

# **Scientific Consensus, Doctrinal Paradox and Discursive Dilemma**

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*DOI: <http://dx.doi.org/10.4314/tp.v8i1.2>*

*Thought and Practice: A Journal of the Philosophical Association of Kenya (PAK)*

*New Series, Vol.8 No.1, June 2022, pp.1-26*

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*<http://ajol.info/index.php/tp>*

*ISSN: 2076-7714*

## **Abstract**

Global ignorance about Africa continues to sustain inappropriate global interventions to resolve public health crises, often with disastrous consequences. To explain why this continues to happen, I marshal two theorems that predict basic statistical properties, called ‘the doctrinal paradox’ and ‘the discursive dilemma’, which underlie scientific consensus formation and evidence-based decision making on a global scale. These mathematical results illuminate the epistemic and material injustices committed by the protocols of medical research conducted at the highest level of global knowledge production in the service of international humanitarian aid for Africans. These social choice theorems reveal that a global scientific consensus projecting claims and proposing policies about Africa’s disease burden is likely to yield a low degree of reliability, in that the probability of its accuracy is less than chance. The solution to this anomaly is to remove from the global scientific agenda the statistically unrealisable demand of satisfying too many multinational corporate and foreign governments’ priorities as equally entitled to benefit from the knowledge produced to improve Africa’s public health sector. Instead, foreign funding targeted to support medical science and policy in Africa should be directed by those specialists *in situ* who are most familiar with their own national health challenges and potential solutions, rather than relying upon foreign decision makers to interpret Africa’s emergency public health care needs.

## **Keywords**

Doctrinal paradox, discursive dilemma, scientific consensus, epistemic trust, global health ethics, group agency

## Introduction

‘Scientific consensus’ here does not denote strict unanimity, but rather the collective judgment of a supermajority manifesting as the publicised archive of a global research collective’s conclusive empirical judgments at a given time. Necessarily a consensus of scientific experts will reflect a wide range of sub-fields in aetiology, drawing upon widely distinct pools of evidence and background beliefs. For simplicity I follow List (2012) by discussing a group’s ‘judgment’ to depict the result of aggregating or deliberating among such a diverse membership’s individual decisions to either assert or refute a set of bivalent propositions. Focus on aggregated judgments rather than Bayesian belief distributions simplifies the discussion and allows consideration of a broader range of factors that influence scientists’ collective adherence to a set of claims that independently those experts for various reasons will repudiate.

When a community of experts is consulted on a topic about which only a minority of its members are reliably accurate, a stark disconnection may emerge between, on the one hand, the reported ‘scientific consensus’ of that group, and on the other hand a tally of all the group members’ judgments elicited individually. This divergence may be neatly demonstrated, indeed it can be anticipated, by applying a theoretical result in the social choice literature called *discursive dilemma* authored by Christian List and Philip Pettit (2002). Further, there is a rich literature discussing various models for pre-empting this and other kinds of paradox in aggregating a majority view of experts, as well as methods for improving the accuracy of such a consensus (List 2011; Bradley, Dietrich and List 2014), through transformation of that consensus by weighting its constitutive judgments to reflect relative degrees of respect and trust accorded among individuals in a community of experts (Bradley 2018).

Nowadays standard scientific practice relies heavily on reinforcing an agreed upon consensus, rather than rewarding the conjecture and refutation model where competing hypotheses are prized as essential to the pursuit of empirical truth. A problem prevails which is not yet addressed centrally by crisis management theorists or social choice analysts, when the expert opinions comprising a supermajority judgement are not adequately experienced nor suitably located in their research or clinical practice to be reliable second order assessors of who is more trustworthy than they themselves. ‘X’s judgment is more trustworthy than

mine' in this context means that expert X is recognised by me as having a greater epistemic advantage than I do regarding the topic in question.

When it comes to the egregious failure of the global scientific consensus to reliably interpret correctly and manage effectively the problems faced in public health arenas of Africa, the problem may be an overall deficit in the shared background assumptions of specialists comprising that consensus. The vast majority of highly trained contributors to the global scientific consensus are not geographically located in the regions and in the socio-economic conditions where their judgments are focussed. So these specialists are not well-situated to recognise upon whom they should place their scientific trust in adapting their beliefs and judgments rationally, in order to improve their judgments as is the standard Bayesian means of achieving greater accuracy from pooling scientific opinions (Hardwig 1985). Those who are in fact properly situated constitute a marginalized fringe of the community of scientific expertise that weighs into determining the global scientific consensus that determines international aid flows for public health in Africa.<sup>1</sup> In consequence, profound anomalies are sustained concerning the aetiology of chronic and fatal illness in Africa's public health arenas. The global scientific community, where the received 'scientific consensus' emerges, is often diametrically opposed to judgments proffered independently by experts with the greatest epistemic advantage within the global community of health specialists, due to their proximity and familiarity with the totality of relevant data about African contagions. The widely publicized West African Ebola outbreak and intervention efforts in 2014-2016 will serve here as two cases in point; but of course there are many other such cases (Lauer and Shenton 2017).

