

# Eating According to One's Genes? Exploring the French Public's Understanding of and Reactions to Personalized Nutrition

Qualitative Health Research

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DOI: 10.1177/1049732318793417

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## Abstract

In this article, we analyze qualitatively the understanding of and reactions to personalized nutrition (PN) among the French public. Focus groups were conducted to identify the opinions and discourses about two applications of knowledge from nutritional (epi)genomics: a biotechnology (nutrigenetic testing) and a public awareness campaign (the “first thousand days of life” initiative). Our objective was to understand to what extent PN could lead to changes in eating practices as well as in the representations of food–health relationships within France, a country characterized by a strong commitment to commensality and a certain “nutritional relativism.” Although discourses on nutritional genomics testify to a resistance to food medicalization, nutritional epigenomics appears as more performative because it introduces the question of transgenerational transmission, thus parental responsibility.

## Keywords

eating pattern; epigenomics; food–health relationships; France; nutrigenomics; parental responsibility; personalized nutrition; public awareness campaign; Western Europe; qualitative methods; research design; focus groups

## Introduction

### *The Emerging Field of Nutritional (Epi) Genomics*

For years, many food and nutrition policies and programs have been implemented worldwide to improve the nutritional status of individuals and to prevent the development of diet-related noncommunicable diseases (World Health Organization [WHO], 2013). In developed countries, these policies and programs consist of population-based recommendations generally aiming to increase the consumption of fruits and vegetables, and to decrease the consumption of fats, sugar, and salt. Since the completion of the Human Genome Project in 2003, new insights into food–health relationships have emerged along with the potential to individualize diets using genotypic and phenotypic data. These new insights are part of the emerging field of nutritional (epi)genomics, whose main aim is to reinvent systems of diagnosis, the prevention and the management of diet-related noncommunicable diseases, by identifying more precisely the genetic and epigenetic risk factors at the individual level. Nutritional genomics was first developed with a focus on the influences of genes on the body's response to nutrients (nutrigenetics), as well as on the influences

of the nutrients on the genes' expression (nutrigenomics) (Kaput et al., 2005; Muller & Kersten, 2003; Simopoulos & Ordovas, 2004). Attention was drawn to the optimization of nutrition with respect to one's genotype. Subsequently, nutritional epigenomics emerged. A new scientific window opened up with the idea, based on empirical data coming mainly from experiments on animals, that the methylation of a gene,<sup>1</sup> or a part of it, could enable or block its expression, and when nutrition and some behaviors of females during pregnancy were identified as causal factors (Weaver et al., 2004). The discovery of this phenomenon introduced the possibility

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of the transgenerational transmission of epigenetic information. Although the identification of the epigenome and some of its characteristics is quite old, the understanding of its functioning as well as its determinants was decisive in the conceptualization of gene–environment interactions. Later, human empirical data have shown that the metabolic disturbances occurring during critical time windows of development (such as pregnancy) could predispose the offspring to food-related diseases, and then, this susceptibility being possibly transmitted to the next generation (Burdge & Lillycrop, 2010; Choi & Friso, 2010; Gallou-Kabani, Vigé, Gross, & Junien, 2007). The focus here was on the epigenetic effects of diet on one’s phenotype. Together, nutritional genomics and epigenomics lead to the development of personalized nutrition (PN). The latter refers to an approach, following the older concept of genetically based personalized health (Gibney et al., 2016), which advocates that the nutritional management of diet-related chronic disease could be considerably improved if based on an individual’s genomic data (including the influences of her or his genes as well as the interactions between her or his genes and the environment).

### *Issues and Applications of PN*

This article concentrates on the possible effects of PN on eating patterns and representations of food–health relationships by analyzing the social understanding of and reactions to two applications of knowledge from nutritional (epi)genomics: a biotechnology and a public awareness campaign. The biotechnology refers to nutrigenetic tests that can be either purchased directly through the Internet or provided by health care professionals, and that consist in evaluating the genetic predisposition of an individual to develop food-related diseases that could be mitigated or modulated with personalized dietary interventions. Despite the fact that nutrigenetic testing gives rise to several scientific controversies (Fournier & Poulain, 2017) as well as ethical, legal, and social issues (ELSI) (Castle, Cline, Daar, Tsamis, & Singe, 2007; Ferguson, 2013; Korthals, 2011b), it has been available in the market over the past decade. In parallel with this scientific and commercial development of nutritional genomics, the field of nutritional epigenomics has emerged and has placed emphasis on the effects of the food environment on the genes’ expression and on the potential transmission of this epigenetic information at the intergenerational level. The main application of this knowledge lies in a public awareness campaign: Attention has been drawn to the fact that nutrition during the so-called “first thousand days of life” (i.e., periconceptual period + pregnancy + first 2 years of child’s life = 1,000

days) could have an influence, by epigenetic process, on the future health of developing children (Hochberg et al., 2011). Thus, some recommendations have been broadcast worldwide since 2010, which aim to raise awareness of intrauterine and infantile nutrition among couples planning to have a child as well as pregnant women and young parents.<sup>2</sup> These biomedical applications—nutrigenetic testing and the “first thousand days of life” initiative—both aim to prevent food-related health problems by personalizing the diet and nutrition of individuals.

