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SYMPOSIUM: SCIENTISM

What Should We Eat? Biopolitics, Ethics, and Nutritional Scientism

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Abstract Public health advocates, government agencies, and commercial organizations increasingly use nutritional science to guide food choice and diet as a way of promoting health, preventing disease, or marketing products. We argue that in many instances such references to nutritional science can be characterized as *nutritional scientism*. We examine three manifestations of nutritional scientism: (1) the simplification of complex science to increase the persuasiveness of dietary guidance, (2) superficial and honorific references to science in order to justify cultural or ideological views about food and health, and (3) the presumption that nutrition is the primary value of food. This paper examines these forms of nutritional scientism in the context of biopolitics to address bioethical concerns related to the misuse of scientific evidence to make claims regarding the effect of diet on health. We argue that nutritional scientism has ethical implications (i) for individual responsibility and freedom, (ii) concerning iatrogenic harm, and (iii) for well-being.

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Introduction

In 1784, Immanuel Kant considered the ability to determine one's own diet without recourse to the authority of a physician as a sign of enlightenment (Kant 1983). In contrast, the "enlightened" individual today follows the direction of those claiming nutrition knowledge in determining a healthy diet and lifestyle. Nutritional expertise is claimed not only by physicians but also by nutrition educators, personal trainers, dieticians, policymakers, food marketers, celebrity chefs, and popular authors (Rousseau 2012). A common feature of the claims made by these "experts" is an appeal to the authority of nutrition science. Whether the diet is vegan, Palaeolithic, Mediterranean, low carb, low fat, or whatever, reference to nutritional science is used to support assertions about the way diet contributes to or detracts from health and longevity (Scrinis 2013). What brought about this transition from independence to dependence on authority and knowledge?

Kant's comment about determining one's own diet was made with no possible scientific knowledge of the complexity of health in relation to food and diet. According to Kenneth Carpenter (2003a). nutrition science was born in 1785 through the "chemical revolution" in France. The development of biology, chemistry, and physiology (or more generally the life sciences)

from the late eighteenth century and into the nineteenth produced greater understanding of causation and transmission of disease. With this knowledge came a perceived capacity to predict, control, and manage life itself. The production of this knowledge became increasingly entwined with the apparatus of the state and enabled strategies of social insurance and welfare programmes to maintain a stable workforce (Garland 2014). These sciences and strategies were used to administer, manage, and examine human life as a political object.

Michel Foucault analysed these developments through the lens of biopolitics. While Aristotle conceived of humans as living beings with the capacity for politics, Foucault argues that modernity conceives of humans as living beings "whose politics places his existence as a living being in question" (Foucault 1998, 143). The starkest manifestation of biopolitics was the scientific racism of the nineteenth and twentieth centuries that interrogated human biology to determine who is included or excluded from the political community (Foucault 2004). However, biopolitics also operates in more subtle ways. The advancement of the life sciences produced more and more knowledge about factors contributing to human health and illness. This knowledge has been used to establish a strong biopolitical imperative for individuals to live healthy lives that do not burden society with disease and costs associated with lack of productivity (Foucault 2007). Scientific knowledge in modernity received a privileged status as providing the best account of how to live a healthy life. The use of scientific knowledge reinforced the role of expert advice in guiding individuals to become responsible for maintaining their own health (Giddens 1991). Independence from purportedly expert and scientific advice was not a sign of enlightenment but irresponsibility. Expert advice justified social and political authorities to intervene in the lives of individuals, families, and populations (Donzelot 1980; Foucault 1980).

Importantly, the manifestation of biopolitical strategies shifts across historical context. The biopolitics of Nazi Germany is different from the biopolitics of the Beveridge Plan in post-war Britain. However, in all contexts the life sciences are central for biopolitical interventions. Today, biopolitics operates in neo-liberal societies predominantly through the idea of choice (Mayes 2014; Guthman 2011; Rose 1999). By governing the putatively free choices and behaviours of individuals, contemporary biopolitics seeks to promote population health and minimize the economic burden of disease. The biopolitical imperative for individuals to live healthy lives is particularly intense in the area of food and diet. Unlike other health-related choices like smoking, drug use, or sexual activity, everyone has to eat. Public health advocates, government agencies, and food companies use nutritional science to reinforce messages about healthy eating as a way of promoting health, marketing products, and reducing the risk of several non-communicable chronic diseases (e.g., coronary heart disease) or conditions (e.g., obesity). Whether actually science-based or not, claims about food and diet often invoke nutritional science.