Today's mainstream knowledge production and dissemination exacerbates the persistent neglect of those experts who are best situated to provide accurate interpretations of Africans' disease burden. Research, emergency interventions, and policy designs on a global scale are nowadays orchestrated by digital informatics technology; and this dominance has already restructured the way scientific results and conclusions are produced, authorized and disseminated worldwide. Global scientific communities are indelibly dependent upon the highly competitive process of publishing and of retaining sufficient grants to continue their

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<sup>1</sup> The epistemic advantage afforded to this global minority of marginalized medical research experts and practitioners, both long-established and based professionally in poorly resourced regions of Africa, is detailed in Lauer (2017b).

work. In such a transformed knowledge economy, new norms of automated data management entail a transfigured understanding of scientific rigour and the best research conduct to which individual scientists aspire. Working as nodes in an extended network of cognitive operations (Huebner 2014), experimentalists and investigators become incorrigibly disengaged from the pre- or sub-digital ‘real’ world as it still dominates the experiences of those scientists who work predominantly ‘outside the web’.

These changes in the criteria that determine best practice in sciences directly serving the public interest are born of new pressures: the global scientific researchers to collaborate with both multinational corporate industry consortia (Chilundika and Pogge 2022, Pogge 2005, 2011) and with the geo-political agents that serve those corporate elites, billionaire philanthropists, and government superpowers relying on science to reconstruct allied security systems of national defense (Elbe 2010, 2012). There is a common ground among these decision makers concerning the conditions and problems responsible for the global health burden, including the causes of pandemics emerging from ‘remote’ populations which threaten global health.<sup>2</sup>

These pragmatic patterns of domination over knowledge production in a post-modern digital knowledge economy will likely occur by default, neither through ignobility nor malfeasance. These imbalances of power between ‘offline’ African-centric *versus* foreign public health researchers and policy makers are likely to be sustained as a function of technologies that allow for the manufacture of scientific consensus through a choice of judgment aggregation driven by best scientific practice: respecting maximal diversity, maintaining impartiality and sustaining systematic rigor in the process of receiving inputs and refereeing decisions that determine the direction of content and application in scientific knowledge production and consolidation.

When too many conflicting interests need to be served, the outcome of research will serve the interests of the dominant suppliers of research funds, rather than producing the most accurate images of the non-digital empirical world. This paper marshals the results of social choice theorists that display this as a statistical inevitability, and to demonstrate a way to pre-empt

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<sup>2</sup> For a detailed account of this common background of implicit beliefs, see Lauer and Shenton (2017) and Lauer (2017a).

the negative impacts of an ignorant majority, accrued as the ‘global scientific consensus’ about African aetiologies by default. If these results from social choice theory were known by those monitoring and refereeing the impact of global monopolies on knowledge reproduced about Africa *within* Africa, then they are one step closer to being positioned to circumvent the negative effects of an ignorant scientific majority which acts, inadvertently to be sure, as a global obstacle to achieving equitable health care for all.

Of course by ‘foreign to Africa’, I include institutions and authorities located on the African continent as well as other continents. In the digital knowledge society, geographic location of a knowledge source has subsided in significance. A range of medical facilities, universities, and centres of expertise within the geographical land mass of Africa have adopted a determinedly current, global protocol for quality assurance, whereby deviations from a selected consensus (e.g. about COVID-19, or the causes of AIDS in Africa) are dismissed as ‘denialism’ (Chilundika and Pogge 2022, Komu 2021) and correlated with misinformed, anti-scientific ideological stances (Agle and Xiao 2021; Navin 2013).

The considerations assembled here suggest an alternative agenda for improving public health and controlling familiar contagions within the continent of Africa. The results of social choice theory presented here suggest that scientific consensus will improve in reliability and accuracy if it is dominated by specialists operating at least partly ‘offline’ and located *in situ*. By transferring policy management and allocation of funding for research to those in local positions of scientific, political, legal and moral responsibility to the African beneficiaries of development plans, the efficacy for African public health beneficiaries of international humanitarian aid is likely to improve.

### **Applying social choice theorems to real-world scientific challenges faced in Africa**

Christian List (2012a) and his work with Philip Pettit (List and Pettit 2002, 2004) on aggregated judgment theorems help enormously to illuminate the reasons for mistaken empirical claims and policy advice for Africa made by the highest profile collectives of foreign experts. As will be shown in this essay, application of social choice theorems reveals why it is that the international ‘scientific consensus’ winds up being wrong so much of the time, and why it ends up with results contrary to its planned aims, serving foreign

governments and multinational merchants rather than the purported beneficiaries of efforts to alleviate the disproportionate disease burden borne by Africans. Without being ontologically excessive or ideologically shrill, these results show how this incongruous effect follows – ironically enough – from adhering to the very principles of best research practice. By ‘best practice’ I mean maximally inclusive impartiality and systematic rigour, as in the several codes of best scientific conduct (cf. Association of the Universities of the Netherlands 2012) that were designed to protect the integrity of empirical inquiry against the perverting pressures of capital and political interests (Gelfert 2013; Lehrer 1977; Kitcher 1990, 1993; Resnik 2008; Levy 2007).

