barely absorb sufficient oxygen to keep those members alive. These individuals fit into the far right and far left hand sides of Figure 4.1. The area to the left of the dotted line represents those lungs performing their function "subnormally," that is, those members of *R* with diseased lungs. More generally, the areas to the right of the dotted line represent organs operating with normal (or, to the far right, supernomal) functional efficiency (for *R*). For a member of *R* to be diseased with respect to some trait *T* is just to fit into the area to the left of the dotted line the chart representing *T* for *R*.

BST is a mechanistic account of health in individuals. It falls into Nijhuis and Van der Maesens' "health" category HC1. However, individual health states are grounded by the health (qua functional efficiency of the physiological subsystems of members) of populations. Health and disease are not states wholly determined by the physiological state of the individual, but those states relative to the average physiological states of the population, estimated through epidemiological studies. It is worth examining the core claims in the schema, since most have been criticized in one way or another (although, in my opinion, for the most part not all that successfully).

1 *The reference class is a natural class of organisms of uniform functional design, specifically, an age group of a sex of a species.*

The first clause has been criticized on at least two grounds: first, that contrary to Boorse's claim, BST is not a naturalist conception of disease. In selecting age, sex, and species type, Boorse is making value judgments regarding the saliency of particular properties to determine the members of each reference class and, *ipso facto,* the biostatistical norms and functional limits for disease states. Second, that age, sex, and species type are the *only* qualities relevant to selecting the members of reference classes is questionable. Cooper (2002) claims that many more than three qualities are relevant, including race and a number of environmental factors—cyclists, for example, typically have lower heart rates. It is even possible that some reference classes are so detailed that they comprise only one member. This, of course, entails that the one member is healthy in every respect, since she alone determines the biostatistical norms (Smart 2016: 28).

2 *A normal function of a part or process within members of the reference class is a statistically typical contribution by it to their individual survival [or] reproduction.*

The second clause is often criticized on similar grounds to the first: Boorse is again accused of making value judgments. In this case, the objection is that in *choosing* individual survival or reproduction as the natural goals of an organism, over, say, writing a novel or performing in a ballet, one can no longer claim to have a genuinely naturalist conception (see Ereshefsky 2009). Making that choice, it is argued, involves a value judgment.

Boorse responds to these objections (both regarding the reference classes and the organism's natural goals) by arguing that in order to establish the intended conclusion—that the BST is, in fact, a value-laden theory—the theory must be shown to include value-laden concepts. "A correct definition of concept H in terms of concepts C1, C2, … Cn is value-laden precisely if one of the Ci is value-laden: that is, if a judgement of the form 'x is Ci' is a value judgement" (Boorse 2014: 12). How the various concepts are chosen is irrelevant, and since none of the concepts involved in BST (statistical normality, survival, reproduction, organism, part, process, species, sex, age, and causation) are value-laden concepts, the theory remains value-free.

Boorse acknowledges that the nature of the reference class can have a profound effect on what counts as pathological. However, he claims that the BST reference classes simply draw from how biologists deal with taxonomy. "When biologists describe and classify organisms, they sort them into species, subspecies, separate them by sex in sexual species, and distinguish immature from adult forms" (Boorse 2014: 15). The alternatives offered by Cooper (2002) (with the exception of race, which Boorse has always said may need to be added (1977: 558; 1987: 370)), simply do not feature in how biologists classify organisms, and thus should not feature in an analysis of disease that is designed to encompass all species.

3 *Health in a member of the reference class is a normal functional ability: the readiness of each internal part to perform all its normal functions on typical occasions with at least typical efficiency.*

Boorse's conception links health states to biostatistical norms, but what is biostatistically normal changes over time—this causes at least two problems for BST:

i Most would agree that, given the progression of modern medicine, improvements in diet and hygiene, and indeed the vast increase in life expectancy, population health has improved significantly since the Middle Ages, but if biostatistical normality is the mark of health, then the same percentage of the population is diseased now as were diseased in the sixteenth century. Surely, any conception of disease with this implication should be discarded (Guerrero 2010).

ii A sudden infectious disease epidemic (tuberculosis, for example) could, at least in principle, considerably lower the average functional efficiency of the lungs across a population/reference class. The implication for BST is that the functional efficiency necessary for healthy lungs drops significantly over a very short period of time.