In this paper, we argue that many of these appeals can be considered nutritional scientism in at least three ways: (1) they simplify complex science to increase the persuasiveness of dietary guidance, (2) they make superficial and honorific references to science in order to justify cultural or ideological views about food and health, or (3) they presume that nutrition is the primary value of food. We argue that such references to nutritional science can be characterized as *nutritional scientism*. Philosophers have defined scientism in various ways (Habermas 1987; Sorell 1991; Pigliucci 2013; Critchley 2001). Susan Haack defines scientism as an "uncritically deferential attitude towards science [and] an inability to see or an unwillingness to acknowledge its fallibility, its limitations, and its potential dangers" (2013, 105). We find this definition useful for understanding aspects of nutritional scientism, and we argue that scientistic uses of nutritional science have ethical implications that have yet to be explored in detail.

Although a small literature has criticized the uses of nutritional science in directing food choice (Scrinis 2013; Pollan 2007). there has yet to be an adequate discussion relating nutritional scientism to the bioethical implications for food, health, and well-being. We do this over three parts. First, as background, we provide a broad outline of the types of knowledge that nutritional science can produce. Second, we identify characteristics of three forms of nutritional scientism and review recent criticisms of how nutritional science is used to generate dietary guidance. Finally, we argue that these forms of nutritional scientism have ethical implications (i) for individual responsibility and freedom, (ii) concerning iatrogenic harm, and (iii) for well-being.

Scientific Knowledge Concerning Food, Diet, and Health

Over the past two centuries, scientific evidence has been used to address nutrient-deficiency diseases and to establish population-level dietary guidelines to address diet-related non-communicable diseases (NCDs). The evidence for these uses is drawn from observational studies as well as from randomized, controlled experiments. The complexity of nutritional science as an area of research between the biological and human sciences has made it difficult for simple and consistent guidance. This section overviews these developments and indicates how nutritional science is vulnerable to scientistic interpretations and uses.

Beginning in the nineteenth century, the notion of scientific nutrition was established through macronutrients (protein, fat, and carbohydrate) and the concept of the calorie (Hargrove 2006). Over the first half of the twentieth century, research determined many new essential vitamins and minerals (Carpenter 2003b). The understanding of nutritional requirements for health created a moral and social responsibility for governments to provide appropriate advice regarding foods that would prevent nutrient-deficiency diseases among vulnerable populations. The acknowledgement of nutritional deficiency as the cause of these diseases also led to an emphasis on home economics and the importance of the housewife to know about scientific nutrition (Apple 1995; Ristovski-Slijepcevic, Chapman, and Beagan 2010). Government agencies were established to help provide education about nutritional health.

By mid-century, nutritional sufficiency was a priority. In 1941, the United States established the recommended dietary allowances (RDA) to address nutritional sufficiency in relation to macronutrients, micronutrients, and calories. If there was enough science-based information about population intake and nutrient status in the population for a particular nutrient, then an RDA value would be established for a population. RDAs were set at the population level so that the nutritional needs of "practically all" healthy people would be met. Unless nutrient status of a particular individual was assessed, there would be no way of knowing whether that person would achieve sufficiency by ingesting the RDA value. However, there could be confidence that population-level sufficiency would be achieved almost entirely. The indeterminacy at the level of any particular individual left the door open for marketers of nutrients to argue that supplementation of a particular nutrient would be a hedge against the risk of insufficiency (Gardner 2006; Frohlich 2010). Once nutritional deficiency diseases were clearly conceptualized, they could be diagnosed in individuals. A paradigm case for deficiency disease for a single nutrient could be understood both in terms of aetiology and treatment if caught early enough. In this way, knowledge of essential nutrients could be readily used at both the population and the individual levels, for both public health and medical treatment (Carpenter 2003c; Santich 1995).

Not only did science lead to knowledge about the nutritional components of foods, but it enabled changes in the manufacturing and processing of food. Consideration of nutrient content was one of several "quality factors" in the production of agricultural commodities and their transformation to food by processing and manufacturing. The field of food science and technology began in the mid-twentieth century. Applying the sciences of chemistry and microbiology to food items allowed material quality factors to be quantified scientifically. Nutritional effects of food processing and manufacturing on a food item could be quantitated. Loss of nutrients, either physically or chemically, could be studied, and processes could be developed to optimize nutrient quality, along with other quality factors such as taste and appearance, in order that manufacturers could compete for sales in the marketplace. Nutritional quality with respect to nutrients was one quality among several and not necessarily the one that contributed most strongly to successful marketing of a product.