### *Literature Review*

To the best of our knowledge, no study has been conducted on the opinions and attitudes toward the “first thousand days of life” initiative among the public. As for nutrigenetic testing, some studies have investigated the consumers’ acceptance and have stressed the influences of the sociodemographic characteristics, the personal history of health problems, as well as the perceived qualities regarding practical issues such as reliability, privacy and data security, use of the Internet, the role of general practitioners, or the empowering potential of the testing (Ahlgren et al., 2013; Fallaize, Macready, Butler, Ellis, & Lovegrove, 2013; Morin, 2009; Ronteltap, van Trijp, & Renes, 2009; Stewart-Knox et al., 2008, 2013). Stewart-Knox and colleagues (2008) have demonstrated that even if it is generally perceived positively in terms of benefits to health, only a minority of the public would undergo a nutrigenetic test with the intent to follow a personalized diet. In their quantitative (2008) and qualitative (2013) surveys conducted in different European countries, results showed some differences across national contexts. Unfortunately, their analysis remained mostly descriptive, with no investigation of the sociocultural dimensions of food and eating or of the representations of food–health relationships, although one may assume that such issues may play an important role in the public understanding of PN.

### *Investigating PN in France*

In this article, we focus on the ways in which PN is perceived in France, a country characterized by a strong commitment to commensality<sup>3</sup> (Fischler, 2011), deep attachment to taste and food pleasure (Dupuy & Poulain, 2008; Etiévant et al., 2010; Poulain, 2001, 2017), and a certain “nutritional relativism”<sup>4</sup> (Fournier, 2014). In such a context, we hypothesize that PN would be perceived as negative by the French public, as the individualistic and nutritional perspectives would work against the predominant eating patterns within the country. Furthermore, in our view, studying the social understanding of and reactions to upcoming PN applications in France is important

as nutrigenetic testing is not yet popular in this national context. Moreover, the recommendations concerning the “first thousand days of life” are being turned into a national nutrition policy. More broadly, this research gives some insights into the processes of medicalization (Maurer & Sobal, 1995) and “nutritionalization” (Poulain, 2015) of food in France—its levers and brakes—as well as on the sociocultural influences on the representations of food–health relationships.

## Material and Method

In this research, we focus on the understanding of and reactions to PN among the French public. As such, a qualitative study appeared to be more appropriated than a quantitative one. The latter is indeed useful for testing hypotheses within a representative sample of the study population to produce some statistics, whereas qualitative research allows for the gathering of unstructured data for an in-depth understanding of social norms, values, practices, and representations to identify tendencies (Berg, 2004). Moreover, a comprehensive approach allows us to gain precise information on the sense individuals make of their relationships to food, health, and the body. Among the data collection methods of qualitative research, focus groups were found to be the most appropriate for this topic. Indeed, through drawing on the participants’ attitudes, feelings, and experiences revealed by the social gathering context and the interactions within the group, this allows for the exploration of the degree of consensus on a given topic (Krueger & Casey, 2014; Morgan, 1996; Morgan & Bottorff, 2010). Thus, this research method appeared to be the most useful and appropriate to us, as we anticipated having to deal with the moral dimension of discourses on food and health (Coveney, 2006; Lupton, 1995).

Our objective was to explore the French public’s understanding of and reactions to PN and, hence, elucidate the conceptual structure of the relationships between food and health. The context of group discussion allowed for exploration of the process of “thematization,” that is, how a scientific question is organized and articulated together with other social issues. This study investigates the “thematization” of PN by citizens and eaters.<sup>5</sup> In other words, how do they grasp and appropriate a scientific question, especially in terms of its applications in daily life. The approach to this issue, in terms of “thematization,” fits into the perspective of the sociology of scientific knowledge, known as the “moderate contextualist program” proposed by Berthelot (2008). It breaks with the psychometric approach and the concept of “perception,” which emphasizes the distortions of lay people regarding scientific discourse, such as the problem of risks (Slovic, 1987). This approach focuses on the process of cognitive reorganization stimulated by the

introduction of new knowledge or possibilities, rather than searching for discrepancies and biases with respect to a knowledge that is supposed to be “objective.” From this point of view, it respects the “principle of symmetry” from the Latourian sociology of science, in the sense that, the same approach (understanding cognitive reorganization) applies to both scholarly and lay constructions. At the same time, it distances itself from the “principle of symmetry” because it does not consider these two types of discourse and understanding (the scientific and the lay) as epistemologically equivalent in their relationship to the proof. This theoretical and analytical framework has notably been mobilized in the context of issues related to the connection of health and nutrition, for example, on obesity (Poulain, 2009), cholesterol (Fournier, 2012), and nutritional genomics (Fournier & Poulain, 2017).

## Recruitment Strategies

Three focus groups were organized in the area of Toulouse in the southwest of France. The research team defined the methodology for the recruitment of participants and the exercise was outsourced to a market research company, where the focus groups then took place. The participants ( $n = 22$ ) were contacted by phone and they accepted to participate in a discussion on food practices. The main topic was deliberately vague, as we did not want them to think about PN before the session. Each of the three focus groups, comprising seven to eight urban participants, had a mixture of demographics: sex, age, family circumstances, and occupations (see Table 1). The mean age of the total sample was 43 years, with a slight majority of individuals living within a family (one or two parents with a child or children) and coming from the middle socioeconomic category. An equal number of men and women participated in the focus groups. At the end of the session, they were all given financial reimbursement for their time and travel expenses.<sup>6</sup>

## Ethics

According to French law regulating clinical research (Loi Huriet), this survey did not require any particular ethical committee or data protection board approval. During the recruitment (by phone), all the participants were informed by the market research company that they would participate in a discussion on food practices, that they would be recorded and filmed, and that they would be given financial reimbursement.