Suppose my lungs are currently diseased due to cancer; for BST, this is just to say that my lungs perform their function subnormally. But I would surely maintain that my lungs are diseased, no matter how poor the species-typical functional efficiency becomes during a tuberculosis epidemic. Health status should not be subject to Cambridge changes (see Geach 1969) in this way, since changes in health status should, at least on the face of it, pertain only to changes in the intrinsic properties of the organism.

Boorse provides a threefold response to David Guerrero's Cambridge change objection:

> (1) The theoretical possibility of a Cambridge change in someone's health status seems to be entailed by any view of health as normality, an idea basic to scientific medicine. But (2) it is far more difficult than Guerrero thinks for such a change to occur, and (3) the only realistic ways in which one could occur are of no importance to medical practice.
>
> *(Boorse 2014: 35)*

Boorse bases normal functional efficiency on what he terms "a reasonable time-slice of the species" (1997: 66). The exact duration of this time-slice will vary from species to species, since some species have a life expectancy of only a few days, whereas others can reasonably hope to live for more than 100 years. However, given that statistical normality is not only calculated based on the properties of those animals currently living, an epidemic of the sort described above will not affect the species-typical functional efficiency of physiological subsystems as dramatically as it first appears. The time-slice, in human populations, would extend into the past, long before the tuberculosis epidemic began. An individual's health status is thus not relative only to the existing population, but to those who existed prior to the onset of the epidemic within the time-slice.

4 *A disease [later, pathological condition] is a type of internal state which impairs health, i.e. reduces one or more functional abilities below typical efficiency.*

Perhaps the most pressing concern regarding tenet 4 of BST is the "Line-Drawing Problem" (Schwartz 2007). If BST required the same percentage of physiological subsystems to be classified as functioning subnormally in all reference classes, then the same percentage would necessarily be classified as diseased, no matter how healthy or sick the reference class. This would be highly problematic, since some diseases affect a large proportion of a reference class, and others are very rare. Similarly, some diseases affect a much larger proportion of some reference classes than others.

Boorse does not, however, impose this condition. The BST, he states, "is consistent with disease prevalence of 35%, 20%, 5%, 1% or, I suppose, even 0%, and with prevalence varying from disease to disease" (Boorse 2014: 34). It is not consistent, as Boorse acknowledges, with disease prevalence of >50%, and this might prove problematic in the very elderly.

There is no particular place in which "the line" demarcating the normal and subnormal is drawn—rather, the location of the line is chosen by "medicine."

Boorse's concept of disease qua pathological condition has, as I have demonstrated here, received much criticism since its first publication in the mid-1970s. However, despite these objections, it remains perhaps the most discussed naturalist analysis of disease in the literature. Its target is explicitly what Nijhuis and Van der Maesen refer to as HC1; that is, the "mechanistic view that emphasises the traditional medical distinction between disease and non-disease in the individual" (Weed 1999: 99) with its remit is firmly within PC1, where the individual is emphasized over the collective. Its prominence in the literature is testament to how well it has stood up to these critiques.

Public health is interested in more than just the biological function of physiological subsystems, but there are certainly aspects of public health where this is the primary concern. The development and testing of pharmaceutical treatments, determining "the normal range" of biological markers in the blood (and elsewhere), and so on, seem to fit this model very well. Boorse's model helps us distinguish between the pathological and the normal, but it does not help determine where public health resources should be directed. Values may not be fundamental to (or even play any role in) pathology, but public health policymakers need a richer concept of disease than that of the pathologist. Policymakers need to know what interventions and treatments should be implemented and when in order to improve public health, and this inevitably requires value judgments.

Value-laden accounts of disease

In this section, I consider three value-laden accounts of disease. The first, which I refer to as Cooper's "tripartite account," has no criteria concerning population health, and no criteria concerning the "functional efficiency" of physiological subsystems whatsoever. The second and third accounts, those of Wakefield (the Harmful Dysfunction Account (HDA)) and myself (the Harmful Function Account (HFA)), take the concept of disease to have both a value-laden and a value-free component. In neither case does the value-free component directly refer to biostatistically average functional efficiencies; rather, the degree of functional efficiency to be expected is determined by evolutionary considerations. In this way, both HDA and HFA are tied to mechanistic concepts of health, and thus to Nijhuis and Van der Maesen's "health" category no. 3. As we shall see, although Cooper's account focuses on the "traditional medical distinction between disease and non-disease in the individual" (category no. 3), there is no mention of physiological mechanisms.

