ABSTRACT
This article articulates a robust study of potentially harmful trend toward personalized nutrition through an examination of contemporary conversations and theories surrounding genetic science, race, identity, health, and food. It makes that case that genetic ancestry kits, and the nutritional recommendations that stem from them, represent a misunderstanding of current genetic science and the capabilities of genetic technologies. I argue that the most troubling outcomes these applications are likely to have is in the further reification and perpetuation of racialized and racializing knowledge and discourses. I also make the case that trends in personalized nutrition are likely to produce yet another locus of inequality based on disparities in access to the ‘right’ foods, the iniquitous distribution of dietary capital, the further responsibilization of health to individuals, increased surveillance, and a more impoverished and functionalized relationship to food itself.

Genomic based nutrition (or nutrigenomics) is a compelling area of study since it feeds into multiple overlapping and often competing epistemologies and conversations that are sociologically and scientifically significant. These include questions of perceived and assigned racial, ethnic, and ancestral identities, food culture, genetic science, body and health anxieties, gender issues, neoliberal capitalism, food safety, technology, equity, and privacy.

In this article, I tease out and examine some of the more potentially pernicious outcomes of the commercialization of nutrigenomics through the use of popular genetic testing kits ostensibly aimed at improving public health through personalized diets based on ones’ individual DNA. While the promise of personalized nutrition might, on the surface, give rise to the hope that it could obviate racial categorization by moving away from racialised and racializing assumptions, it remains the case that the majority of companies that make these recommendations are also testing for ancestry. Moreover, the practice of using race as a proxy for population has long been de rigueur in science and will likely continue. Similar to the outcome of the Human Genome Project, which established human beings are 99.9% genetically identical, the personalization of genetic data is unlikely to result in the challenging of biogenetic racism, the continued use of race as a
category in science, or racialization in general. Kelly Happe, in her work on the Human Genome Project, demonstrates how race has become a black box allowing for health disparities to be explained using individual and biogenetic level explanations that are actually social (Happe, 2013). Margery Fee’s research on the trope of the ‘thrifty genotype’, meant to explain high rates of diabetes amongst Indigenous groups, speaks directly to how race becomes a ‘crude proxy’ for genetic differences that are presumed rather than real (Fee, 2006, p. 2988).

As such, I argue that not only do genetic ancestry kits, and the nutritional recommendations that stem from them, represent a misunderstanding of current genetic science and state of genetic technologies, but that the most troubling outcomes of these applications are the further reification and perpetuation of racialised and racializing knowledge, discourses, structures, and actions. By coupling critiques of race-based medicine with those that surround ancestral DNA testing, I make the case that trends in personalized nutrition testing risk, re-entrenching historically rooted myths about race, biology, and identity leading to a myriad of harmful outcomes for racialised groups and individuals. These include the production of yet another locus of inequality based on disparities in access to the ‘right’ foods, the iniquitous distribution of dietary capital, the further responsibilisation of health to individuals, increased surveillance, and a more impoverished relationship to food itself.

Thus, my objective is to critically assess trend toward personalized nutrition through an examination of contemporary conversations and theories surrounding genetic science, race, identity, health, and food. I begin with a section detailing and explicating the complex and problematic ways in which genetic science has used race and ethnicity to parse and classify human populations. These practices suggest that racial categories are a scientifically significant markers of difference – even if they are solely being used as a convenient way to gather and present information. Following this, I discuss how one specific company that advertises personalized diet services, 24Genetics, contextualizes and promotes their nutrition plans using a case study method. It is important to remember that with respect to nutrigenomics, it remains the case that individualized dietary profiles rely on data collected and assessed in the same way as ancestry testing (e.g. using the same data) wherein biogeographical ancestry, ethnicity, and race are used interchangeably.