## Organization of the Focus Groups

Each focus group lasted two and a half hours, and was divided into five segments (see Table 2). First, an overall

**Table 1.** Sociodemographic Characteristics of the Participants.

	Number ( <i>n</i> = 22)
Sex	
Male	11
Female	11
Living circumstances	
Alone	5
As a couple	7
As a family	10
Socioeconomic categories (actual or previous if retired) <sup>a</sup>	
Lower	5
Middle	11
Upper	6
Age, in years	
20–29	2
30–39	7
40–49	7
50–59	4
≥60	2
M age	43
Range	25–61

<sup>a</sup>Lower: independent farmer, self-employed craftsman or artisan, independent shopkeeper or tradesperson, salaried service staff, factory or agricultural worker. Middle: intermediate salaried professional and paramedical professional, primary school teacher or similar, salaried employee. Upper: business owner (self-employed and with more than 10 employees), self-employed professional (except paramedical professionals), teacher (high school and university), salaried scientist, upper level manager. Source. Institut National de la Statistique et des Etudes Economiques (2008).

presentation was given to introduce researchers and participants to one another, and to explain the structure of the session. The introduction aimed to let participants define, in their view, what constituted a “proper meal”<sup>7</sup> and what the food–health relationship meant to them. It also allowed the participants to feel more comfortable with the exercise and the moderator before the main topic of discussion commenced. Two futuristic scenarios were then presented to them. Why futuristic scenarios? As nutrigenetic testing has been less publicized in France, it would have been useless to ask the participants directly about their understanding of this biotechnology. As for nutritional epigenomics, the “first thousand days of life” initiative is currently being drawn up in France, so it would have been also impossible for the participants to be aware of it. As a consequence, we invited them to look at a fictitious future characterized by great improvements in nutrition and genetic research. The two scenarios started as following: “Imagine that we are in 2050 . . .” For each scenario, the moderator briefly defined its scientific and medical rationale, and then posed a battery of questions concerning the participants’ understanding of the scenario, their reaction to it and potential uses that they

**Table 2.** Topic Guide.

	Topic	Content
Segment 1	Presentation	Welcoming and thanks Presentation of the research team Presentation of the session
Segment 2	Introduction	Q1. Proper meal Q2. Food–health relationships
Segment 3	Scenario 1: Nutritional genomics	Presentation of Scenario 1 Q3. Perceived risks and benefits Q4. Willingness to undergo a test Q5. Conditions of use Q6. Personal definition
Short break		
Segment 4	Scenario 2: Nutritional epigenomics	Presentation of Scenario 2 Q7. Perceived risks and benefits Q8. Influence of gene and food on health Q9. Inheritance and responsibilities Q10. Personal definition
Segment 5	Conclusion	Debriefing Presentation of the research project Thanks and gift voucher delivery

envisaged. The first scenario was about nutritional genomics, and it was explained that one would be able to purchase a nutrigenetic test directly through the Internet (direct-to-consumer—DTC) for identifying the risk factors within one’s genetic makeup and, consequently, to receive personalized nutritional advice to prevent these eventuating. The second scenario concerned nutritional epigenomics and their attention was drawn to dietary recommendations that would be targeted to individuals during some critical time windows of fetal and child development (preconception period, pregnancy, and infancy) to prevent future health problems of the children. We envisaged that, together, the responses to these two futuristic scenarios would allow us to analyze the participants’ understanding of PN as a future event. Finally, the concluding segment of the focus group aimed for a comprehensive discussion of all the issues, and included a summary of the main arguments.

For each part of the discussion during the focus group, the participants were first invited to write their answers on individual pieces of paper and then present them publicly. This technique allowed each of them to express what they personally felt and thought (as some people, especially at the beginning of the discussions, were shy and/or might be influenced by what the others had just said). Then, the spontaneous discussion could begin. This approach resulted in precise information based on the

ideas and opinions of each participant (the written answers were given to the moderator at the end of the focus group), and also allowed for the collection of interaction data.

### Data Analysis

Using focus groups as an investigative technique meant that data collection and analysis were concurrent, analysis beginning during the first focus group (Krueger & Casey, 2014). To achieve this, the moderator was assisted by another researcher who stayed in the adjacent room, behind a one-way mirror, so as to keep a distance for a better analysis. After participants left the room, a debriefing was conducted, which allowed the researchers to share their notes and feelings. This step was important, not only to initiate the analysis (Kidd & Parshall, 2000) but also to identify the data saturation point, that is, the point at which no new data are emerging. Thus, it was decided to stop the data collection at the end of the third focus group, which had reinforced some themes previously identified without yielding any new data.