### **Applying the labels ‘discursive dilemma’ and ‘doctrinal paradox’ to public health issues**

The discursive dilemma (List 2005, Pettit 2004) along with the somewhat older conundrum recognised by juridical theorists called ‘doctrinal paradox’, have both been discussed in List’s earlier contributions to the logic of aggregating group judgments. These statistical challenges to deriving effective outcomes and fair policies from democratic decision procedures are ubiquitous in the current literature on social choice theory. They both follow from the late Kenneth Arrow’s ‘impossibility theorem’ (List and Pettit 2002, 2004, 2011). Kenneth Arrow received the 1972 Nobel Prize for his contributions to welfare economics, through a general result that shows the paradoxical outcome of a perfectly fair, democratic calculation of a group’s preference. In the developments applied here, the group concerned is that of global medical experts whose research and recommendations have an impact on the way funding is applied to help Africa’s public health sectors. The preferences in focus here concern the contradictions that do arise between intention and practice, when aggregating scientific experts’ individual judgments regarding specific claims or given policies designed to address public health crises in Africa.

List and Pettit show that a discrepancy tends to occur between the decisions of individuals and the overall decisions attributed to the group which those individuals comprise. List and others have proved mathematically that this discrepancy is bound to occur anytime the procedure for determining a group majority follows conditions regarded as ideally rational and democratic (i.e. whenever the procedure of calculating the majority’s consensus ensures

universal inclusion, anonymity, and systematic completeness). These conditions for an ideally rational democratic procedure match up with classic notions of best practice in scientific research, namely, accommodating the maximal diversity of evidence-based hypotheses, sustaining a uniform and impartial receptivity to all theoretical perspectives, and entertaining with a neutral rigour the systematic management of all available evidence.

List (2005, 34) provides a general, ideal model (an outcome of his proofs for theorems in decision modelling) about what will determine the reliability of a collective decision. His theoretical work reveals that there are only two conditions for any group's majority decision being optimally reliable. These two conditions are not provided by List as an empirical prediction about the beliefs are formulated; rather, the two conditions follow among the results of his mathematical proof of how statistical results emerge from aggregating a group's judgments. The only two ways to guarantee reliability of a group's judgment are: (i) the group's decision or judgment must be completely unanimous as the only outcome, or (ii) the group's decision or judgment must rely upon the verdict of only one authority representing the group. The moment that a calculation of the majority judgment begins to aggregate the votes of different opinions within a group of experts, one must curtail the conditions of ideal scientific practice in order to avoid erroneous consequences (as will be shown momentarily). List establishes this as a statistical result in the form of a deductively proven theorem, further details of which the reader can pursue in the social choice literature cited in the references. Here we will simply apply his results.

List has shown deductively that the following two conditions are required to expect a collective judgment (such as a scientific consensus) to approach accuracy: viz. (i) each fallible individual's background expertise must bias him or her towards the truth *at least slightly*; and (ii) their judgments must be independent of each other. But as I will show momentarily, there is dismally copious evidence in the global health arena that leading scientists, public health experts and ethicists with this agenda are not making judgments independently of one another (Hardwig 1985; Wilholt 2013). Nor do these experts have, on average, a greater than chance probability of understanding the scope and depth of the relation between poverty, malnutrition, social stratification, coping strategies, public health care problems and solutions specific to conditions in Africa. On the other hand, African experts who are based in economically destitute regions do have that background. Further, by virtue of the very conditions that render health care delivery problematic and under-



resourced, African based experts maintain an epistemic advantage. This advantage is sustained because the cyber-bubble, which is changing the complexion of scientific research in the global North's digital knowledge economy, has yet to infiltrate the independence of researchers and practitioners working 'offline'.<sup>3</sup> In consequence, the current scientific consensus in the global health arena is not biased towards the truth about the complex aetiology of disease and the poverty-related causes of preventable premature death and chronic contagion in Africa. But this cannot just be stated; it must be shown and will be, momentarily.

When Christian List (2005) argued for the most optimal way of meeting the dual challenge of group rationality and group knowledge, his two conditions seemed innocuous enough. Those conditions were stated in the previous paragraph; they are: the individuals whose judgments comprise a democratically achieved consensus that is guaranteed to be optimally rational and knowledgeable must be independent of each other, and each must be at least minimally biased towards the truth. Applied to the real-world challenge of alleviating gross injustice in the imbalance of benefits enjoyed worldwide from the output of medical research, List's presuppositions in defence of epistemic democratization are remarkably important. His two conditions provide an objective, non-accusatory and non-ideological basis for African experts to claim their proper place of authority in constituting the consensus that interprets the needs and recommends the remedies on behalf of their own populations.

Real world applications of these two social choice theorems (*the discursive dilemma* and *the doctrinal paradox*, both outgrowths of Arrow's more general *impossibility theorem*) will be presented in the next two sections. Together they provide an explanation of the catastrophic inconsistencies between the intentions and the outcomes of foreign intervention in African public health systems. There are many examples, not addressed here, of the egregious disparities between practice and consequence as the result of misdirected international aid. One is the current legal fallout and controversy raging over the carcinogenic effects of glyphosphates in weed-killers produced by Bayer pharmaceutical company's multinational subsidiary, Monsanto (Weyant 2018).