Cooper's tripartite account

Cooper begins her account of disease with a disclaimer: "that a neat account of disease cannot be achieved" (2002: 271). Perhaps the two most reliable ways of rejecting a conceptual analysis A of a concept C are (i) to provide examples that satisfy all the criteria set out in A, but are not cases of C; or (ii) to provide examples of C that do not satisfy all the criteria set out in A. On the face of it, one cannot reject Cooper's analysis on either ground since the disclaimer allows for cases of both (i) and (ii). Cooper is right. The concept of disease is messy. It is certainly the case that the meaning of "disease" is context-dependent, and perhaps even within specific contexts no one set of necessary and sufficient conditions is going to be a perfect fit for all our intuitions. That being said, below I present Cooper's view, and criticize it in exactly the same way as I would those analyses whose defenders do not assert this prior disclaimer (after all, what else can one do?).

Cooper's tripartite account (2002: 271) states that "we" (note the unqualified "we") take a physiological condition to be a disease if and only if:

1 the condition is "a bad thing to have" for the individual patient;
2 one would consider "the afflicted person to have been unlucky"; and
3 the condition "can potentially be medically treated."

Cooper is of course speaking of diseases in individuals rather than in populations, so once again this is an analysis of health in PC1. But this is not a biostatistical account—it does not rely on the statistically normal functional efficiencies of the collective, but is based only on the intrinsic properties of the individual patient, and society's attitudes toward those properties.

Condition 1 of Cooper's view jumps straight into the value-laden quality of the disease concept. That diseases are bad naturally comes to mind when thinking about health and disease. In other words, the value component seems to form a part of the lay concept of disease. It most likely forms a part of the clinician's concept, too. For Cooper, the primary reason for including the "bad thing to have" criterion is that biological abnormality without a normative component is simply not enough to draw conclusions about health states. Having ginger hair, she points out, is a biological abnormality, but it is not a disease (2002: 272). Perhaps the most intriguing benefit of Cooper's account, at least as an account of health and disease within a clinical context, is that it allows for physiological conditions to be diseases for some people and not others. A daisy, she says, "can be a weed in one garden but a flower in another, depending on whether or not it is a good thing in a particular garden" (274). A gardener will not remove the daisy, nor will she consider it a weed, when she likes it in her garden. Similarly, a patient will not treat some physiological condition, nor consider it a disease, when she takes it to be a good thing to have. For myself, male pattern baldness (MPB) might well come out as a disease under Cooper's definition. However, for some, baldness is a valued part of their identity (think of actor Patrick Stewart, for example).

Condition 2 (that the patient must be considered to be unlucky) eliminates some of the obvious counterexamples. By unlucky, Cooper does not mean unpredictable by medical science, but rather "'unlucky as judged by the uninformed layman', that is, roughly, worse off than the majority of humans of the same sex and age" (Cooper 2002: 276). Cooper (strangely enough, considering my own example above) uses MPB as an example of a condition that is clearly not a disease to warrant the "unlucky" criterion. For her, MPB is obviously not a disease, precisely because men cannot be considered unlucky if they have it.

Cooper uses a second example of a 90-year-old man who cannot walk as far as he could when he was younger. Since that is to be expected of any man, it is not unlucky, and thus not a disease. I would urge Cooper to apply similar reasoning to MPB. It is true that 70-year-olds can expect hair loss, but only 16% of 18–29-year-olds have MPB (Rhodes et al. 1998). At the very least, it is arguable whether or not MPB can be a disease in young men, whereas it is certainly not arguable that 90-year-olds who cannot walk as far as when they were younger are diseased. Why? If Cooper is right, it is precisely because the former are unlucky, and the latter are not. The argument about whether MPB in a young man (who does not want to be bald) is a disease, then, is really just an argument about whether that man is unlucky to have the condition.