Towards the end of the twentieth century, there was a shift in focus from nutrient deficiency to diet-related NCDs. Questions about the relationship of food and diet to health became increasingly focused on the relationship of food and diet to the risk of NCDs, including heart disease, stroke, cancers, and type II diabetes. For these chronic diseases, which tend to develop over multiple years or decades, the question of cause became more complicated than for deficiency diseases (Mayes and Thompson 2014). Early observational studies suggested relationships through correlations between behaviours and disease incidence. Using statistical models, a nutrition scientist could ask about the strength of disease correlation to various behaviours (dietary and otherwise) and about possible statistical significance of correlation of disease incidence with these various behaviours. Because there was no clear understanding of the causative nature of these relationships, and because the relationship would be established only through

mathematical analysis, the behaviours significantly associated were considered "factors." Factors allowed for the careful skirting around the problematic issue of cause. If when the factors were present incidence was higher and statistically significant, the factors were considered "risk factors." The idea of risk was required because the disease incidence in a group exhibiting detrimental behaviours could still be relatively low in an absolute sense. Not only was a particular risk factor not necessary to cause the disease, but it was often not sufficient either: disease incidence was observed in the absence of the risk factor. Thus with respect to NCDs, much nutrition knowledge was indeterminate and probabilistic. The risk factors could best be understood at the level of the population, and thus the knowledge was understood to have the potential to contribute to the possibility of improved population health. However, the application of this research knowledge to individual persons was problematic. In the face of the statistical nature of the evidence, it was impossible to say to a particular person, "If *you* change *your* diet in a certain way, reduced disease risk will result for *you*." This is in clear contradistinction to the understanding that for everyone a nutritionally sufficient diet will preclude nutrient deficiency.

Randomized, controlled experiments are designed to address whether a particular treatment is causative. In a simple case, if two experimental groups, randomly sampled from a healthy population of interest, are compared when the only difference between the two groups is some nutrient, food, or diet, then when a difference in disease outcome is observed, the difference may be considered causal. But it is causal only at the level of difference in incidence between the groups studied. A reduction of incidence by fifty per cent could still involve a relatively small proportion of an experimental group if incidence is low. Although establishment of causal nature is a conceptual increase in the nutrition knowledge base, the multifactorial nature of NCDs means that by appropriate design of experiments, the disease might be shown to have multiple causes, none of which would be by itself either necessary or sufficient.

A fundamental indeterminacy remains with respect to information that would guide the individual. Whether the risk for an individual person will be reduced by avoiding risk factors is not clear (but it may appear prudent to assume so). However, at the population level there is reason to think there might be benefit. Nevertheless, we have no idea why a particular individual with all the risk factors might fail to contract the disease. And, formally, we cannot say precisely why a person with or without the risk factors contracts the disease. Incidence is a probabilistic concept with respect to either factors or causes, even though we might be able to suggest a mechanistic explanation for those who contract the disease. With respect to diet-related NCDs, recommendations to a person are at best probabilistic.

In general, particular observational studies or randomized, controlled experiments are not replicated precisely. Moreover, it is not unusual that the outcomes may be or appear to be disparate for these different studies and experiments. Furthermore, the body of research on a particular NCD can be immense. Thus, a tremendous amount of scientific knowledge and judgement is required to take all the scientific evidence into account with respect to recommending some action to reduce the incidence of a particular chronic disease in a population. Communicating complex scientific information to lay populations is problematic considering the vast amount of knowledge and evidence behind the RDAs. The information must be simplified if nutrition educators are to communicate compelling messages of nutritional guidance to the lay public.[1]

[1] In the United States, the RDAs were regularly updated and published approximately every five years until the tenth and final edition (1989). After a longer-than-usual hiatus, the RDA publication was replaced by a more comprehensive approach: the dietary reference intakes (DRIs), which included not only the old RDA values but also additional values (estimated average requirement, EAR; adequate intake, AI; and tolerable upper intake level, UL). The last publication of the RDAs per se ran to only 283 pages, but the fourteen volumes of the DRIs total thousands of pages (Otten, Pitzi Helwig, and Meyers 2014). The first version of the Dietary Guidelines for Americans was published in 1980, and this publication has been updated every five years since. At the time of writing, the current version is dated 2010 (United States Department of Agriculture and United States Department of Health and Human Services 2010). The first step in a revised version of the Dietary Guidelines for Americans involves the constitution of the Dietary Guidelines for Americans Advisory Committee, a group of nutrition scientists who meet regularly over about a year to consider the vast body of research available. Their task is to consider the strength of the evidence for conclusion statements about various relationships, classifying each as strong, moderate, or limited. The report of the advisory committee (the 2015 report has recently been released) is reviewed by a group affiliated with the USDA and DHHS (United States Department of Agriculture 2011). This group develops the actual Dietary Guidelines for Americans, taking into account whatever practical considerations are deemed appropriate and condensing and simplifying the original message as required.