Following this, I point out, what makes nutrigenomics distinctive from, for example, race-based medicine, is that there is an abundance of co-constitutive knock-on socio-cultural effects of treating cooking, eating, and food with little context. As such, I argue that the complex role food plays in our lives is negatively affected by the genetification of diets. Specifically, I discuss the cultural importance of food as well as the impact of nutritional reductionism on public conceptions of health and wellbeing. I also speak to why it remains the case that much of the identity and community building work that food does is itself grounded in the same processes of racialization that has given rise to scientific race-based classifications in the first place. I conclude, however, that the material reality of exclusion, domination, and biological inferiorisation that race-creation has given rise to is simultaneously harnessed by racialised communities to engage in cultural practices, like cooking and eating, that build networks of resistance and anti-racism that are socio-politically productive (Cook et al., 2011; Preuss et al., 2014).
Nutrigenomics: ancestry, diet, and genetic science

In this section, I provide some background into the science behind nutrigenomics which relies on population categorizations wherein race remains a central and scientifically significant marker of difference. This marker is relied upon even when the objective is personalized nutrition. A salient example can be found in personalized sports nutrition research which relies on studies at the level of population (read: race) on its way to individualized dietary recommendations in which racializing assumption do not simply disappear (Hyun, 2017; Kussmann & Fay, 2008). This background is necessary in order to better understand the subsequent section in which I discuss how structures of race fit into the rhetoric of companies currently advertising DNA-based personalized diet plans as an add-on to their ancestry testing.

As the Human Genomic Project demonstrates, the human population consists of extremely genetically similar biological entities. The question scientists have is whether there are small, scientific and/or medically relevant genetic distinctions (not of kinds of genes but proportions of genetic variations or alleles) between smaller subpopulations that can tell us something about, for example, probable future health status such as disease predispositions, medicine metabolization, food reactions, and differential responses to environmental stimuli. Trying to capture heterogeneity within a population, on the way to personalized medicine and dietary advice, has become an important part of medical and health research.

A highly lucrative trend that has taken off in the past five years consists of private companies offering personalized dietary advice alongside the genetic ancestry testing that forms the main part of their business. 24Genetics is one such company which offers an array of additional services to ancestry testing from skin care to pharmacogenomics. I use 24Genetics as a case study from which to provide analytic and ‘thick’ observations and insights that speak to the argument I have set out. This ‘particularistic, descriptive and heuristic’ approach allows for the kind of ‘analytical eclecticism’ that pulls out insights that tend to be overlooked by positivist methodologies (Merriam & Tisdell, 2015, p. 46; Stake, 2013; Thomas, 2011). In applying this approach, I draw on 24Genetics as a paradigmatic case because of its popularity, international presence, and the breadth of scientific information it has made public. A comprehensive analysis of the company’s background, methods, discursive claims, business values, and objectives are analysed in the course of the article.

Briefly, the traditional means by which to test ancestry or lineage is via Y-Chromosome testing or mitochondrial DNA testing which traces either the father or mother’s parentage. The objective of these two approaches is to map mutations onto current populations such that ‘An individual’s lineages can then be described in terms of current populations that share them, and inferences can be made about the historical origins of anyone’s maternal line or a man’s paternal line’ (Panofsky & Donovan, 2017, p. 6). Currently however, the most popular technique is admixture testing which examines one’s inherited cellular chromosomes which are scanned for anomalous SNPs (single-nucleotide polymorphisms) and compared to the patterns of SNPs in other parts of the world giving consumers a ‘statistically likely’ breakdown of ancestry along biogeographical lines (e.g. African, Native American, European, East Asian etc.).

24Genetics is an operationally obscure but popular private company with a lab in Spain and office in the Greater Boston Area with one of the largest databases of genetic markers...
and collections of biogeographical data. They operate in 90 countries and advertise themselves as one of Europe’s ‘First Health and Ancestry companies’ offering ‘comprehensive genetic tests’ with high levels of privacy and security (24Genetics, 2019b; Crunchbase, 2019). 24Genetics uses the admixture approach to test ancestry and the data is fed into their proprietary algorithm and used to dispense dietary and health related advice. The continental categories 24Genetics use map seamlessly and intuitively onto phenotypically rooted, and subsequently normative, racial categories (e.g. European: White; African: Black; Asian: Asian; Native American: Native American). ‘It is by this statistical legerdemain’, Duster argues, that we have come to the molecular reinscription of race in contemporary human genetics (Duster, 2016, p. 6). Criticisms of these tests include the opacity of their techniques and algorithms (which are protected by intellectual property law), the lack of industry standards, limited population samples from African nations (leading to skewed or partial results and high error rates), as well as problematically assuming that these markers stand in for ancestral rather than current populations (Barnett et al., 2017; Royal et al., 2010).