Cooper's "unlucky" condition is questionable, even if cashing out only the lay concept of disease. We saw that Cooper uses the example of a 90-year-old who struggles to walk as a case of poor, but biologically normal functional efficiency. This is not a disease for Cooper, since it does not count as unlucky. This coheres nicely with our intuitions, but there are at least some potential counterexamples—cases where a patient is not unlucky by Cooper's definition (since she is not worse off than the majority of people her age and sex) but is nonetheless diseased. It is not particularly unlucky (at least not in Cooper's sense) for a very elderly man to suffer from severe arthritis. It is a very common condition in the elderly. The same is true of hearing loss, and even mild dementia in very elderly patients. These states are (surely) all pathological, and typically require intervention(s) no matter how old the patient. It seems that condition 2 is not a necessary condition after all.

Further, I have argued elsewhere that all three of Cooper's conditions can be satisfied, without the afflicted individual being diseased:

> Suppose Sam decides to get a tattoo reading "peace and love" on her arm, and, as is the fashion, decides to have it written in Chinese characters … The tattoo artist gets confused, and instead of "peace and love", Sam finds herself with "I hate China" decorating her arm [in Chinese symbols she does not understand]. Given that Sam is about to go to China, this is definitely bad and unlucky, but fortunately for her, this is also medically treatable. Nonetheless, it is not a disease.
>
> *(Smart 2016: 8)*

Cooper's view looks to satisfy the concept of health for PC1, but not using the solely mechanistic approach typical of the naturalist accounts. Rather, it includes aspects of Nijhuis and Van der Maesen's HC2—the somatic, psychological, and social aspects of disease. On the face of it, it is a good contender for an appropriate concept of disease in the clinical context—that which determines not only whether some condition counts as pathological, but whether it should be treated and how.

Nonetheless, we have seen that Cooper's conception of disease is problematic in two ways. First, not all of the supposed necessary conditions are necessary. Second, they are not always together sufficient for disease status. Cooper recognizes that her analysis (along with all others) is likely to fail in some instances, however, and her view exposes some important features of the lay concept of disease.

The introduction of the value criterion is also important for clinical medicine, in a way that it is not for the theoretical/pathological account provided by naturalists such as Boorse. Following Wakefield, however, I believe that a more plausible account of disease can be constructed by combining a value criterion with a value-free criterion—one that is more suitable in the context of public health.

Mixed accounts: disease as harmful function/harmful dysfunction

The value-laden accounts of Wakefield (the HDA) and myself (HFA) take the concept of disease to have both a value-laden and a value-free component. In neither case does the value-free component directly refer to biostatistically average functional efficiencies; rather, the degree of functional efficiency to be expected is determined by evolutionary considerations. In this way, both HDA and HFA are tied to mechanistic concepts of health, and thus to Nijhuis and Van der Maesen's HC1.

Wakefield provides the second of the three value-laden accounts of disease presented in this chapter. He suggests that:

> A condition is a disorder in and only if (a) the condition causes some harm or deprivation of benefit to the person as judged by the standards of the person's culture (the value criterion), and (b) the condition results from the inability of some internal mechanism to perform its natural function, wherein a natural function is an effect that is part of the evolutionary explanation of the existence and structure of the mechanism (the explanatory criterion).
>
> *(Wakefield 1992: 384)*

For Wakefield, the harm of the condition is judged by the standards of the person's culture, rather than (only) by the patient himself/herself. It is an account of what it is to be diseased *within a particular cultural context/population.* Wakefield's view, then, implies that those who are not sterile as a matter of choice (i.e. did not voluntarily, and without coercion, have a vasectomy/tubal occlusion) are diseased since this would be deemed harmful by the standards of the person's culture. Further, Wakefield's view is not subject to the Cambridge change objection, since disease status does not hinge on the health of others within the population.

For Nijhuis and Van der Maesen, in the context of public health policy, "public" is "primarily conceived of as populations within social, economic, and political systems" (PC2), and "health" as "the degree to which an individual reaches an equilibrium state with somatic, psychological, and social influences" (HC2) (Weed 1999: 99). Wakefield's account of health implicitly incorporates both.

I take there to be a sizeable problem with Wakefield's account, however. Wakefield states that for a condition to be a disease, the harm caused by it must be a result of the *failure* of some physiological subsystem to perform its natural function. It is certainly true that in the case of some pathological conditions, an organ, tissue, or cell might be to perform its natural function. During myocardial infarction, the heart ceases to pump blood around the body effectively, for example. But in many (if not most) cases of disease, those biological parts continue to perform their natural function; that is, they continue to perform the process which explains its continued existence through the evolutionary process—they just perform that function at a poor level of efficiency.