For example, the current Dietary Guidelines for Americans (United States Department of Agriculture and United States Department of Health and Human Services 2010) was written for specialists, not for the general public. It is supposed to be used as the basis for development of nutrition education programmes (e.g., MyPlate) and for policy decisions. The nutrition education programmes may be considered simplified technologies based on nutritional science. The programmes the lay public sees are much simplified even beyond the Dietary Guidelines in order to make the information and recommendations accessible to the general public. Thus, scientific nuance at the level of the official Report of the Dietary Guidelines Advisory Committee is necessarily lost, in favour of strongly worded practical recommendations (Marantz, Bird, and Alderman 2008; Willett and Ludwig 2011). Nutrition education programmes are heavily weighted towards the goal of effectively changing behaviour in the name of improving public health. The public is expected to respect the authority of the programmes and to follow the recommendations, and nutrition educators are expected to effectively communicate the recommendations. Ideally, from the perspective of nutrition educators, the lay public would trust the expert knowledge and judgement of the educators and recognize the benefit for simplification of knowledge in this complex scientific field. But when the underlying complexity is out of view, the lay public may be led to believe that the science is actually simple and learns to trust in the power of a simplified form of science. As we will elaborate below, this is one type of scientistic attitude about the relationship of food and diet to health.

Simplified recommendations of technologies such as MyPlate or food pyramids are inconsistent with the actual complexity of scientific knowledge of nutrition, its thoroughly probabilistic and indeterminate nature at the individual level, and its probabilistic nature at the population level. This tension and possible confusion can provide fertile ground for the apparent viability of believable alternate recommendations, many of which may be either ascientific, scientistic, or both. Moreover, much of what is "known" about what foods are good for us can come from food and diet advertising and marketing that thrive on oversimplification of nutritional messages. The question of how we, as a population and as individuals, know what we claim to know about the relationship between food/diet and health is a very live one.

The complexity of nutritional science is largely due to its role in the intersection of the biological and human sciences. Although human nutrition is a biological science, it is one that is directed towards the human organism. Studies of human nutrition must deal with challenges that go with working with humans, especially if the study or experiment involves free-living groups. Human food behaviour has a strong psychological and social element. Thus, the lived experience of human beings must be taken into account in the design of studies and experiments and in the interpretation of the results. Design of nutrition education programmes based on nutritional research also must take into account lived experience and cultural context (Lindsay 2010). Marketing of foods and diet programmes by the private sector draws heavily on psychology and social psychology for its effectiveness. Commercial food and dietary recommendations can rely loosely or very little on the consensus knowledge of nutritional science and more strongly on the putative scientific authority of the person asserting a claim. Katz and Meller (2014) have recently argued that although some of the more popular diet plans may have some limited efficacy, it is difficult either to establish efficacy or to distinguish among them on that basis. They note that "the full scope of health effects, both good and bad, attributable to all variations on the theme of dietary pattern defies calculation because of the complexities of the causal pathway" (Katz and Meller 2014, 84).

Today, multiple and often competing appeals to nutrition science raise important questions about the status and role of scientific knowledge in governing individual and population behaviour associated with health. The biopolitical concern over population health, particularly in relation to diet and the purported obesity epidemic, creates the conditions for scientistic uses of nutritional science from government, public health, and commercial actors seeking to promote or market "healthy" diets. Before addressing the ethics of this situation, we need to outline nutritional scientism in greater detail.

The Problem of Nutritional Scientism

The science of nutrition, like any science, is not itself scientistic. A science of food and nutrition that analyses and isolates specific components is appropriate,

important, and useful. What we are interested in is what Stenmark describes as "the view that the only reality that we can know anything about is the one science has access to" (Stenmark 2001, 4). When scientific understandings of food, diet, and cuisine become the dominant or exclusive mode of understanding of food and diet, the label of scientism is warranted. Scientism has epistemic and attitudinal features relevant to this analysis.

Jürgen Habermas defines the epistemological aspect of scientism as "the conviction that we can no longer understand science as one form of possible knowledge, but rather must identify knowledge with science" (Habermas 1987, 4). That is, science forms the limit of what can be known about the world. This does not mean that science can know all things, but that if something can be known it will be most fully and completely known via science. This means that scientific understanding of the world is "truer" or "more accurate" than lay or non-scientific understandings. A consequence of epistemic scientism described by Hannah Arendt is that "we have come to live in a world that only the scientists 'understand'" (Arendt 2006, 263). Thus a piece of food may *appear* good, yet only science can confirm the unseen nutritional *reality* as to whether it is good.

The attitudinal feature of scientism is widespread and has diverse cultural expressions. Massimo Pigliucci defines scientism "as a totalizing attitude that regards science as the ultimate standard and arbiter of all interesting questions" (Pigliucci 2013, 144). This attitude is expressed and reinforced through the appeal to images, concepts, and practices associated with science. Iain Cameron and David Edge describe the scientistic attitude as the way

> people draw on widely shared images and notions about the scientific community … in order to add weight to arguments which they are advancing, or to practices which they are promoting, or to values and policies whose adoption they are advocating (Cameron and Edge 1979, 3).

Attitudinal scientism often appears in advertisements for products, where the authority of science (perhaps only through use of a white lab coat) and technical terms are used to give weight to arguments about the healthfulness of the product.