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<sup>3</sup> For two thorough-going accounts of this transfiguration of modern scientific knowledge production as it grows in complexity and interdependency through digitalization of knowledge, see Huebner (2014) and Scerri (2016). Also see Lauer (2017b)

A further upshot of applying these decision-theoretic results is that we have a non-ideological, mathematical basis for demonstrating why the transnational activities involved in producing medical scientific knowledge for public service cannot be left as functions of free market forces. In other words, the implications of the impossibility theorem as spelled out here demonstrate why there has to be some control and management of *which* expertise weighs heaviest in the scientific consensus that interprets African needs. Such judgments involve when to call a public health crisis an emergency and what to do about it. To fix our ideas, consider that the discursive dilemma result can be applied to an empirical statement which remains an historical truth endorsed by scientific consensus concerning the Ebola crisis and response in West Africa throughout 2014-2016.

### **A discursive dilemma in the consensus over evidence-based truth<sup>4</sup>**

In the first example below, consider this quotation of an empirical assertion I will refer to hereafter as ‘E’ This claim was published by the National Academies of Science in June 2017 ostensibly on the basis of a scientific consensus generated globally:<sup>5</sup>

**E:** The 2014-2015 Ebola epidemic in western Africa was the longest and most deadly Ebola epidemic in history, resulting in 28,616 cases and 11,310 deaths in Guinea, Liberia and Sierra Leone.

(NCBI 2017)

To appreciate the incongruity of circulating such a grossly improbable assertion as if it were an established empirical report, consider the response of representative individual specialists when asked independently of their judgment about the status of E. For the sake of argument I have distilled many studies and a great number of individual informants, to create seven hypothetical individual perspectives of differently placed specialists representing the minority

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<sup>4</sup> The author is especially grateful to Kurt Ludwig for drawing attention to the discursive dilemma theorem in response to the presentation, “The anatomy of complexity in scientific collaboration driven by non-evidential criteria for consensus,” at the workshop “From Minimal to Complex Collective Actions” hosted by the Center for Social Action, Philosophy Department, University of Milan, September 4, 2017. Prior to that, David Martens raised the important query at a philosophy symposium hosted by the University of Kwazulu Natal in 2015: ‘so what is to be done?’ when the author presented a shrill and accusatory Afri-centric reprimand treating the concerns raised here. Martens’ pragmatism cleared a path forward for bridging an ideological divide in the ethics of African public health policy analysis.

<sup>5</sup> Many reports such as this example were broadcast through the *BBC Worldservice* and referred to subsequently as explanatory reporting on the military occupation of the DRC in 2018. Statement ‘E’ has been promulgated as a fact by means of prestigious high impact journals, textbooks, popularized fact sheets, health education posters and campaigns, and the major international news wires (Associated Press, Reuters), through which scientific networks communicate their findings and conclusions first to each other and then to the general public (Fleck 1981).

and side-lined sectors of the global health arena. This distillation functions like a philosophical thought experiment: the different voices (i-vii) constituting a group of experts represent here a composite of many actual informants and published studies. These specialists and published works harbour a great volume of experience and expertise on the subject, but they are side-lined in the global discourse for reasons that I will discuss later in the paper.

(i) Suppose one such specialist was among those who worked on the team that originally delivered the Zaire report that first labelled with the name 'Ebola' a new filovirus in one human. This research was published in 1977 as a "preliminary communication" (Johnson *et al.* 1977, 570). She conceded that the study involved only one case, and that the sample was badly handled; the published electro-photographic image did not display anything near the amount of viral material demonstrably shown to be fatal. While no one disputes Ebola viruses have been found at fatal levels of concentration in green monkeys and other animals, she doubts E can be called true on the basis of evidence, since no one has isolated or purified the Ebola filovirus in human blood or in the tissue of a human fatality.

(ii) A second specialist is the Director of the Foundation for Innovative New Diagnostics (FIND) working closely with World Health Organisation (2014), to get research funding for an adequate method to test Ebola under poorest of emergency conditions. His portfolio is predicated upon the understanding among professionals gathered at the meeting called by WHO that E would have to be completely unreliable and in all likelihood false, given the inadequacy of tests in use during the 2014-2016 period.

(iii) Yet another professional, a Médecins Sans Frontières volunteer health worker in rural Guinea, confessed she had no way to tell by consulting any records of the CDC or WHO indicating how many of the cases of Ebola were under twelve years of age, nor on any given day how many of them were men, nor how many deaths over the same period and region were due to malaria, or pneumonia. During October 2014, she witnessed an outbreak of acute fulminating Meningococcal Septicemia caused by the

CDC using overheated vials in a meningitis inoculation campaign.<sup>6</sup> The CDC's accident was never publicized, so the violent symptoms and horrific deaths were attributed through rumor to Ebola. So she too does not put any credence in E.

(iv) A senior doctor working in Sierra Leone knew first-hand that the symptoms of Ebola Virus Disease (EVD) in patients quarantined in 2014-2015 were not those of Ebola in Zaire 40 years before, and only one of those who died were bleeding from any orifice (Schiefflin 2014<sup>7</sup>). She knows it is five times harder to catch Ebola than it is to contract measles, and that orderlies at risk of contagion were in no greater danger than when they managed patients coughing up blood uncontrollably and in violent fits at the very advanced stages of tuberculosis. From what she knew, there was no evidence to confirm E, and she would not endorse it.