Disease as harmful function

I propose an adjustment to Wakefield's account that eliminates the part-dysfunction criterion. My account of disease in clinical medicine, as an amended version of Wakefield's above, runs as follows:

a The condition causes some harm or deprivation of benefit to the person as judged by the standards of the person's culture (Wakefield's value criterion).

b The condition results from an internal mechanism either (i) failing to perform its natural function, or (ii) performing its natural function at a harm-causing level of efficiency, "wherein a natural function is an effect that is part of the evolutionary explanation of the existence and structure of the mechanism" (the explanatory criterion) (Smart 2016).

This account of disease as harmful function deals with the counterexamples to Cooper in much the same way as Wakefield's account of disease as harmful *dysfunction*. Further, it functions well as a concept of disease in the public health concept since it draws on both health categories HC1 and HC2 of Nijhuis and Van der Maesen's model—HC1 insofar as the condition results from an internal mechanism of the individual, and HC2 insofar as disease status is also partially dependent on somatic, psychological, and social determinants. However, it better accounts for diseases whereby physiological subsystems continue to function, but do so inefficiently, than Wakefield's position. Elsewhere (Smart, Stevens, and Verbakel 2018), I have looked to chronic kidney disease (CKD) of a good example of where this applies.

Kidneys clean waste products from the blood, regulate the production of red blood cells, control the body's fluids, and release hormones that regulate blood pressure. There are various ways of measuring the functional efficiency of the kidneys, but most measures relevant to defining CKD at least refer to the "glomerular filtration rate" (GFR), which estimates how much blood passes through the glomeruli (filters in the kidney that cleans the blood of waste products) each minute. The evolutionary explanation for the kidney's existence is thus the need to filter blood of waste products, with the normal/healthy range being 90–120 mL/min/1.73 m^2.

One can see that at CKD stage 5, as the GFR dips below 15, the kidneys malfunction to the extent that dialysis is (typically) required to keep the patient alive. However, even though functional efficiency (as measured by GFR) is below the normal/healthy level, CKD stages 2–4 do not involve "dysfunction." The kidneys of a 20-year-old patient with CKD stage 3 *are* performing that function which explains their continued existence through the evolutionary process—they are filtering the blood of waste products—but they are doing so rather poorly for someone of that age. If one grants that stage 3 CKD is a disease, then, one must do so on the basis of *how* efficiently the kidneys are performing their natural function, rather than *whether* they are performing that function. HFA thus takes disease to poor efficiency of natural function, as opposed to failure to perform a natural function.

Table 4.1 US National Kidney Foundation (NKF) Kidney Disease Outcomes Quality Initiative (KDOQI) definition and classification of stages of chronic kidney disease (columns 1–3), and remarks on symptomatic status (column 4)

KDOQI Definition and classification of stages of chronic kidney disease[a]			*Remarks*
CKD stage	*Description*	*GFR (mL/min/1.73 m²)*	
1	Kidney damage with normal or elevated GFR	>=90	Asymptomatic except: Increased risk of cardiovascular disease Increased risk of stage 2 CKD and beyond
2	Kidney damage with mild decreased GFR	60–89	Asymptomatic except: Associated with a greater risk of cardiovascular disease than stage 1, but less than stage 3 CKD Increased risk of stage 3 CKD and beyond
3	Moderate decreased GFR	30–59	Asymptomatic except: Associated with a greater risk of cardiovascular disease than stage 2, but less than stage 4 CKD Increased risk of stage 4 CKD and beyond
4	Severe decreased GFR	15–29	Asymptomatic except: Associated with a greater risk of cardiovascular disease than stage 3, but less than stage 5 CKD
5	Kidney failure	<15 (or dialysis)	End stage CKD Associated with a greater risk of cardiovascular disease than stage 4 CKD Kidneys malfunctioning such that dialysis of transplant is needed to stay alive.

a 2002 Guidelines; from http://kidneyfoundation.cachefly.net/professionals/KDOQI/guidelines_ckd/index.htm.