Nutritional scientism arises through specific contexts, uses, and interpretations of nutrition science. There have been a small number of critical analyses of the use of science in food, nutrition, and public health (Scrinis 2013; Rousseau 2012; Nestle 2007; Mayes and Thompson 2014; Pollan 2007; Biltekoff 2013). Another concept, *nutritionism*, has been used recently to address concerns about the ideological limitations of nutritional science (Scrinis 2013). Coined and most fully developed by Gyorgy Scrinis, nutritionism focuses on a critique of erroneous science. Scrinis suggests that an excessively reductionist focus on nutrients detracts from other quality factors that he associates with health from food, in particular something he calls "food production and processing quality" (Scrinis 2013, 215–216). Our concern with nutritional scientism is something different. It considers the biopolitical context that uses science for particular ends. Nutritional scientism is enabled by and through a biopolitical network of four key domains: reductive science, social authority, historical experience, and subjectivity. These domains and the effects of nutritional scientism are activated and framed by the biopolitical imperative of health.

Reductionism

Care is needed to articulate what exactly about reduction might be scientistic. For instance, Albert Szent-Györgyi used a reductive scientific approach to discover vitamin C, which enabled greater understanding of its role in preventing scurvy. This is not considered scientism but one of the great achievements in the history of nutrition science. What is scientifically problematic, however, is when the success of reductionism in one area, e.g., nutrient-deficiency disease, is applied uncritically to a different area, e.g., diet-related NCD.

Scrinis describes reductionism as the "focus on the nutrient composition of foods as the means for understanding their healthfulness [and] by a reductive interpretation of the role of these nutrients in bodily health" (Scrinis 2013, 2). Pollan argues that reductionism "means ignoring complex interactions and contexts, as well as the fact that the whole may be more than, or just different from, the sum of its parts" (Pollan 2007, ¶25). For both Scrinis and Pollan, the term reductionism is used to critique science that is unduly narrow as science: they argue that proper science should take into account the complexity and interactions among components of foods and diets. Per Scrinis, nutritionism may rely on reductive science, but it is also something different; it understands the health value of a food item solely in

terms of its nutrient makeup, which in turn informs an understanding of human health as determined by appropriate consumption of nutrients to produce statistically normalized biomarker measurements.

In our view, nutritionism becomes nutritional scientism when it limits the way food is valued to a scientific understanding of health, devaluing or ignoring its value in relation to human diets, practices, and cultures. As discussed above, nutrition science is both a biological and human science. A form of nutritional scientism of concern to us in the present analysis is when human experience and values are ignored or devalued as unscientific in a narrow understanding of the value of food and diet. This concern is a different kind of reductionism, when legitimate values are reduced or limited to scientific values.

Authority

Nutritional scientism is established by and reinforces certain authorities. The belief that the total value of food comes from unseen nutrients, which in turn determines whether one's diet increases or decreases one's risk of developing an unseen chronic disease, creates a scenario where those who "see the unseen" have authority to direct behaviour. As scientific knowledge of the health effects of food is not readily accessible to a lay population, nutritional scientism reinforces the need for experts to interpret and teach individuals and populations. These experts can be public health and nutrition educators or commercially interested companies marketing foods with added nutrients so that perceived health concerns can be fixed technologically. Whether commercial or governmental, nutritional scientism establishes and reinforces the need for authoritative guidance because the actual science is inaccessible to the lay public. However, there are significant questions about the expertise of some of these guides and whether their understanding of nutrition science warrants the authority assumed by them (Mayes and Thompson 2014).

Nutritional scientism based on authority appropriates the terminology or fragments of evidence from nutrition science to strengthen a position about some process or product that may be valued for cultural, religious, or ideological reasons. For example, Thomas Schlich (1995) notes the uses and debates surrounding nutrition science in relation to Jewish dietary laws in Europe during the nineteenth century. Proponents of the traditional diet and reformists who believed Judaism needed to become a rational religion to survive in the modern world (as well as non-Jewish critics) claimed nutritional science as an ally. Rather than distinguishing theological or cultural justifications from scientific ones, the debates rested on whether dietary laws could be reconciled with nutritional science. Schlich writes that when "used to criticize the religious tradition, nutritional science was actually placed above religion: science knows better what is good for human beings than the Holy Scriptures" (Schlich 1995, location 2019). However, when used in defence of dietary laws, "nutritional science was simultaneously being justified by religion." Schlich concludes that in both cases "the winner was nutritional science" as the ultimate authority (Schlich 1995, 119). However, it is arguable that nutrition science was not the winner of these debates. Rather, victory went to the honorific appeal to science and the authority it lends to cultural, religious, or ideological positions regarding food.