Once this SNP based information is collected and a statistical breakdown of ancestry determined, this same data is used to identify and extrapolate from the presence of genes and SNPs that are believed to contribute to health and wellbeing. While 24Genetics is rather circumspect in what they share (vis-à-vis which genes and SNPs form the basis of their reports) in a sample report on their website they do provide a list of the genes and genotypes they use to extrapolate a customer’s propensity to do well on a Mediterranean Diet or, as reflected in sample report, that the ideal Mediterranean Diet, will ‘affect[s] you just as well as the rest’ (24Genetics, 2019a).
Indicators traditionally assessed by 24Genetics include: genes that are associated with hunger, food preferences/impulse control, caffeine consumption, gene-saturated fat interactions, metabolism efficiency related to particular nutrients (carbohydrates, proteins, fats etc.), micronutrient requirements, and genes linked to obesity. These results are combined with other factors including current health status, activity levels, and ongoing food consumption. While the company cites scientific data supporting their approach, it is important to point out that ‘the company only lists 4 scientific papers as “evidence” for how these tests are prepared and analysed’ (Compare DNA Kits, 2019). While explicit references to race and ethnicity are largely absent from the dietary component of 24Genetic’s reports, their methods continue to rely on and are sustained by the racial logic that forms a large part of genomic research and is even reflected in how we talk about these reports. In a 2003 article in The New York Times, the author writes about a California company’s personalized DNA-based diet recommendations by beginning the article with the following observation:

A Greek co-worker [in their report] is getting clams, crab, liver and tofu – a bounty of B vitamins to raise her coenzyme levels. A friend in Chicago, a second-generation Zambian, has been prescribed popcorn, kale, peaches in their own juice and club soda which demonstrates the discursive slippery slope from ‘personalized’ to ‘raced’ (Grierson, 2003).

Being phenotypically identified as belonging to a racialized group for whom a particular diet is frequently recommended opens up avenues for corporate marketing since these results can be easily extrapolated backwards. In a similar vein, it is foreseeable that patents on nutrigenomic based vitamins and foodstuffs will follow a similar pattern and be marketed to specific subpopulations and groups for profit.
rather than on the basis of effectiveness and public health. Preuss et al, in an 2014 article, traces the move towards such a state of affairs in which a patient’s DNA is examined for SNP based susceptibilities that are then preventatively treated by drugs and diet for which an extensive number of patents have been taken out or are being assessed (Kaput & Fogg-Johnson, 2010; Preuss et al., 2014). These include ones for personalized diet design, personalized nutritional supplements (inclusive of vitamins), and population-based dosing of nutraceuticals. It is important to note that in each of these cases the identified SNP patterns are rooted in the study of population categorization using race as a convenient proxy which risks inscribing race, falsely, as fundamentally genetic. This, as Duster argues, functions such that race is seen to have ‘genetically sufficiently distinctive features, i.e. with “distinctive gene pathways”, which are used to explain health disparities between racially categorized populations’. (Duster, 2005)

However, it is also possible the trials that test the efficacy of particular diets based on one’s individual DNA might lead to different kinds of subgroup classifications based not on race and/or ethnicity, but on dietary practices or specific nutrients. Yet, currently, this kind of research is sparse and continues to rely on research, data, and dietary knowledge that is driven by traditional biogeographic assumptions (e.g. the Mediterranean diet, Japanese diet etc.). Another alternative that has been proposed involves harnessing the data we collect on ourselves via apps which would ‘provides [sic] a real-time readout of 8–10 nutrient status markers, functional biomarkers, chronic disease markers, and infectious disease markers’ (Forum, 2018). Whether these markers would be aggregated, targeted, and categorized based on racialized categories, as they have in the past, remains to be seen. Also concerning are the privacy, ownership, and discriminatory implications and possibilities of data usage on which much critical commentary has been written (Gidaris, 2019; Lupton, 2017). Overall, in addition to reifying race, both personalized and population-based medicine and nutrition have been implicated in economic objectives aimed at finding new ways to increase markets, and thus profit making, as well as individualization of health as a personal rather than a collective responsibility.

Finally, it is also the case that much of the research produced aimed at examining whether these personalized reports result in diet-based behavioural changes continue to default to racial categorization. A salient example of this is Nielsen et al’s longitudinal study of PGT (personal genomic testing) customers in which one of the primary subgroup categories in their findings is race and ethnicity thus demonstrating how tenacious these categories are despite moves towards personalization (Nielsen et al., 2017).