Healthy populations

PC2 emphasizes the collective over the individual. Corresponding concepts of health and disease must therefore reflect this, and not focus on the pathophysiological mechanisms of the individual. Rather, they should reflect the functions of society as a whole.

The properties of health and disease in medicine are more often viewed as properties of individual organisms, but talk of "healthy populations" is not entirely foreign. Indeed, arguably the primary concern of public health is the health of the collective/population (Kindig 2007). What, then, should one take this to mean? In this section, I consider the possibility of attributing the property of health to populations as a collective, as opposed to the individuals that make up that collective.

In their follow-up paper to the 1994 editorial, Nijhuis and Van der Maeson write: "Our proposition is that health is primarily an attribute of individual subjects. Notions such as healthy communities or healthy populations evoke confusion. A healthy population metaphorically refers to a population that is doing well, culturally and economically" (2000: 135).

While I agree that the primary concern of medicine is health and disease in individuals, it is not clear to me that health and disease can only be viewed as applying to groups in a metaphorical sense. When Boorse sets out his BST, he does so with a view to it being applicable across all species. Let us, for now, consider a species where the idea of a healthy (or diseased) population is more easily construed as a literal property ascription.

Bee colony health indicators

Honeybees, which play an important role in human health through plant pollination, honey production, and its associated economic impact, are facing a crisis. There is a growing concern that the drastic global rise in colony collapse disorder (CCD) will result in severely depleted bee populations, which could have devastating consequences not only for beekeepers (and their bees), but for the environment more generally. As the name suggests, CCD is not a disorder of an individual bee. It is a disorder of the colony, whereby the majority of worker bees in a colony leave the hive and do not return. They abandon the queen bee, the honey they have produced, and the juvenile bees. This quickly results in a collapse of the colony.

Fabrice Requier, in his 2019 paper "Bee Colony Health Indicators, Synthesis and Future Directions," writes that: "Honey bee colonies can be assimilated to a complex system for which survival depends on its individual quality, its adaptive capacity and its threshold of resilience to pressures" (Requier 2019: 1).

Beekeepers, when they speak of the health of their colony, are not speaking metaphorically. CCD is a real disorder, and one that applies to the colony (the collective), not to individual bees, which, despite abandoning the hive, may themselves suffer from no pathological conditions as individuals. One might question whether the "health" property, as attributed to a colony, is the very same property as that one attributes to the individual bee. Arguably not, but simply because an analysis of "colony health" will differ substantially to that of "individual bee health" does not imply that the term is being used metaphorically. After all, as we have seen above, the content of the disease concept in individuals differs substantially from one context to another. Health/disease as concepts at the population/group/colony level is just another context in which these meaningful concepts can be usefully deployed.

The health of human "colonies"

Requier defines a healthy hive as a "colony that does not show any symptomatic diseases and includes adequate population sizes of adult bees and brood and an adequate production of honey in relation to the annual life cycle of the colony and the geographical location" (2019: 2). While this same definition would be inappropriate for modern human populations (perhaps, in the past, low population sizes might have been an issue for some human populations), it shows that *contra* Nijhuis and Van der Maesen, the literal use of "health" as a predicate applying to "Public Category 2" (the collective) need not evoke confusion. Of course, one might simply object that "humans are not bees,"[3] but I contend that the literal use of health as a property applicable to human populations is very plausible. It merely needs careful exposition. In this section, I provide a tentative analysis of healthy human populations, based on the statistical model of Boorse and key markers of flourishing healthy human populations.

First, let us consider what it is about bee colonies that enable one to speak of their health status. One cannot meaningfully talk of the health of any random collection of bees from multiple hives. One does not even speak of the health of the dyad of two adjacent hives. The health/disease property is ascribed only to individual bee colonies, with a single queen and all the worker bees servicing the honey production and the development of that colony's juvenile bees. Each bee plays a particular role or function within its community, contributing in some way to the continued survival of the colony. It is this quality, I argue, that makes a bee colony a suitable collective/population for the disease predicate. The colony has, to use Boorse's terminology, certain "natural goals." The individual bees have certain functional roles that contribute to the attainment of these goals, and sometimes those bees fail to perform those functions. When those functions are no longer adequately performed, the colony can accurately be described as diseased.