Experience

In the process of transferring authority from individuals and populations to purported nutrition experts, nutritional scientism also undermines people's experience of food and associated traditional or cultural practices. Experience in this context is not isolated to an individual's senses, but following Foucault, we understand experience "as the correlation between fields of knowledge, types of normativity, and forms of subjectivity in a particular culture" (Foucault 1992, 4). That is, experience is constituted historically according to different objectives and knowledges. Mirroring Foucault's analysis of sexuality, limiting the value of food to its nutritional components forms a singular experience of food as a nutritional object around which specific sciences, regulations, and subjectivities are formed (Coveney 2006).

Continuing the example of Jewish dietary laws in the nineteenth century, Schlich writes of the way early "nutritional science severed the physiological aspects of food from its cultural aspects, considering only the metabolic functions of nutrition" (Schlich 1995, location 1568). The pleasurable, social, cultural, or religious experience of food becomes divorced from the new reality of food as a nutritional object known by science. A new nutritionally oriented experience starts to take form. Pollan describes an aspect of this in arguing that nutritionism undermines human experience of food that gave the capacity to know "how to read these biological

signals: this smells spoiled; this looks ripe. … This is easier to do when a creature has long experience of a food, and much harder when a food has been designed expressly to deceive its senses" (Pollan 2007, ¶51). Reference to nutritional science and the focus on purported health benefit of macro- and micronutrients limit the way food is experienced by individuals and populations.

Subjectivity

Related to the transformation of food into a nutritional experience is the shaping of subjectivity. By narrowly considering food as nutrients, the effect of which can only be understood by an authoritative expert, the human interaction with food and the formation of subjectivities are constrained. If, according to the hackneyed adage, "you are what you eat," then nutritional scientism provides the conditions for individuals to think of themselves materially in accordance with borrowed terms from nutrition science. The proliferation of nutritional information has "profoundly shaped how the lay public understands and engages with food and the body" (Scrinis 2013, 43). This has the effect of confusing the public and making people further dependent on nutritional experts and authorities (Fischler 1988; Mayes 2014). According to Scrinis, for a "nutricentric person" in thrall to reductive nutritionism, a focus on nutritional value of food can provide a sense of control and empowerment (Scrinis 2013, 43). Empowerment in this context is the supposed capacity to determine one's health and ensure disease is prevented from occurring in the future, even if this is based on a simplified understanding of nutritional science. However, the other side of this notion of empowerment is responsibility (Guthman 2011). As will be discussed in the following section, there are a number of ethical concerns about making an individual or population responsible by misusing or misconstruing scientific knowledge.

The biopolitical drive to direct the dietary behaviours of individuals and populations towards primarily valuing a physiological conception of health both enables and draws upon nutritional scientism. Drawing on the life sciences, governments in Europe and the United States developed strategies to measure, predict, and prevent the effects of disease on populations (Foucault 2007). Thomas Lemke writes that knowledge produced by the life sciences made "it possible to analyse processes of life on the level of populations and to 'govern' individuals and collectives by practices of correction, exclusion, normalization, disciplining, therapeutics, and optimization" (Lemke 2011, 5). The development of nutrition science since the mid-nineteenth century has enabled governments to control and direct the diets of individuals and populations—transforming Western society into a nutrition culture (Kamminga and Cunningham 1995).

Elsewhere we have addressed the normalizing effects of biopolitical strategies such as food labels and dietary guidelines (Mayes and Thompson 2014; Mayes 2014). Our focus here is on the biopolitical use of nutritional scientism to ascribe the value of foods to its nutrients, reinforce authorities, transform experience, and produce nutritional subjectivities. Not only do these developments alter the way food is understood and experienced, they also have a number of ethical implications that require careful analysis.

Bioethical Implications of Nutritional Scientism

Whether nutritional or otherwise, scientism is often characterized as a problem because it is philosophically unsound and/or does a disservice to science by undermining public understanding (Pigliucci 2013). When nutrition advice is scientistic, it is an inappropriate use of science that mistreats its object (food) by constraining the sense of its value; it may also confuse public understanding about scientific knowledge. Although critics have addressed reductionism in nutrition science (Scrinis 2013; Pollan 2007). they do not explore the bioethical implications of nutritional scientism. We recognize further work is needed to explicitly confront the biopolitical features of scientism. However, this is implicitly addressed in our analysis of the bioethical implications in relation to subjectivity, harm, and well-being. In this final section of the paper, we argue that limiting the value of food to nutrients, dependence on authorities, the transformation of experience, and the production of nutricentric subjects create the conditions for three ethical concerns: (i) individual responsibility, (ii) iatrogenic harm, and (iii) well-being as more the physiological health.

Responsibility

The increased emphasis on individual responsibility as a public health strategy in relation to diet and obesity

reinforces and relies on a nutritional scientism. Despite the indeterminate nature of the scientific evidence for the individual with respect to NCDs, public health programmes in Western liberal democracies overwhelmingly focus on the individual (Petersen and Lupton 1996). These programmes and the use of nutritional scientism create the conditions for the plausible deployment of responsibility rhetoric (Rose 1999). Put simply, the story that foods are comprised of chronic disease-causing or disease-preventing nutrients and that individuals who choose to eat those foods are responsible for their own health outcomes is made possible through the biopolitical use of nutritional scientism.