Taken together, this overview is meant to tangibly demonstrate how personalized dietary advice based on genetic testing works to reify race wherein ‘racial categories [are] used as proxies for specific functional genetic information’ (Blell & Hunter, 2019). In the next section, I return to of the most significant assumption, values, and choices that have produced a situation in which scientific health-oriented practices, remain firmly entrenched in structures and discourses that ‘exacerbate or even produce exclusions and subordinations which are coterminous with supposed “racially” different populations’ (Anthias & Yuval-Davis, 2005, p. 8).
Back to basics: the politics of categorization

Despite efforts to find new ways to categorize populations, most classification strategies in genomics still default to pre-existing categories based on constructed social identities – i.e. essentially perceived commonalities like race, ethnicity, language, geography. There is no evidence, however, that these distinctions, which are socially produced and often based on voluntary self-identification, tell us something meaningful about biological differences. That is, they are attempting to capture ‘a substantive biological significance that race and ethnicity do not [actually] possess’ (Foster & Sharp, 2002, p. 845).

With respect to diets, a whole set of factors make the capturing of biologically significant differences that might, for example, make a certain dietary profile or particular food cancer preventing for a specific population or person highly unlikely. To begin with, in most cases, it is really minute variations that lead to even smaller differences. As Kaufman and Cooper argue, ‘Even if it were possible to sensibly quantify genomic variation, we would still need to determine how much variation is enough to make separate races’ (Kaufman & Cooper, 2001, p. 293) – let alone reaching conclusions about whether these variations map onto health and diet specific variances. Second, doing so assumes a level of genetic homogeneity within a socially identified groups that is misleading. A whole host of geographic, demographic, migratory, cultural, linguistic, and social factors would have to be discounted rendering this assumption reductive while also amplifying minor genetic variations as biologically representative of an entire social group. With respect to food, this kind of reductionism, even on an individual level, can result in increased stigmatization and/or erasure of intra-group differences since they rely on data rooted in population-based studies. Third, as it stands, current genetic samples are not large enough to be thought of as sufficiently statistically representative to get even marginally close to truly personalized nutritional regimes. Fourth, engaging in this kind of analysis can also lead to group based discrimination based on genetic information that, if communicated without context, can be harmful to individual subpopulations.

As such, while the default of using race and ethnicity as a proxy for biological variation may be expedient, the way they have been used is highly problematic. This is the case not only with respect to whether it tells us anything useful about genetic and biological differences, but also because it glosses over what tends to be the most significant determinants of health – namely, environmental and socio-economic factors that happen to map onto racial and ethnic identities.

It is also important to underline that dietary contributions to ill health cannot be mapped neatly onto discrete genetic variations at a population or individual level. Yet, we have a situation wherein the socially constructed category of race has been made materially manifest through discriminatory policies, laws, and institutions that have produced, amongst other things, unequal health outcomes. Based on these socially produced stratifications, the scientific community has chosen race and ethnicity as an expedient means by which to study the genetic heterogeneity of populations.

Karen and Barbara Fields refer to this process as an act of Racecraft. Racecraft is the process of producing a statistically defined population based on folk classifications that are always added into the causal chain after the fact (Fields & Fields, 2014, p. 17). Essentially, through acts of racism (slavery, Jim Crow, algorithmic decision making etc.), race is
produced or ‘conjured’ as an extant fact. For instance, they draw attention to media reporting of high incidences of asthma amongst Hispanic and Black children in an area with dangerous levels of pollution which, in being reported without context, makes it sound as if there was a causal relationship between the race and asthma. This, according to the Fields sisters, ‘makes as much sense as claiming the things that cause asthma are pollution but also speaking Spanish in the household’ (Fields & Fields, 2014, p. 17).

The desire, and impetus to classify, categorize, and parse knowledge has been critiqued by feminist and postcolonial scholars as a distinctly Western, colonial, capitalist, and patriarchal mode of scientific practice that favours models of thought that privilege deductive cognitive styles, adversarial logic, hierarchical representational models, and abstractions. These choices, feminist scholars argue ‘may perpetuate biological determinism and unjustly legitimate gendered, racialized, sexualized stereotypes and hierarchies’ (Åsberg & Lykke, 2010, p. 304). Alternative models and frameworks based on a feminist, as opposed to feminine, science highlight alterity, ontological heterogeneity, and diffusion (Hartsock, 1983; Longino et al., 2002).