Human societies are not unlike bee colonies, in this way. One cannot arbitrarily pick out a group of unconnected humans, call them a population, and ascribe a health status. Some classes of humans are suitable candidates for health/disease predicates, and others are not. The key principle that distinguishes the two is an interconnectedness, with each member contributing (or potentially contributing) toward the collective flourishing of the group. Individual countries, for example, often comprise millions of taxpayers, some of whom work in the health sector, others in the financial sector, others in farming, and so on. The success of, for example, a country's economy affects each and every one of its citizens in innumerable ways, including their individual health and well-being. When unemployment rates are high, or a country is poorly administered by a corrupt government, the functional efficiency of important sectors within society begins to fail. Currencies collapse, access to basic commodities such as food, water, and electricity become restricted, healthcare services start to deteriorate, and so on. It is the interconnectedness of the bees that qualifies the bee colony for a health status, and the same interconnectedness demarcates those classes of humans that qualify for a health status, from those that do not.

Nicolae Morar and Joshua August Skorburg (2018) have argued along similar lines for their "hypothesis of extended health." They claim that the bearer of health need not be an individual organism, but that "certain features of our biological and social environment can be so tightly integrated as to constitute a unit of care extending beyond the intuitive boundaries of skin and skull" (Morar and Skorburg 2018: 341). Borrowing from S. Orestis Palermos (2014), and using the example of the relationship between the gut microbiome and the human organism, Morar and Skorburg identify "ongoing feedback loops" as the key feature in identifying those interconnected organisms that qualify for a combined health status. This, they claim, can meaningfully be extended to the parent-child dyad, partly because interventions such as obesity treatments "targeting only the parent might also turn out to be effective at producing weight loss in the untreated child" (Morar and Skorburg 2018: 363). At least for the purposes of healthcare interventions, then, Morar and Skorburg take the parent-child dyad to be a suitable bearer of the health property. Of course, when one talks of healthy populations, we are not referring to dyads (although the term is vague, a "population" comprises more than two members). But nevertheless, the same "ongoing feedback loop" principle can be applied. There is an ongoing feedback loop between members of those populations that qualify as bearers of the health predicate—the actions of those working in the financial sector, as many found out during the 2007/2008 financial crisis, have a profound impact on everyone, and even the actions of those who do not substantially contribute to the economy affect others through their consumption of water, goods, and services. Where no ongoing feedback loop exists, for example, random humans from distinct societies, that "population" cannot qualify as a bearer of the health property.

Markers of healthy populations

Like bees, human populations are prone to diseases, and require an adequate food supply. They also need housing, access to good medical care, and access to education and jobs. Mental health and economic productivity are also important factors in a healthy human population. In addition to the individual HC1 healthy needs of the individuals making up the population, these are the somatic, psychological, and social aspects of Nijhuis and Van der Maeson's HC2. Key markers for the health of a population will thus include measures to this effect. I do not set out to provide a comprehensive list here, but healthy populations will be characterized by:

- low extreme poverty rates (Lotter 2011: 27–32);
- access to sanitation facilities;
- access to education;
- low child mortality rates;
- high life expectancy;
- low levels of inequality;
- low levels of mental-health disorders; and
- low rates of unemployment.

It may sound odd to classify a human population as health with respect to, for example, levels of poverty, but such an approach to targeting public health problems need not be viewed as problematic. Public health aims not only to promote individual health and well-being, but the overall flourishing of a society.

I remain agnostic as to whether one should label "the absence of health" as "disease" in human populations. One could just as easily label high inequality or high unemployment as a "public health problem," without loss of meaning. If labeling an unhealthy (in the context of public health) human population as "diseased" evokes confusion, this move can be side-stepped, as I demonstrate in the next section.

What counts as collective health? A tentative solution

Boorse's BST focuses on part-function; that is, he does not provide a definition of what it means for the organism as a whole to be diseased; rather, he considers the health state of the physiological subsystems in terms of their contribution to the natural goals of the organism. I propose a similar system for health and disease at the PC2 level; that is, when analyzing the health of a human population as a collective, one can consider the performance of each of these key indicators independently (although they are, undoubtedly, interconnected—as indeed the health of our physiological subsystems often are). I further suggest that rather than distinguishing between diseased and healthy populations, public health is better suited to a "comparativist theory of health" (Schroeder 2013).