Despite criticisms of the population basis of this line of reasoning, policymakers, public health advocates, and putative nutrition experts continue to emphasize individual responsibility as a dominant strategy to prevent diet-related disease and conditions (Holm 2007; Brownell et al. 2010; Puhl, Peterson, and Luedicke 2013; Goldberg and Puhl 2013). However, as Marcel Verweij argues in relation to health promotion professionals, there are "good moral reasons for trying to minimize the chance that the public understands their messages as supporting charges of moral responsibility for those who get ill" (Verweij 1999, 101). The use of an oversimplified nutritional science message to legitimate claims that individuals are responsible for contracting a particular non-communicable chronic disease (NCD) is problematic. As described above, an individual can contract an NCD even without behavioural risk factors and also may fail to contract the NCD with them. The absence of deterministic control presents an ethical problem. To be held responsible requires informed agency and deterministic knowledge. However, scientistic advice undermines the informed agency of the individual and also burdens the individual with a scientifically unjustified sense of capacity of control.

When nutritional guidance from governments, industry, or popular diet writers simplifies science in order to establish a causal chain between nutrients, food, diet, and health, the conditions are established for individuals to be unjustifiably held accountable for their health outcomes associated with diet. There is a place for individual responsibility in relation to health status (Holm 2007 and Brownell et al. 2010 make this point). however, individual responsibility needs to be justified by evidence that individual dietary behaviour *actually* causes the conditions in that individual so that the individual does in fact have control over that behaviour and can be expected to assume responsibility for the outcome. The focus on individual responsibility is problematic not only in relation to the science, but it can result in victim blaming and ignoring the multifactorial character of diet-related diseases and conditions (Mayes and Thompson 2014).

"Iatrogenic" Harm

In his polemic against the Western medical establishment, Ivan Illich (1975) called attention to the idea of iatrogenic harm—adverse consequence resulting from the physician's and the medical establishment's attempts to heal. Illich's critique has been broadened to include possible harms resulting from or associated with the advice and interventions of preventive medicine and public health (Skrabanek 1994; Verweij 1999).

Possible iatrogenic harm from food and diet recommendations may have ensued from the emphasis on cholesterol and dietary fat intake in relation to heart disease. Gary Taubes (2008) argues that this focus was premature and less than thoroughly justified. Others argue that well-meaning recommendations to reduce intake of fat and cholesterol may actually have been counterproductive towards the goal of improving public health (Rothstein 2003; Scrinis 2013; Taubes 2008). This critique is particularly relevant in relation to advice based on a scientistic understanding of nutrition, where scientific terms are used in an honorific way to gain authority or where complex knowledge is simplified to become more persuasive. To the extent that the recommendations were oversimplified for nutrition education purposes, we may consider them scientistic. To the extent that scientific knowledge reached premature closure, we may criticize the quality of the science. A less immediately physiological form of iatrogenic harm resulting from advice promoted via nutritional scientism is the growing confusion and anxiety that consumers report in relation to diet and health (Mol 2010; Lupton 2008; Coveney 2006; Pollan 2006).

The accusation of iatrogenic harms associated with nutritional scientism draws attention to the dangers of giving oversimplified (if not scientifically premature) advice to populations. Real harms can result from encouraging or discouraging people to consume certain foods due to a reductive understanding of nutritional content in relation to health. Perhaps most importantly, there is a more general concern with iatrogenic harms resulting from the fracturing of people's relationship

with food and of the social and cultural experience of eating. This relates to the final ethical implication concerning well-being and the importance of thinking about health in more than a physiological sense.

Well-Being: More Than Physiological Health

In addition to overemphasizing the value of nutrients for health relative to other food-related values, nutritional scientism can exclude broader ways of thinking of health than physiological health, such as aspects of well-being. The biopolitical imperative seeks to protect population health by encouraging individuals to modify their bodies and lives to accord with the norms and knowledge produced by the life sciences. However, the life and health of the individual cannot be reduced to or defined by norms external to lived experience without violating the integrity or well-being of the individual. Nutrition and biomedical sciences have successfully developed norms of health through laboratory work and statistical models. Although these norms have clinical utility, it is in the lived reality of the organism as it interacts with its surrounding environment that normality or pathology is experienced. The lived experience of the individual resists attempts by biomedical, public health, and the life sciences to colonize life, giving inordinate value to physiological health in accordance with external norms.