Each focus group was recorded and then transcribed, thus resulting in a global database of more than 24,000 words. The coding process now began, and consisted of identifying the main themes/arguments in the different topic areas addressed in each focus group, that is, placing similar labels on similar things (Krueger & Casey, 2014). Then, the characteristics of each theme/argument were scrutinized (frequency and intensity), and finally correlated with the sociodemographic variables of the participants (gender, living circumstances, socioeconomic category, and age) to identify trends. For each verbatim quote used in the analysis below, the names of the participants have been removed to ensure anonymity. When the context was important, the interactions between the participants have been described.

## Results

### *Eating Patterns and Food–Health Relationships*

Participants were first invited to answer the following question: “What do you consider to be a ‘proper meal’?” Answers dealt with three main issues: dimensions of food (a “proper meal” as a meal providing pleasure in eating and/or constituting a balanced diet), social context (a “proper meal” as a shared meal, with social interactions and conviviality), and the structure of the meal (a “proper meal” as a diachronic meal—with a starter, main course, cheese, and dessert—with the eaters seated at table). Thus, the setting of meals appeared to be essential and more important to participants than what basically lay on their plates.

Health was addressed as a dimension of food among other factors. Neither explicit reference was made to nutritional concerns nor specific vocabulary was employed (such as proteins, fat, carbohydrate) except for the term “balanced diet.” When asking the participants about food and health relationships, references to the French National Nutrition and Health Program were spontaneous, with the “5 a day serving of fruits or vegetables” recommendation as the first to be mentioned and the most quoted. These references were often made sarcastically, generally leading to discussions involving criticism of nutrition science as well as possible conflicts of interest between scientific research and the agrifood industry, thus reflecting a climate of distrust in these “top-down” recommendations.

### *Scenario 1: Nutritional Genomics*

*Perceived risks and benefits of nutrigenetic testing.* Within each focus group, the presentation of the first scenario generated strong opinions, either on favor of (such as “that’s simply great!”) or opposed to (such as “that’s just terrible!”) nutrigenetic testing. Then, arguments related to these views evolved during the discussion, thus justifying the use of focus groups as an appropriate empirical tool. Some attitudes of interest toward nutrigenetic testing were identified (curiosity, scientific advances, early diagnosis, and life extension) but much of the discussion showed attitudes of reluctance toward its adoption (Internet use, criticism of science, deterministic aspect, fear of knowing, wish/right not to know, ethical issues, attachment to French eating patterns) as presented in Table 3.

*Willingness to undergo a test and conditions of use.* Even if the sample was not intended to ensure statistical representativeness, the participants were asked about their willingness to undergo a nutrigenetic test. Among the 22 participants, the majority was against, with the following overall distribution: 10 against, five undecided, and seven in favor (this distribution was almost the same in each group). They were then asked about the conditions of use. Four issues emerged as conditions under which the participants who were against nutrigenetic testing as well as those who were undecided would undergo a test: better regulation, scientific evidence, medical support, and cheapness (Table 4). These conditions were also important for the participants who were already in favor of nutrigenetic testing.

Finally, a situational exercise was proposed to understand to what extent the participants would apply the personalized recommendations issued from a nutrigenetic test in everyday life. Thus, they were invited to imagine that they had undergone a test. Would they accept all the recommendations, or would it depend on the foodstuff the recommendations advocated? In each focus group, cheese was spontaneously cited as the main foodstuff

**Table 3.** Nutrigenetic Testing: Interests and Reluctance.

Interest	Reluctance
<p><b>Curiosity</b>            “Out of curiosity, I’d like to know. It’s like me visiting a fortuneteller. A lot of distance and curiosity. Maybe for a better understanding of myself too.” (F, 31, administrative technician at the university, single, without children)</p>	<p><b>Internet use</b>            “I really don’t like this system, because of Internet mainly. I need a human being, a doctor or a nutritionist.” (F, 44, high school teacher, single, one child)</p>
<p><b>Scientific advances</b>            “I’m fairly in favor of. If the recommendations from this kind of test tell me that if I eat leek twice a week the risk of developing a cancer will be largely reduced, then it’s instructive for me and it’s a kind of progress.” (M, 38, police officer, with a partner, one child)</p>	<p><b>Criticism of science</b>            “Scientific knowledge must be put in perspective. It’s true until proven otherwise!” (M, 48, biographer, with a partner, without children)</p>
<p><b>Early diagnosis</b>            “My six-month-old baby has developed a big food allergy and . . .” (M, 37, independent auditor, as a couple, one child)            [cutting him off] “The test would have avoided this problem. Your baby would have had his own card and it would have been easier for the doctors to find out the origin of the allergy.” (F, 34, store manager, with a partner, two children)</p>	<p><b>Deterministic aspect</b>            “The deterministic aspect bothers me. And it’s nonsense for me, this is only statistics!” (F, 45, high school teacher, with a partner, two children)</p>
<p><b>Life extension</b>            “I think the older we are, the more we want to know. If we can get five years more, it’s not so bad!” (M, 61, public service retiree, single, without children)</p>	<p><b>Fear of knowing</b>            “It’s insidious. If we do it out of curiosity, even though we don’t believe in it, reading the paper [results of the test] would nevertheless influence my life.” (F, 50, convent manager, with a partner, four children)</p>
	<p><b>Wish/right not to know</b>            “I prefer eating well than talking about nutrition.” (M, 25, aeronautical engineer, with a partner, no children)            “I live and that’s it, come what may!” (M, 43, administrative manager, with a partner, two children)</p>
	<p><b>Ethical issues</b>            “I’m afraid it’s eugenics, meaning that it will lead to select some people according to their heritage. I find it very dangerous.” (F, 45, high school teacher, with a partner, two children)            “There’s also the question of the use of these data, because if the banker bumps into these . . .” (M, 45, senior executive in transport, with a partner, one child)</p>
	<p><b>Attachment to the French eating pattern</b>            “I would be afraid that the notion of food pleasure, which is important for me, would disappear. Or that it [nutrigenetic testing] would create frustrations to me. And food is especially linked to culture. In my opinion, culture won’t exist anymore after two generations because if I’m programmed to eat only starch and fish, and never foie gras and coffee for example, then cultural transmission will disappear after two generations.” (M, 39, CFO, with a partner, two children)            “It’s unworkable regarding conviviality, and also for the one who’s in charge of food and cooking.” (M, 62, retired forklift driver, with a partner, without children)</p>