(v) The fifth of our specialists represents someone interviewed repeatedly on the BBC, a Swedish popularist of statistics who was appointed as Deputy Director of the UN's Ebola Crisis Emergency Mission in Sierra Leone, though he claimed no prior experience with Ebola. He distanced himself from any involvement with sourcing the data he managed in Sierra Leone, and the distribution on Freetown's street corners of free mobile phones with access to an Ebola hotline number to call for help, and posters all in English in a chiefly French speaking population. For most of the city dwellers, this was the first time they ever saw an ambulance or had access to primary health care. The predictable spike in public call-ins determined the number of Ebola cases that day.<sup>8</sup> Based upon his numerous comments, Rosling would agree off the record that he also rejected E as unsubstantiated.

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<sup>6</sup> She was aware that no such disaggregated records were available at any time from the W.H.O. nor the CDC presiding over the crisis response. The symptoms of Meningococcal Septicemia, also called Waterhouse-Frederichsen syndrome, include vomiting, diarrhoea, extensive purpura, cyanosis, tonic-clonic convulsions, and circulatory collapse usually with haemorrhage into the adrenal glands.  
<http://investmentwatchblog.com/exposed-ebola-outbreak-in-africa-coincides-with-massive-cdc-meningitis-vaccine-campaign/> Accessed May 15, 2016.

<sup>7</sup> The symptoms associated with the Ebola Haemorrhagic Fever (EHF) in former Zaire forty years before were not the same. Of thirty three fatal cases that she monitored in her Ebola ward in Freetown, only one was bleeding.

<sup>8</sup> *BBC World Service* 24 November 2014, 26 March & 29 April 2015. Still this individual warned the public of the gargantuan threat that Ebola posed "like a great octopus" and "a monster."

(vi) The principal investigator of Ebola Phase II trial in Accra Ghana, of the United Nations' coordinated International Ebola Emergency Response Centre, is an epidemiologist and director of one of the leading tropical disease research institutes in West Africa, based at the University of Ghana. His concern is to stress that the entire programme's responsibility requires erring on the side of caution in detecting possible cases of Ebola. His job is not to propose exactly accurate case numbers and mortality figures which are beyond the scope of public protection. Diagnosis of particular patients lies outside the field of epidemiological responsibility. As an epidemiologist concerned with sending the right message to the public, he stood by asserting E as a public cautionary announcement, even while recognising that E as an empirical report is an example of pseudo-precision, and inaccurate.

(vii) In October 2015, shortly before the 3,000 US army troops were deployed to Liberia, the Deputy Minister of Health in Monrovia was interviewed live on the *BBC World Service*. He conceded that so far as he was aware, no one in his Ministry had invited these troops though there was plenty of need to address urgently and treat the health crises that Liberians faced, but he had no idea what kinds of expertise the US soldiers had in dealing with the fatal contagions that Liberians were actually coping with, together with chronic malnutrition, in the absence of hospital facilities and primary care for an impoverished population. He saw no basis for endorsing E as true.

Here is a summary of the single sources of evidence supplied by these experts independently, constituting columns 1-9 in Table 1:

1. There is no gold standard that has ever established 'Ebola' is fatal in humans, though much evidence exists that it is fatal in sufficient quantity in monkeys, bats, pigs, and mice. It is not clear what, if any, relation exists aetiologically between EHF discussed in 1995 and the EVD diagnoses in West Africa in 2014-2015 (Johnson *et al.* 1995; Leroy *et al.* 2005; Swanepoel *et al.* 1996; Wauquier *et al.* 2010).
2. The original 1977 study declaring discovery of Ebola in Zaire was published as a 'preliminary communication', and, according to its authors, the sample was flawed in several respects; their results concerned only one subject from which they could not claim to establish fatality due to the virus (Johnson *et al.* 1977).

3. Poor diagnostic tools, adequate testing for Ebola are still not available; the methods for gathering cases during the outbreak are known to be unreliable (WHO 2014).
4. Early symptoms of Ebola are indiscernible from malaria, typhoid, diabetic shock, meningitis – fatal and chronic health threats endemic in these regions.
5. No disaggregated data is available; misdiagnoses are frequent; record keeping is speculative (Lauer 2018).
6. Alternative causes of fatal haemorrhagic fever in the regions have not been ruled out (Lauer and Shenton 2017).
7. Dubious relationship exists between EVD (2014) in West Africa and EHF (1977) in Zaire (Kummervold 2017).
8. Many studies show significant percentages of Ebola positive test results in healthy populations in Cameroon, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Uganda (Leroy *et al.* 2011; McCormick *et al.* 1987; Becquart *et al.* 2010; Bowen *et al.* 1977; Gonzalez *et al.* 2000; Gonzalez *et al.* 1989; Johnson *et al.* 1993).
9. Data collection methods were arbitrary and capricious in Sierra Leone (Schieffelin *et al.* 2014).