Moreover, this default in traditional science has been used to produce more refined classifications in the name of representativeness or to superficially choose different nomenclature (i.e. use fewer racial and more ethnic or geographical categories). This does little to challenge the persistent racialization of even the newest categories when the objective is to use them as convenient, non-hierarchical markers of difference to target groups and ultimately individuals with potentially lifesaving data. Despite this objective, as Kim Tallbear points out, ‘racial hierarchy in the lexicon of mainstream science, relations of power, difference, and hierarchy remain integral to our broader culture, to our institutions and structures, and to the culture in which science gets done and which science helps produce’ (TallBear, 2007, p. 415, 2013).

Thus far, the majority of this article has been dedicated to study of the genetification of health and diets through popular consumer ancestry tests and a critique of the continued use of biogeographical categories to classify data. However, it is important to also unpack how food, diet, and nutrition represents a unique and complex locus of competing discourses and traditions that extend the study of race, food, and health in all sorts of unanticipated ways. In the remainder of this piece, I touch on two of these related elements in which race again appears in a very different form, and the problems inherent in nutritional reductionism for which critical race theory offers some useful and compelling rejoinders.

**Food, race, and culture**

Another significant component of this techno-scientific move towards personalized diets is its predisposition to extend what is increasingly becoming a socio-culturally impoverished and functionalized relationship to food. Literature in food studies has for decades established the significance of food as source of meaning with respect to culture, belonging, gender, race, and class. Sociologists like Lévi-Strauss (1968), Douglas and Isherwood (1996), Pierre Bourdieu (1979), and Jack Goody (Goody, 1982) first formed the basis upon which food began to be treated as a socio-cultural phenomenon rooted in cultural richness and meaning. The significance of how food is semiotically constructed (tying it to contemporary media studies) as well as its significance as a kind of culinary art and
locus of class difference based on a normative conception of ‘taste’ are a few of many important themes.

Identity and belonging, in this context, should not be thought of as rooted in static racial categories but enacted through iterative histories and traditions in which food figures prominently. I argue that this community building element of food and foodways is elided by highly scientized genetic tests that either treat culture as static or, in the worst case, irrelevant. In much of food studies literature, race has an unexpected relationship with food in that the material reality of racialization is seen to have produced group identities that now work to resist oppression through foodways. A particularly salient example in the context of Black communities in the US lies in the significance of Soul Food in which ‘embracing soul food’ as a signifier of heritage represents ‘a statement of racial pride precisely because it reclaims foods previously despised – those animal parts that slaves had to eat and those that their owners would not’ (Bailey, 2007; Slocum, 2011, p. 306). Similar work elucidating the immigrant experience examines how traditional food can foster a productive sense of nostalgia and positive intimacies as well as potential sites of cross-cultural encounter (Ritivoi, 2002).

The economics of food provisioning, ownership, and control are also deeply tied to issues of race which is excluded when food is seen solely as a source of nutrition tied to the optimization of health (Biltekoff et al., 2014). Having access to food and control over its production continues to be racialized in ways that effect wellbeing broadly defined. As Daniel Ross argues:

… food security cannot be divorced from the issues of concern to communities […] food and agriculture lends itself to addressing [racism and power imbalances] because food is so central to communities and, if you had working communities, you’d have justice and equality. […] At the heart is the element of justice. (as cited in Slocum & Cadieux, 2015, p. 31)

Histories of colonialism, exploitation, slavery and trauma are also significant in that they intimately are tied to ill health (Sandiford, 2000). As Breeze Harper argues in her book Sistah Vegan: Black Female Vegans Speak on Food, Identity, Health, and Society, the statistically significant differences in health status between Black and White Americans need to be addressed through structural and institutional change since they are deeply tied to the historical ‘inequities of Black slavery in America’. This has led to Black people struggling to ‘get access to proper health information, food, and resources to maintain optimal wellness. Health disparities’, she continues, ‘are one of the worst legacies of slavery and colonialism’ (Harper, 2009, p. 29), and not the product of genetics.