Note. F = female; M = male.

whose consumption it would be difficult (and sometimes impossible) to regulate, no matter what the test said. As indicated below, the reasons for potential lack of

compliance included food pleasure, heritage aspect, and the refusal to be forbidden to eat something that made sense in terms of social and cultural identities.

**Table 4.** Under Which Conditions Would You Undergo a Nutrigenetic Test?

Would Undergo a Test on the Condition That . . .	
Better regulation	"It's an advantage that needs medical and legal securing, and ethical debate." (M, 45, senior executive in transport, with a partner, one child)
Scientific evidence	"I assume that this is scientifically validated. So if it's reliable, yes I'll do it." (M, 61, public service retiree, single, without children)
Medical support	"Why not, if it's my attending physician who do it. I know him, I trust him." (F, 50, convent manager, with a partner, four children)
Cheapness	"If it's cheap, I'll do it out of curiosity." (M, 38, police officer, with a partner, one child)

Note. M = male; F = female.

For me it's cheese. That's horrible, I would not able to remove it. I've been in countries where there's no cheese, and I wonder how they manage! Living without cheese when you're French . . . [ripple of laughter] Well, if I were told that I would be facing possible death, of course I'd give up. I want to live. But if I were told that I'm going to have pale skin and white hair and that's it, I'd keep on eating cheese! (F, 45, high school teacher, with a partner, two children)

Cheese for me too. That's impossible to remove. If this kind of test announced that I'll be in really bad health, not just a small allergy, I think I would redo it ten times before thinking about reducing my consumption. (F, 29, administrative employee in engineering school, with a partner, without children)

A life without cheese? Of course no! It would be difficult for me as it's food pleasure, and it's heritage too. I would find it difficult to tell myself that I won't be eating cheese until I die. (M, 39, CFO, with a partner, two children)

*Two different perspectives on food and eating.* Interestingly, the analysis of the discourses on nutrigenetic testing allowed us to identify two main groups—the supporters and the opponents—who corresponded to two perspectives on food and eating. The supporters had a more functional and pragmatic relationship with food than the opponents; they had experience of dieting, and were attracted by the idea of controlling their health through food choices. More broadly, they had a low sensitivity toward ethical and political issues (such as potential conflicts of interest between scientific research and the agrifood industry). The opponents group was less homogeneous and manifested two types

**Table 5.** Characterizations Emerging From Scenarios 1 and 2.

Characterizations Given by the Participants (Occurrence)	
Scenario 1 (Nutritional Genomics)	Scenario 2 (Nutritional Epigenomics)
Commercialized (6)	Control (4)
No pleasure (4)	Influence of environment (4)
Medicalization of food (3)	Responsibility (4)
Robotization (3)	Ability (3)
Sad (3)	Choice (2)
Artificial (2)	Complex (2)
Bloody annoying (2)	Consequences (2)
Control (2)	Hope (2)
Deterministic (2)	Reassuring (2)
Loss of liberty (2)	Shaming (2)
Programming (2)	Transmission (2)
Progress (2)	Unpredictable (2)
Restriction (2)	
Uncertainty (2)	

Note. The question, asked at the end of each scenario, was "How could you define or illustrate this scenario with a maximum of 3 words?" Only the words mentioned by at least two participants are quoted in this table.

of discourse. The first one was characterized by strong food conservatism, particularly marked among the oldest participants, as illustrated in the following excerpts: "We already know what should be eaten to stay in good health"; "Before, we were used to eating better"; "We should go back to a balanced food intake." The second subgroup, more alternative in their focus, developed a critical posture (for instance, the need for ethical debate, danger of the state manipulation of lifestyles, need for reporting on the risk of eugenics). People of higher socioeconomic status were overrepresented in this group.

### Scenario 2: Nutritional Epigenomics

*A significant shift in discourse.* The change of scenario was obviously associated with a change of rhetoric in each focus group, thus constituting an important result. The second scenario (nutritional epigenomics) was indeed perceived as more positive and less subject to criticism than the first one (nutritional genomics), as illustrated by the personal definitions given by the participants (Table 5). Contrary to the "artificial," "sad," and "determinist" perceived qualities of nutritional genomics, nutritional epigenomics was associated, for instance, with "ability," "reassurance," and "hope." Even those who had been adopting a firm position on the medicalization of food that nutrigenetic testing could imply or reinforce, changed their minds with the second scenario as it introduced the question of transgenerational transmission, thus responsibility.