Comparative theories of health avoid trying to define a particular state (health or disease) in favor of the relational concept "healthier than," which holds between two or more organisms—or in the case of PC2, two or more populations, or two or more possible states in the same population. Andrew Schroeder argues that this comparative model should be adopted at the PC1 level for HC1 (mechanistic) health measures. This, he argues, resolves a number of problems associated with attempting to identify an absolute distinction between the healthy and diseased (as per the BST model), including those arising from increasingly healthy populations. This debate is beyond the scope of this chapter, but on the face of it, Schroeder's proposed solution eradicates concerns regarding distinguishing diseased from healthy populations when applied at the PC2 level.

Consider "multidimensional poverty" as a health measure. The Multidimensional Poverty Index (MPI) does not focus only on meeting the income requirements determined by the international poverty line (i.e. earning more than a fixed amount). It acknowledges that poverty is not just about low income, but also (among other things) access to education, toilet facilities, electricity, and clean running water. The MPI also includes health measures, such as nutrition and child mortality (Alkire et al. 2020). It thus serves as a good measure of multiple aspects of public health.

Countries with a high level of multidimensional poverty are less healthy in these respects than those countries with low levels of multidimensional poverty, and a single country can improve its population's PC2 health by lowering its multidimensional poverty levels. Of course, each component of the MPI could be assessed individually, and the health of the population with respect to its absolute poverty level, for example, or access to education, or access to adequate nutrition could be individually compared with that of another population. However, as an overall assessment of relative population health, the MPI is a good contender since it encompasses many of the key indicators mentioned above.

Conclusions

Philosophical literature on public health remains fairly sparse, but Nijhuis and Van der Maesen's (1994, 2000) papers and the response by D.L. Weed have made some inroads toward a philosophy of public health. The earlier article advances four ontological categories: PC1, PC2, HC1, and HC2, which form the basis of public health. To separate the metaphysical understanding of the population/public into PC1 (which emphasizes the individual over the population) and PC2 (the collective over the individual), and health into HC1 (medicine's traditional mechanistic understanding of health) and HC2 (the somatic, psychological, and social aspects of public health), lays good groundwork for further analysis.

In assessing the health of a bee colony, one must first identify whether the individual bees are suffering from any diseases (a PC1 and HC1 concept). Public health is concerned not only with the pathological conditions of individuals, however, but also the somatic, psychological, and social qualities of health. Analysis of health at the colony/population level thus requires including aspects of both HC1 and HC2. Boorse's HC1 analysis provides a useful analysis of what it is to be a pathological condition, but this is insufficient for public health purposes, since it provides no guidance for public health policy, which is an inherently value-laden process. A more appropriate HC1 analysis can thus be found by including a value criterion. While Cooper includes a value criterion, I have shown her analysis to be problematic in a number of ways. Wakefield's account, which includes both an explanatory criterion and a value criterion, seems much closer to the mark, but I recommend a slight adjustment to Wakefield, proposing an account of disease as a "harmful function." This novel account of disease is, I maintain, suitable to play the HC1 role within the context of public health. The value criterion focuses on the patient's reaction to somatic, psychological, and social influences, and the explanatory criterion on the biological functions that distinguish disease states from other harmful states.

Where Nijhuis and Van der Maesen have argued that the literal use of "health" at the PC2 ontological category can evoke confusion, I have shown that its use is already commonplace in the scientific discussion of the health states of other species, highlighting the example of the honeybee. Although I concede that demarcating diseased from healthy populations is difficult, this does not, I contend, hinder the correct and literal use of the health concept for human populations at the PC2 level. Instead, I propose that we follow Schroeder's lead (in the PC1 context) and implement a comparative theory of health at the level of the collective. In this way, we can compare the health of populations by appeal to key markers of population health, such as those included in the MPI. Individual assessment of those factors included in the MPI can guide public health policymakers on how best to improve the overall health of populations.

Notes

1 Suggesting "not healthy" as a definition of disease is not useful unless one already has a solid analysis of the concept of health. In short, one must pick one concept to focus on—which one does not matter if they are deemed negation of one another (but whether health is equivalent to "not diseased" is also up for debate).
2 There are vestigial physiological subsystem, such as goosebumps and possibly the appendix, but those shall be ignored, for now.
3 My thanks to Alex Broadbent for raising this objection.

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