Harper’s perspective also problematizes the neoliberal tendency to search for individual causes for disease and wellbeing which then becomes the sole responsibility of a particular individual or group, rather than being seen as a consequence of deliberate choices and structures that have combined to produce ill health. While it is true that nutrients from food do effect gene expression, and that a person’s genetic makeup can make them require nutrients at higher or lower levels, these requirements do not emerge out of vacuum, nor are they a result of only one or two genes (other factors including overall diet, physical activity, environmental health and safety, gut bacteria, epigenetics etc. also play a significant role). While the approach may at first glance appear laudable (i.e. as an act of social responsibility and reparative justice to pay attention to populations often ignored by medical science), it is important to avoid doing so in a manner that
suggests there is a genetic component to race, or that carrying a specific gene is necessarily determinative of ill health. A more just approach would consist of using race to demonstrate and tackle how practices of Racecraft and racialization have led to ill health as a result disparities in access to consistent quality nutrition and health care, lower socioeconomic security, higher stress levels, barriers to education, and a higher exposure to environmental contaminants that are heavily concentrated in poorer and racially segregated neighbourhoods (Braveman & Gottlieb, 2014; Thorpe et al., 2016). Another alternative rooted in science is articulated by Guthman who, drawing on the work of Michel Foucault, examines how we might think about differences between raced bodies without reducing it to ones’ genes by suggesting that ‘biological difference [s]… are more an effect of racism than a cause’ and that ill health is not a function of race or genes but an outcome of ‘differential exposure somatised epigenetically’ (Guthman, 2014b, p. 1153). As such, health and food justice would require a multi-generational transformation, not individual level dietary change.

Finally, it is also important to emphasize that the basics of a healthy diet are generally well known which Christopher Gardner, Professor of Nutrition at Stanford, who generally supports nutrigenomic research, underlines in a recent interview in which he states: ‘At the end of the day, if we really could get the majority of the population to eat wholesome real foods most of the time—regardless of macronutrient composition—most of the nutrition-related problems would be resolved’ (Belluz, 2018).

**Nutritional reductionism and race**

A final significant and problematic corollary underlying DNA driven ancestry and dietary technologies is that they tend to combine the technification and molecularization of food with a molecularization of human physiology to produce a narrow understanding of health and wellbeing. Gyorgy Scrinis, in his book *Nutritionism: The Science and Politics of Dietary Advice*, makes the case that the trust placed in the ‘truth’ of nutritional science to provide us with immutable and universalizing advice distorts the underlying science which ‘have often been interpreted in a reductive manner and then translated into nutritionally reductive dietary guidelines. This reductive interpretation …’, Scrinis argues, ‘… includes the decontextualization, simplification, and exaggeration of the role of nutrients in determining bodily health’ (Biltekoff et al., 2014; Guthman, 2014a; Mudry, 2017; Scrinis, 2013, p. 21). Biltekoff makes a similar argument in her examination of food pedagogy and the discourse of ‘real food’, wherein food is reduced to functional choices, while Bobrow-Strain’s research examines how commercial food production has been used to make the case that food technologies can and will continue to deliver performance enhancing, quality food (Biltekoff, 2016; Bobrow-Strain, 2008).

There are interesting parallels between the faith placed in the identification of discrete DNA markers to ascertain ancestry, health status, and nutritional requirements for optimal health, as discussed above, and the boundaries applied to dietary requirements. In the latter, the consumption of a single nutrient, whether in the form of whole food, so-called superfoods, and/or supplements, simplifies the complex and multifaceted interactions that lead to ‘the good life’ and are incorrectly assumed to be monocausal, historically bounded, and fixed. This propensity betrays a Western and exclusionary model of scientific practice that gives rise to science being seen as neutral and objective (Clark
et al., 1999; Hankins, 1985). These assumptions have been raced from the 1700s onwards wherein science, through measurement and mathematics, was used to ‘dispassionately’ typologize races as separate (and then a singular) species with White Europeans assumed to be intellectually, biologically, and culturally superior (Dennis, 1995; Tucker, 1996). This logic was used to support race ideology, human slavery, and a host of other inequities rooted initially in physical traits, and then ‘transformed into markers or signifiers of social race identity’ (Smedley & Smedley, 2005, p. 22). Thus, the very same processes that has led to a contemporary nutrition-information landscape that treats food and health as a series of mechanistic elements of intake and expenditure, biochemical interactions, genetic predispositions, and clear categorizations (i.e. good food versus bad food), has also led to the belief that ill health can be set right through DNA. This testing traffics in a form of second-order reductionism wherein the ‘complexities of interactions between nutrients and the body are overridden by a simplified focus on particular nutrients, or on particular bodily processes and biomarkers’ (Kimura et al., 2014; Scrinis, 2008, p. 41).