I would not have done the first scenario, but I agree on this second one. Because when you're pregnant, you're told not to eat this stuff or this stuff. And you do it, not for yourself, you do it for your baby. (F, 50, convent manager, with a partner, four children)

Well I'm a dad, so if I were told that keeping on eating cheese would induce a big disease in my son, of course I'd give up. Because it would not be about my own health. (M, 39, CFO, with a partner, two children)

I have the feeling that when it's about yourself, it doesn't work because you do what you want. But when it's about your child, you are definitely more attentive. (F, 35, independent consultant, single, without children)

In other words, even those who were less likely to change their food habits for health reasons (as in the first scenario) declared their readiness to do so if it could have a positive impact on the future health of their children. Even cheese lovers who were mocking the potential recommendations from nutrigenetic tests affirmed their willingness to stop their cheese consumption. This responsibility was primarily and mainly perceived in a positive way, as expressed in the following excerpt:

The fact that awareness would work by telling us that our food would have some consequences on future generations is actually the same strategy that is used for ecology. When people are told that they are dirty and disrespectful, nobody cares. But when asked "what planet will you let to your children?," that moves minds. (F, 45, high school teacher, with a partner, two children)

However, there was in each focus group someone—always a woman—who asked after a while about the possibility of a dangerous drift in public opinion related to the shaming of parents, especially the mother. The questioning pinpointed the confused boundaries between responsibility, accountability, and shaming. It was also mentioned that recommendations aiming to raise awareness of intrauterine and infant nutrition would add to levels of anxiety as well as more domestic work for mothers.

It could actually lead to blaming the parents who have a handicapped child for example: they would be told that it's their fault. I don't accept that someone would tell me that, it's just nature. (F, 45, high school teacher, with a partner, two children)

[examining the participants' discourses on what women should eat during pregnancy] OK wait, it's very different: we are women, and they are men! We share totally different perspectives about food for children. (F, 50, convent manager, with a partner, four children)

*The influence of genes and food on health.* Furthermore, the focus groups probed views on the influence of genes and food on health. Participants were asked to answer the following question: "In your opinion, what is the main influence on human health: genes or food?" To do this, they had to place a cursor on the following scale.



Ten of them placed the cursor on the food side, six right in the middle, and six on the genes side. Two issues motivated the choice of the middle position: either their sense of an interaction between genes and food or their declared incompetence to make a choice. Those who took positions clearly in favor of either genes or food were more affirmative and they illustrated their stance with personal examples.

For me it's food. It's the main factor. In my family, they all died of cancer, I have had cancer too but I'm still alive, and it is food that got me through. (M, 56, IT engineer, with a partner, without children)

I recognize that food has an influence, but I know some people who had esophageal cancer while never having smoked. So genes . . . (F, 34, store manager, with a partner, two children)

By comparing these data with those from the question on the willingness to undergo a nutrigenetic test (Scenario 1), it is noteworthy that all the participants who placed the cursor on the genes side had previously said that they would undergo a test.

## Discussion and Conclusion

### *Medicalization and Nutritionalization of Food in France*

Critical literature on PN based on genetic information has raised some ethical issues, especially the risk of increasing the medicalization of food and eating (Gorman, 2006; Komduur, Korthals, & te Molder, 2009; Korthals, 2011a; Lévesque et al., 2008b). As explained by Nordström, Coff, Jonsson, Nordenfelt, and Gorman (2013), "food may be understood as a tool for good health. This implies an instrumental relationship between food and health, where food is ascribed a secondary value" (p. 358). It should be mentioned that one of the main reasons for us to conduct this study of the understanding of and reactions to PN in France was the relatively weak performativity of nutritional recommendations in this country, or more precisely, the coexistence of still high levels of the social valorization of taste,



commensality, and food pleasure with the growing process of “nutritionalization” (Fournier, 2014; Poulain, 2015). Having established this, it is important to ask how do French eaters grasp the normative assumptions underpinning PN? Our study demonstrates that they predominantly perceive PN critically. Responses to the question “what is a ‘proper meal’ for you?” overwhelmingly emphasize the setting of the meals (including commensality) (Lahlou, 1998), which is different from results in other developed countries, especially Anglo-Saxon ones, where nutritional concerns appear to be regarded as much more important (Fischler & Masson, 2008).<sup>8</sup> Critics of the French National Nutrition and Health Program as well as of nutrigenetic testing (Scenario 1) also testified to a resistance to the medicalization process by the population. Their main concern was not nutrition per se but the risk of it dominating the sociocultural aspects of food and eating, especially sociability and identity. Cheese is a good example to illustrate this process: When invited to imagine that they had undergone a nutrigenetic test, the majority of the interviewees—including supporters and opponents—explained that they would not give up cheese consumption even if the test has revealed an adverse health outcome. This is similar to the case of a community of hypercholesterolaemic French individuals, who were supposed to reduce their consumption of fatty foods (Fournier, Bruckert, Czernichow, Paulmyer, & Poulain, 2011) but to whom cheese appears as a “totem foodstuff” whose associated values of heritage and identity were more important than nutritional health, thus leading some individuals to deviate from the dietary recommendations.