The following Table 1 captures in nine columns these nine cited pieces of evidence narrated above, and the ticks in each row reflect the seven experts' independent reasons for drawing their conclusion to reject E, a judgment that might have been (or in some cases actually was) conceded through direct interviewing by this author. Below the table is a summary of which kind of evidence each of the columns 1-9 is designed to represent, with the tick corresponding to the experts citing that specific evidence as the basis for their individually rejecting E. The last column demonstrates the unanimity among these specialists' rejecting E independently of each other.

However, by counting up the ticks in each column separately, one sees no majority of experts congregating around any one piece of evidence as sufficient for their own individual rejection of E.<sup>9</sup>

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<sup>9</sup> So the consensus could be taken as finding any piece of evidence on its own as sufficient for rejecting E. As indeed the Center for Biotechnical Information, the World Bank, The World Health Organisation, and Centers for Disease control Claim.

**Table 1: A discursive dilemma in the consensus over evidence-based truth**

EXPERTS i-vii	TYPES OF EVIDENCE 1-9									EVIDENCE-BASED CONCLUSION Do you Reject or Endorse E?
	“Given your expertise, is there sufficient evidence to reject E?”									
	1	2	3	4	5	6	7	8	9	
i.	√								√	Reject
ii.		√								Reject
iii			√							Reject
iv				√						Reject
v					√	√	√			Reject
vi								√		Reject
vii						√	√			Reject

On the one hand, by regarding their individually and independently determined verdicts, one discovers none of these experts accept E as true. Alternatively, by assessing how the different kinds of cited evidence fared comparatively, one discovers that no one piece of evidence attracted a majority of the experts as a sufficient reason to reject E – since they all had their different reasons. This would be expected, of course, given their different disciplinary backgrounds, geographic locations and temporal encounters with the range of viral material dubbed ‘Ebola’ over many years. On this second analysis, there might appear no evidence as sufficient for a consensus of experts to reject E. So depending upon how one aggregates this scientific consensus (by a conclusion-based approach or by a premise-based approach, cf. List 2005), one obtains contradictory conclusions about what is the consensus of these experts: This is what is meant by a *discursive dilemma*.

**An example of doctrinal paradox in scientific consensus**

A second example of the gross discrepancy that can emerge between what gets counted as a decision based on scientific consensus, and what the individuals constituting that consensus actually decide independently, has been recognised for some time in juridical contexts by the label *doctrinal paradox* (List 2012b; List and Pettit 2002, 2004).

Consider the public outcry that arose in Ghana over the decision in May 2015 to commence a Phase II clinical trial of an Ebola vaccine on a mass scale involving healthy subjects, as required before a vaccine is registered as safe and effective (Kummervold *et al.* 2017). Subsequently GlaxoSmithKline, collaborating with the US National Institutes of Health, withdrew their trial program from Ghana because they had gathered the requisite thirty thousand samples to complete their mass experiment from other African countries (Ghana News 2015; World Health Organization 1995).

Nevertheless, events could have gone differently. Ebola posed no threat in Ghana, so suppose the government assembled a committee of three experts representing various stakeholder groups to make a recommendation on V. Let V be this policy decision:

**V:** The Phase II clinical trials for an Ebola vaccine should be discontinued in Ghana, because the overall expected benefits do not outweigh the known risks involved.

Suppose now that this committee of three experts instituted by government was mandated to arrive at their verdict based strictly upon these two considerations: (i) whether a greater potential benefit would be gained over the available alternatives by continuing the vaccine trial, and (ii) whether the vaccine on trial was considered sufficiently safe. Only if both these conditions were met, then the vaccine should continue – otherwise it should be aborted, according to global standard protocols for clinical trial programmes (World Health Organization 1995).

Suppose one member of the committee was the Principal Investigator acting as proxy agent for the United States' National Institutes of Health (NIH), the vaccine manufacturer that contracted him. Suppose further that he knew the highly publicized call of an Ebola crisis was itself part of a global military force collaboration between China, the Royal Air Force and US Army, under the aegis of the United Nation's World Health Organisation, foreign allies on the UN Security Council working on a top priority defence rehearsal of public protection in preparation for an anticipated future of bio terrorist warfare.<sup>10</sup> So he quite justifiably ticked both conditions as satisfied for continuing the trials.

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<sup>10</sup> (Elbe 2010, 2012). The entire Ebola alert, highly visible and relentlessly publicized through international media, was predicated upon the need to generate public knowledge that a "dangerous emergency" of epidemic proportions was immanent, to warrant experimenting with healthy humans in accordance with WHO Ethics Committee stipulations.



Suppose the second committee member represented the independently concerned scientists based in Ghana who were familiar with the technical literature and the potential dangers of the vector method used.<sup>11</sup> Further, suppose this member of the jury knew that the personnel selected to run the trials were insufficiently experienced in filovirus pathology because the local statutory protocols for approval of mass experimentation had been bypassed. So although generally in favour of the efficacy of immunisation as a preventative public health strategy, the second juror regarded the risk as too high and voted to discontinue the trial.

The third committee member represented the nursing students and public health civil servants recruited as subjects without statutory informed consent. These public servants and students regarded the trial as safe enough but regarded the benefits of foreign investment in a vaccine as negligible when compared to alternative allocation strategies to improve public health advancement. So this representative’s vote joined the majority of 2 to 1 conclusive verdicts for discontinuation of the trial.