In critiquing nutritional scientism, it is important to address not only its influence on food but also the way it relies on a narrowed conception of human health. In discussing Georges Canguilhem's philosophy of health, Annemarie Mol states that "measuring variables of an isolated organism may yield a lot of knowledge, but it does not say anything about the question of where health turns into pathology" (Mol 1998, 275). According to Canguilhem (2007). life itself is normative; the living organism creates norms in its interaction with the environment and others. It is only "when the organism can no longer react creatively to new elements of its surroundings, when it loses its potential to set new norms, does it falter" (Mol 1998, 275) and become diseased and deceased. Writing along similar lines, Rene Dubos (1987) highlights the situational feature of health and the limits of applying norms that are alien to the lived experience of the individual. Dubos suggests it "is not easy to discover a formula of health broad enough to fit Voltaire and Jack Dempsey, to encompass the requirements of a stevedore, a New York City bus driver, and a contemplative monk" (Dubos 1987, 262). The lived experience and surroundings of the monk and the bus driver are very different and produce different norms. Dubos writes that "to feel at ease among the neon lights of Broadway demands a type of body and mind not conducive to happiness in the midst of a Taoist moonscape" (Dubos 1987, 269). If health is determined by norms external to lived experience and surroundings, then a situation is created where an individual at-ease may be determined to be *dis*eased and vice versa.

Foods and cuisines may contribute to an individual's or community's sense of well-being and at-ease in their lived reality in the world. However, the value of these foods could be constrained through a narrowed scientistic lens as containing little nutritional value or as increasing risk of disease, thereby undermining the role of a food as a source of well-being beyond physiological health. Arendt (2006) describes the effects of overly scientific understandings of the world in describing the way it can undermine lay understandings and create a sense of the lay person being "out of touch with reality" as reality is known by science. Arendt elaborates on this in saying that we "understand only what appears but not what is behind appearances" and any concerns or "anxieties are simply caused by ignorance" and resolved through more science or trusting in science (Arendt 2006, 263). From Arendt's phenomenological perspective, scientism can make people experience the world in an uneasy or arguably dis-eased mode.

Arendt speculates that in a society dominated by a scientific understanding of the world and human interactions, "speech and everyday language would indeed be no longer a meaningful utterance that transcends behaviour even if it only expresses it, and it would much better be replaced by the extreme and in itself meaningless formalism of mathematical signs" (Arendt 2006, 274). It could be argued that nutritional facts panels and front-of-pack labels are attempting to do exactly this—to articulate the *actual* nutritional value of the food via mathematical signs. Such speculations aside, the point here is that nutritional scientism operates with a narrow conception of health that undermines the lived reality of individuals and their own sense of well-being in the world.

The ethical implications of nutritional scientism for responsibility, iatrogenic harm, and well-being should give pause to policymakers, public health practitioners, and nutrition educators tempted to simplify nutritional science research to be more persuasive and to promote

and prioritize health narrowly. While commercial actors are also complicit, it is unlikely that ethical concerns alone will motivate them to make more nuanced and appropriate use of nutritional science. As a result, greater consideration of these ethical implications could be used as a basis for regulation in relation to health claims and the use of nutritional science in advertising. However, further legal and policy work are needed to establish this argument.

Conclusion

What should we eat? In the biopolitical context, the answer is whatever nutrition experts recommend to promote health and prevent disease. However, as we have argued throughout this paper, the science is not that simple. Attempts to communicate a strong causal chain from nutrients to food to diet to health tend to rely on scientistic persuasion. A more accurate, though less satisfying answer to this question is: it depends. What is there to eat? What do you want to eat? Who is "we"? Why should we eat?

In this paper, we argued that the answer to these questions is conditioned by the biopolitical use and deployment of the life sciences. The network of power and knowledge operating in these domains combines to produce nutritional scientism. We have described three types of *nutritional scientism*: (1) the simplification of complex science to increase the persuasiveness of dietary guidance, (2) the superficial and honorific use of science to justify cultural or ideological views about food and health, and (3) the presumption that the only important value of food is with respect to nutrition and health. These uses of nutritional science not only mislead and potentially undermine public perception of science but also have ethical implications for individual responsibility, associated harms, and well-being.

The solution is not to abandon food and nutrition sciences. Scientific knowledge of nutrition has led to improved health most clearly with respect to nutritional deficiency. However, the success of nutritional science in addressing nutrient-deficiency disease should not lead to oversimplified uses of nutrition knowledge in response to more complex phenomena. In relation to improving public health by reducing the incidence of non-communicable chronic disease, nutrition knowledge is probabilistic and fundamentally indeterminate for any particular person. Yet, the biopolitical concern surrounding diet-related diseases among Western populations has resulted in simplistic and honorific uses of nutritional science. Rather than allow biopolitics to capture nutritional science in the uncritical drive towards health, a more nuanced and rigorous use of nutritional science could serve as a potential ally in critiquing biopolitical strategies that reduce well-being from food to physiological health.

Nutrition science provides one avenue for answering the question—"What should we eat?"—but it needs to be placed in the larger context of a plurality of values that include culture, ethics, pleasure, and well-being.

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