### *ELSI of PN*

The other critiques addressed to nutritional genomics in our study were in line with the ELSI discussed in the literature. Here cost-benefit calculations were of great importance (Morin, 2009), cost here referring to both financial and moral values. First, all the interviewees asked about the price of nutrigenetic testing, some supposing that cheapness would be the precondition for them to undergo a test, others fearing that testing would lead to the rise of social inequality in relation to health (Saukko, Reed, Britten, & Hogarth, 2010). Second, even the individuals interested in undergoing a test wondered whether nutritional genomics services would be backed by sufficient science to transform their hopes (of early diagnosis or life extension) into reality. They asked, “Is this biotechnology evidence-based?” and “sufficiently secured?” These concerns are mainly linked to the perceived weakness—or even the absence—of regulation in nutritional genomics. As shown in other studies (Ahlgren et al., 2013; Castle & Ries, 2007; Ronteltap et al., 2009; Wendel, Dellaert, Ronteltap, & van Trijp, 2013), DTC marketing

and more broadly, the use of the Internet, are frightening to the public. As such, better regulation (legal safeguards) and medical support (especially by general practitioners) constitute the conditions under which the interviewees would undergo a test. Beyond concerns of reliability and regulation, nutrigenetic testing raises another ethical issue that touch on the consequences of one’s genetic information becoming acquired by the state or as yet unknown organizations. This issue operates at both collective and individual levels. At the collective level, human enhancement highlighted by nutritional genomics is associated with the risk of eugenics, as noted in other studies (Winkler, 2008). At the individual level, the classical concept of “the right not to know” (Chadwick, Levitt, & Shickle, 2014) is here extended with a further dimension, “the fear of knowing,” what we called the “the fortuneteller syndrome”: Although interviewees did not believe in the promises of nutritional genomics, some of them explained that they would not undergo a test because they would be afraid that the results might influence their everyday lives, even subconsciously.

All of this—the French eating patterns combined with the ELSI of PN—helps explain that only a third of our sample (seven out of 22) declared that they were in favor of undergoing a nutrigenetic test. This proportion is close to the one found in a quantitative study, which aimed to elucidate the attitudes toward genetic testing and PN in six European countries, in which 44% of the French sample reported a willingness to undergo genetic testing for general interest but only 29% said they would do so with the aim of following a personalized diet (Stewart-Knox et al., 2008). Despite some important differences between the six countries (29% in France compared with 39% in Great Britain, for instance), this study was mostly descriptive: No information was given about the demographics of those who were interested in PN and those who were not, in each country. Our study allowed for the identification of tendencies within the discourses and representations of PN from its supporters as well as its opponents. The data from supporters showed their more functional, pragmatic, and individualized relationship with food and health. Their proportion within the sample (one third) testifies that a food medicalization process is ongoing in France despite—or in coexistence with—the resistance described above. From the fact that these supporters agreed that genes have a more important influence on human health than food (see the exercise with the cursor on the scale), we can hypothesize that this food medicalization process is reinforced by “geneticization” (Hedgecoe, 1998; Lippman, 1992). The other group—the opponents—expressed two types of discourse: strong food conservatism on one hand and a critical-ethical posture on the other hand. As in the debates on GMOs or the industrialization of food (Lepiller, 2013), PN based on

genetic information attracts divergent political viewpoints. It is recommended that tendencies regarding the sociodemographic characteristics of the two subgroups (oldest participants within the first one, people of higher socioeconomic status within the second one) be statistically tested within a representative sample of the French population.

### **Responsibility, Accountability, and Shaming**

One of the most important and surprising results was the significant shift in the discourses of the participants between Scenarios 1 and 2: Even those who had adopted a firm position on the medicalization of food that nutrigenetic testing could imply or reinforce subsequently changed their minds when talking about nutritional epigenomics, as it introduced the question of transgenerational transmission, and thus parental responsibility. Even cheese lovers guaranteed their willingness to stop their cheese consumption if it would have a positive impact on the future health of their children. Thus, our study stresses that the upcoming nutrition policy on the “first thousand days of life” could potentially lead to changes in food practices and representations in a more significant way than nutrigenetic testing. As in the passive smoking issue in which public health recommendations placed stress on “innocent victims” (Berridge, 1999), emphasizing parental, as opposed to individual, responsibility may be more effective and performative within the food change process. This question of responsibility is inherent in the personalization of medicine in the postgenomic era (Rose, 2013; Rouvroy, 2007): Making the individuals more responsible for their own health would benefit both governments (by saving money due to better prevention) and themselves (by enhancing empowerment). Nonetheless, responsibility is, in the words of Rose (2013),

a double edged sword. On the one hand it seems to give people more power as individuals, providing them with information, and enabling them to make the key choices about their healthcare and disease risks. But on the other hand, individuals are obliged to take this role, subject to new expectations about their skills and capacities to understand and manage the information, to choose between different options with their own costs and benefits, and to accept at least some of the consequences of their choices for their future health. They are obliged to manage almost all aspects of their lives in the name of health . . . And they may feel guilt, or maybe regarded by others as in some way guilty, if they are unable or unwilling to do that. (pp. 349–350)