To summarize the jury’s verdicts, these experts are listed as A, B, and C in table 2 below:

**Table 2: A doctrinal paradox in determining a consensus over policy**

Experts A,B,C	Criterion 1 Safety	Criterion 2 Immediate benefits	Criterion 3 Long term impacts	Criterion 4 Best of all affordable options	Verdict: abort <i>or</i> continue ?
A	X	X	passed	passed	Abort
B	passed	passed	X	X	Abort
C	passed	passed	unknown	unknown	Abort
Systematic incremental assessment of each criterion (per first 4 columns) final verdict in last column	2:1 majority pass criterion 1	2:1 majority pass criterion 2	inconclusive	inconclusive	← criteria- discrete calculation = continue the trial program

<sup>11</sup> Cf. Quershi et al. 2014, Thaci et al. 2011. The dangerous aspect is known as the chimpanzee adenovirus type 3 (ChAd3) whose safety in previously published studies had already been challenged, known to the local independent concerned scientists of the Ghana Academy of Arts and Sciences (2015).

Reading the conclusions drawn and tabulated on each row of Table 2, all three members drew the verdict to abort the Phase II clinical trial, from their independent applications of the four criteria. Yet the authorities managing the trial results were mandated by government to accommodate foreign diplomatic pressures. So by looking down each column, and aggregating the committee's total votes on each separate consideration taken independently – again, what social choice theorists call a premise-based procedure for determining an overall verdict – there was no single consideration that the majority of the committee agreed upon, by which each of them regarded the two criteria as unfulfilled. Analysing the verdicts this way ('premise-wise', as described in the literature), there was no majority of the committee members who found any single criterion as a sufficient basis for discontinuing the trial. So from this standpoint, the consensus of the committee favoured continuation of the vaccine trial.

Table 2 above captures the paradox in a graphic way – respecting the protocol of reliance on the final judgment of each committee member, the verdict was indeed unanimous: to abort the clinical trial. However, a different way to aggregate the committee's verdict is to examine the view of everyone on the committee according to their individual interim judgments on each criterion regarded separately. This method results in no overall majority, leaving open the decision to continue the trial, contrary to the verdict drawn by every member of the jury-committee. The foregoing provides another clear cut example of a group's consensus yielding contradictory views based upon how the individuals' judgments comprising that group are tabulated.

In sum, I propose that these two applications of theorems (*discursive dilemma* and *doctrinal paradox*) from the social choice literature offer several advantages in explaining why abject falsehoods about African public health problems and solutions are consistently portrayed as the global scientific consensus.<sup>12</sup>

Firstly, the discursive dilemma demonstrates how the divergent demands pressuring medical researchers and practitioners focussed on chronic diseases and fatal immune deficiency in Africa so often yield counterproductive effects, based on claims and policies that those same

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<sup>12</sup> Other examples of this are climate change, genetic engineering (Weyant 2018), product safety decisions.

researchers and practitioners repudiate outright off the record on the basis of their individual and direct experiences and expertise.

Secondly, and more importantly than persistent identifying conflicts of interest, this approach suggests ways of reconstituting the 'scientific consensus' so that the experts selected to comprise that body might be (i) genuinely independent in their judgments, and (ii) biased towards truth about their subject matter, thereby fulfilling Christian List's suggested Arrowian preconditions to ensure that the epistemic advantage of a rational democratic procedure for aggregating a group's majority view is likely to exceed either the procedure of following one authority's view, or of relying on an absolute consensus (List and Goodin 2001; List 2005).

### **The statistical case against pursuing global health justice as a free-market enterprise**

The same point can be developed further, by reflecting on the chaotic effects that emerged in these real life examples when trying to satisfy fundamentally opposed interests in the global political economy. On the one hand, (i) building a scientific consensus to produce medical knowledge and policy advice is intended to alleviate the imbalance of chronic diseases and short life expectancy which unduly burden Africans, to the chagrin of responsible members of the sixtieth United Nations World Health Assembly (Velasquez 2014). At the same time, (ii) policy makers and organisational heads at the global level of public health care are expected to ensure that pharmaceutical shareholders retrieve their investments (Pogge 2005, 2011; Shah 2010). Further, (iii) multi-lateral military alliances are preparing a new defence strategy in global warfare to protect affluent populations against new risks of bio-terrorism (Elbe 2010, 2012).

As was shown earlier, Arrow's impossibility theorem applied through this approach to the WHO's Global Health Action Plan demonstrates that there is a limit to how many diverse interests can be equally weighted in aggregating a collective decision. In this case, these three conflicting demands constitute a collective decision-making overload: (i) abiding by the principles of best scientific practice, while (ii) meeting both the challenge of maintaining consistent reliability in maximally effective policy and intervention strategies over time, as

well as (iii) providing maximally accurate judgments that are representative of facts on the ground.