Also of note is the imbrication of capitalism with modern genetic science whose impact on processes of racialization cannot be overstated. Historically, as Sardar puts it,

The growth of Western science is a function of the exploitation, colonization and development of non-western societies … Western science advanced primarily because of the military, economic and political power of Europe, focusing on describing and explaining those aspects of nature that promoted the power of the upper classes in Europe (Sardar, 1998, p. 204).

While this critique centres largely around the dynamics of class and economic exploitation, an updated critique must also include and reflect feminist criticisms of hegemonic science as androcentric and methodologically impoverished in light of its reflexive preference for objectivity and rationality over experiential knowledge and history (Garry & Pearssall, 2015; Harding, 2016). Critical race theorists similarly question the ethnocentric prioritizing of Western notions of truth over storytelling as well as the invisibilising of whiteness in scientific practice (where whiteness is seen as ‘the norm’) (Delgado & Stefancic, 2017; Ladson-Billings & Tate, 1995; Sammel, 2009). New developments in critical race theory not only focuses attention on the raced nature of food production and distribution, referred to by Andrea Freeman (2013) as ‘food oppression’, but also the biomedical individualization of consumption (Alkon, 2012; Dixon, 2002; DuPuis, 2000). It also, as highlighted above, absents the significance of taste, pleasure, and relationality associated with food as well as its rootedness in cultural belonging. This erasure risks undermining social flourishing and works to perpetuates the linking of physiology and biology with perfectibility (Cuomo, 2002; Guthman, 2011). It is notable that 24Genetics, other than promoting a general diet plan, presents their findings in truncated categories that are not connected to a larger, culturally resonant and socially grounded philosophy of food. For example, in another sample report for a fictional customer, the section on ‘fats’ details the function of fats and provides an overview of current research showing the dangers of high saturated fat consumption before pinpointing the genetic variations that ‘predispose carriers to ingest more fats by increasing their appetite for foods rich in them’. The report identifies the salient gene and Jane’s genotype (SLC46A3 and TC respectively), and concludes that ‘You [Jane] have a greater appetite for foods high in fat. Therefore, it is recommended to limit your consumption to avoid being overweight’
(24Genetics Nutritional Report for Jane, 2019), as if being overweight was a dispositive identifier of health (Bordo, 2004; Cooper, 2016). The report also does not consider how different nutrients react with one another in an overall diet, nor how they might fit into ideas of affective belonging wherein food is seen as ‘one of the most viable and valuable sites from which to inquire into the richly layered texture of how race is imagined and reinterpreted within the cultural arena, both to affirm and resist notions of home and belonging’ (Mannur, 2019, p. 8).

In each of these subject areas, the critique of reductive science extends to concerns around commercialization and the concomitant exploitation of genetic resources and information. 24Genetics facilitates a reductionistic understanding of gene-disease and nutrient-health relations which, when coupled with geneticized conception of race, produces problematic assertions about the ability of science to make dispositive dietary conclusions based on ones’ DNA. While the benefits to individuals may be materially limited, they do open the door for companies to exploit genetic data and science for profit. A particularly salient example in the area of pharmagenomics, which has to potential to map on nicely to nutrigenomics, is the case of BiDil.

BiDil is a combination of two drugs marketed to Black patients in 2005 to treat heart failure based on the assumption that Black individuals were genetically predisposed to lower nitric oxide bioavailability – which this medication could remedy (Benjamin, 2018; Brody & Hunt, 2006; Garrod, 2006). However, when the trial that suggested this is examined more closely, what emerges is that the patent protection for these two drugs, held by NitroMed, was about to lapse and that combining them for this specific purpose would extend royalties and control for another 13 years. Additionally, the trial itself enrolled only Black individuals who self-identified – which suggests it might have worked equally well on other groups. As Brody and Hunt argue,

BiDil is on the scene today mostly in answer to the question of how a company could generate a profit and much less an answer to the question of which drug would best help which group of patients and why. (Brody & Hunt, 2006)

Currently, there are several similar ongoing studies examining the impact of particular vitamins (uptake/impact etc.) on racial and ethnic groups (Signorello et al., 2010; Zhu et al., 2016). The 24Genetics sample reports delve deep into genetic identifiers for predispositions to, for instance, having low levels of vitamin B9 or vitamin D which suggests the need for supplementation. This data could easily be recategorized and subsequently marketed to racialized groups. Again, it is important to point out that the statistical and material disparities in overall nutritional health, particularly with respect to deficiencies in vitamins and minerals, do often fall along racial lines but that this is a result of social, environmental, and structural inequalities which critical race theory suggests is an effect of racialization, not a feature inherent to biologically distinct and categorizable races. As such, the best way to tackle these inequities is to target the sources of inequality that have led to raced groups lacking access to nutritious food, spaces to be physically active, and non-toxic environments.