This question of guilt emerged from the focus group discussions about nutritional epigenomics: Despite the fact that the participants would agree to change their food

practices to improve the future health of their children, few of them wondered about the boundaries between responsibility, accountability, and shaming. This ethical issue is all the more important to discuss as it is gendered. Indeed, the “first thousand days of life” initiative points to nutrition awareness at three stages: periconceptual period, pregnancy, and infancy. Although epigenomics revealed that the nutritional status of males could be as important as that of females at the periconceptual period (Lambrot et al., 2013),<sup>9</sup> women remain the main targets, first, because of the fact that they are the ones who experience pregnancy. In an opinion piece titled “Don’t Blame the Mothers” published in the journal *Nature*, Richardson and colleagues (2014) pointed out the “long history of society blaming mothers for the ill health of their children” and urged “researchers, press officers and journalists to consider the ramifications of irresponsible discussion” when talking about healthy behaviors during pregnancy (p. 131). More, it must be said that the “first thousand days of life” initiative would add anxiety as well as domestic work to women, especially those having young children: Women are indeed still the ones mainly in charge of food chores within the family, particularly those involving care (Counihan, 2012; Fournier, Jarty, Lapeyre, & Touraille, 2015; McPhail, Beagan, & Chapman, 2012; Parsons, 2015). Thus, the women who would not comply with such normative injunctions, such as breastfeeding (Guell, Whittle, Ong, & Lakshman, 2018), would have to face possible stigmatization. Here, one can notice a concurrence between medical (nutritional health) and social (gender equality) issues in the implementation of a nutrition policy, definitely calling for further research and interdisciplinary debates.

To conclude, our study stresses that calling on parental responsibility for nutritional prevention will lead to changes in food practices and representations in France in a more significant way than broadcasting some recommendations targeted to the individuals. This insight, together with the social, ethical, and political issues it raises, has direct implications for research and policy. As for practice, our study serves to reinforce the need to consider the sociocultural dimensions of food when planning the shaping of eating habits.

### **Acknowledgments**

The authors would like to thank Lucie Serres (Inserm, Toulouse, France) for her support in the organization of the first focus group and Wendy Smith (Monash University, Melbourne, Australia) for editing services.

### **Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by OCHA—Observatoire CNIEL des Habitudes Alimentaires, Paris (Nutrigen Project).

## Notes

1. DNA methylation is one of the epigenetic mechanisms that cells use to control gene expression. Some of its origins seem to be linked to an individual's behavior, such as eating practices, social interactions, or involvement in stressful situations. Although pregnancy constitutes a privileged time for genes methylation, it occurs throughout the whole life of an individual (the epigenetic marks being transmitted from one cell's generation to the next) and, sometimes, across generations (some of the epigenetic marks, of which the majority are supposed to be deleted at the meiosis stage, nevertheless seem to be transmitted). In most cases, methylation of DNA is, according to Phillips (2008), "a fairly long-term, stable conversion, but in some cases, demethylation can take place to allow for epigenetic reprogramming." (p.116). As such, methylation is a reversible process, thus opening up new therapeutic perspectives.
2. Although this initiative has initially and predominantly taken place in low-income countries (related to issues of malnutrition) since its launching in 2010 by the American nongovernmental organization (NGO) "Thousand Days" (<http://thousanddays.org/>), it has now spread to high-income countries (in the context of issues of overweight and obesity). At the time of writing, the French National Nutrition and Health Program is implementing its fourth version. Scientific advances from the "first thousand days of life" initiative, which has been recently supported by World Health Organization (WHO), are visible in this new version. Associated recommendations deal with nutrition at major steps: periconceptual period, pregnancy, and infancy. Moreover, the implementation of a preconception medical consultation program aimed at evaluating the (micro)nutritional status of the future parents and, if need, be offering supplements to the women (such as folic acid and zinc) is still under discussion.
3. The practice of eating together.
4. "Nutritional relativism" refers to the weak performativity of nutritional recommendations that results from the combination of three factors: cultural patterns, social determinants, and social interactions. Moreover, this concept stresses on the fact that commensality, taste, and food pleasure are still much valorized although health and nutritional concerns are more and more considered, thus introducing a concurrence between all these dimensions within the food choice process.
5. "Eaters" refers to a sociological paradigm developed by many scholars to create a conceptual distance from the notions of "customer" or "consumer" that are dominant in the fields of economics and nutrition. See, for instance, Fischler (1988).
6. The amount was 45 euros per person.
7. This expression, derived from Douglas' (1972) work on

"Deciphering a Meal" and that allowed for the development of quantitative analyses to investigate the gaps between norms and practices (Poulain, 2001, 2017), is used in a qualitative approach to start the discussion on the normative dimensions of a meal.

8. This is despite the fact that the classical sociological determinants remain significant in each country.
9. Lambrot and colleagues (2013) have demonstrated that the nutritional status of male mice at the conception phase influences, by epigenetic process, the pregnancy outcomes, as well as the future health of the offspring. Transfer of this knowledge from animal to human is being explored, but one can hypothesize that the nutritional status of men at the periconceptual period may have an influence too.

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### Author Biographies

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