## Conclusion

Global ignorance about the causes and spread of Africa's fatal contagions contributes to the hemorrhaging of funds intended as humanitarian medical aid. Aspects of knowledge production and dissemination during the 2014-2016 international interventions in the West African Ebola crisis are an instructive case in point. I have demonstrated that it follows as a consequence of mathematical truths (in particular, aggregated judgment theorems deductively proven by social choice statisticians) why African experts should be the primary advisors and determinate decision makers when setting global research priorities and interpreting the public health care needs of their localities. The overall yield of foreign investment in alleviating the continent's disease burden would then be more effectively focused on recommendations of regional specialists. They recommend multi-sectoral preventive approaches to the elimination of acquired chronic immune deficiency, non-centralised delivery of affordable medical services through community outreach, and locality-specific solutions to the infrastructural reasons for chronic contagion – these include malnutrition, lack of potable water, substandard housing and inadequate municipal services in major urban centres throughout the tropics.

Lastly, I now address the reader whose interests in group agency are theoretical rather than practical. In what follows, I mention consequences of these applications of aggregated judgment that may matter to a philosopher whose interests are not focussed upon Africans' high mortality and morbidity rates. The group agent illustrated here is the global research and practicing health care community. It is this self-monitoring, public service-oriented, knowledge-producing professional community with which a decisive scientific consensus is regularly associated. This vast network has all the properties of an integrated collectivity as Philip Pettit (2003) suggestively characterises 'a group with a mind of its own'. The discursive dilemma framework demonstrated in this paper illuminates statistical features of amassing a consensus or majority view drawn from such integrated collectives. The paradoxes and dilemmas illuminated by Pettit and applied here emerge as the result of judgment *aggregations*. These aggregations are mathematical *acts* or *practices* of a second

order, amassing data collected from the group's members using two different approaches (conclusion-based vs. premise-based aggregations).

There seems to be no basis for invoking an individuated ontological category or ontological kind in order to account for the diametric opposition that can occur between a group's overall consensus and the views of individuals comprising that group. Nevertheless, many group agency theorists propose such a special ontology for groups (e.g. Weatherall and Gilbert 2018). When each of those individuals' judgments unanimously opposes the overall consensus attributed to that group, the judgments themselves can each still be construed as the property of the individual members of that group nonetheless. The source of these anomalies is a statistical phenomenon rather than an ontological one, as social choice theory illuminates.

Consider an analogy: there is a more familiar 'paradox' in the use of statistics which occurs when you consider a statement such as 'The mean average of the number of children born to families is 3.75'. Obviously, it need not follow that there must exist an ontological type of couple which bears 3.75 children. Or compare the mean average, the mode, and the median of individuals' annual incomes constituting a wide economic sector such as the international health arena. The vast numerical majority of health care workers across the globe are grossly underpaid, while a few elite surgeons make many times more than the majority of the health work force. So depending upon how you 'average' their incomes, you will get wildly different values. It would clearly be absurd to conclude from this disparity between the results of three different ways of averaging income that there must be three distinct kinds of wage earner to which each of the contrary results (mean average, mode, median) of computing income belong. Hypostatizing the difference that emerges from these three distinct ways of calculating an 'average income' by postulating three different *kinds* of income recipient would deflect attention from the facts on the ground. The facts on the ground demonstrate that some ways of computing an average for a large population can be profoundly misleading, especially when the distribution of the attribute being measured (such as income) is drastically skewed. Postulating special ontological kinds of income recipient constitutes an obvious theoretical deflection from the gross disparity in the remuneration that exists among researchers, directors, lab technicians, hospital orderlies, nurses, surgeons, home-care practitioners, midwives, specialist consultants, and general practitioners around the world.

To bring the analogy home: metaphysics should not take the place of facing squarely the existing power dynamics prevailing in the global scientific, public health policy, and medical research arenas. The details of the decision theory models applied to these two examples are intended to eliminate the need for postulating a scientific group subject or agency as a distinct ontological category. What may actually be at play is the working of uneven power dynamics between constitutive members in the global community of public health experts, included in that community both as individuals and as sub-groups. The two applications of paradox illuminated by social choice theory as presented here provide a response to Philip Pettit's challenge to find a reason "why we should deny that the collective is an intentional entity in its own right" (Petit 2003, 181). A reason might be this: no special entities need be postulated to account for long-prevailing imbalances of power in decision making which continue to exist between African medical specialists working in economically compromised nations, and those medical experts located in former colonizing affluent nations.

A further valuable outcome of these results is to throw into relief how much chaos emerges from the social norms that characterise rational thought processes and activities of researchers subject to the tightly regimented protocols which control the large scientific networks contributing to, and extracting from, global research data banks (Kuhn 2017). This chaos is under-represented by philosophers focussed on institutional agency. The examples presented here demonstrate the inadequacy of a widely received model of organized agency proposed by Michael Bratman (2018). Bratman presupposes that a neat and precise fit can be expected between the outcome of sub-plans and activities of constitutive sub-groups, and the overall plans and intended goals attributable to a consortium of professional institutions overall. When the institutional agencies are those collectively responsible for producing a global scientific consensus, the data runs contrary to Bratman's theoretical model. There is little congruency about the public health crises actually faced by Africans and the policies created to address them. As recognised and proposed by independent, locally based experts in Africa, the interpretations and global action plans amassed from the preponderant majority of medical decision makers worldwide are woefully inadequate to relieve the problems faced by the majority of Africa's health ministries. Here, some interesting theoretical results of collective choice modelling have been recruited to explain why.

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