Current personalized nutrition that relies on traditional scientific practices strongly suggests that it is our genes that are the primary driver of ill health, which then feeds into popular assumptions about the relationship between diet and race in ways that are ripe for corporate exploitation. Nutrigene is a company that has begun to engage
in this kind of commercial work wherein customers are able to upload their 23andMe genetic ancestry data and the company will produce and send supplements ‘built just for you’ (Buhr, 2018). The largest food company in the world, Nestle, has also ‘pivot’ to this sector with a DNA testing kit marketed alongside their meal-delivery and supplement offerings (Du et al., 2018). To be clear, Nutrigene and Nestle makes no explicit mention of race or ethnicity, but it is important to remember that these recommendations are rooted in tests for which biogenetic and geographic categories map directly onto race. Moreover, the popular nutrition sector, represented online and in best-selling books, also relies on this kind of logic with celebrity doctors like Dr. Oz making recommendations about the ‘best diet for your genes’ accompanied by wide ranging generalizations that touch on all of these elements:

“If it was good enough for your parents, it’s good enough for you,” says Dr. Katz. “That’s the real power of nutrigenetics. It reminds us of the importance of our heritage.” For example Scandinavians do very well consuming dairy because they are lactose tolerant, whereas, many Native Americans and Chinese are lactose intolerant. (Doctor Oz, 2019)

All of which is scientifically dubious.

**Conclusion**

As argued throughout this article, nutrigenomic-driven moves towards personalized nutrition requires further critique in light of the unique set of concerns constellation within and around it. First and foremost, we need a critical assessment of the ‘populationisation’ of DNA testing which, despite moves to individualization, has resulted in the continued reification of race as a biological reality. This is because biogeographical population categories remain racialized by being rooted in ‘definitions of human difference’. Remember that ‘these [racial categories] map onto continents’, that are ‘then deployed to sustain the biological bases of racial ascription (as “social” fact)’ (Fullwiley, 2008, p. 698). The result is that the SNPs used in ancestry tests like 24Genetics are fed into proprietary dietary algorithms and scanned for markers based, for instance, on metabolism efficiency that ‘revive[s] older discourses of biological determinism’ by ‘reading race in the DNA’ rather than solely through phenotypical characteristics (Fullwiley, 2008, p. 697; Merz, 2016).

Added to this is the additional problem of a functionalized approach to food that accompanies the genetification of foodways that precludes a substantive engagement with how food is a pivot part of establishing and expressing ones’ identity, solidifying cultural traditions, showing love, experiencing pleasure, and (re)experiencing familiarity. Quandt et al. (2001) characterizes food as a kind of ‘social glue’ that reinforces social norms, cultural values, and familial intimacies. Also discussed in this article is the ways in which racialized groups have used food to challenge racism either by reengaging with racialized food practices that have been denigrated in the past, or by working towards anti-racist food justice politics which aim to challenge the very structures that give rise to racialization by ‘Connecting inequities within the food system (e.g. food insecurity) to larger structures of oppression – capitalism, patriarchy, colonialism, and white supremacy’ (Kepkiewicz et al., 2015, p. 101). Technologies and scientific practices that reduce food production and consumption to DNA driven inputs ignore this perspective
and, instead, results in the depoliticization of food and the production of a body of knowledge in which race is seen as foundational.

Given the preceding case study, critical analysis, and articulation of a myriad of ancillary concerns, I conclude that the trend towards personalized nutrition, particularly when based on DNA driven data, needs to be further interrogated with respect to race and racialization as well as the attendant socio-cultural and political factors discussed throughout in this piece. Also of concern is the potential for these technologies to contribute to increase social inequality and stigma based on knowledge and access to the right kinds foods and information; the rise of a disengaged State with respect to health care and citizen well-being; and an overall impoverished relationship with food and eating. This is not only a result of a functionalization of food, but also due to proliferation of new technologies aimed at surveilling and disciplining bodies in the pursuit of normalized lifestyles, behaviours, and foodways. The perspectives, policies, and methods that support this approach, as I have argued, require concerted action towards transformative change.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

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