

Considering the path of nutrigenomics: a pragmatic ethical approach



Rixt Komduur

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Considering the path of nutrigenomics: a pragmatic ethical approach

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Thesis

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Contents

CHAPTER 1 GENERAL INTRODUCTION

Nutrigenomics: a new food science	9
Societal impact of nutrigenomics	10
Pragmatic ethical approach and concepts from STS	12
John Dewey and dramatic rehearsal	14
Application of the ideas of Dewey to ethics of nutrigenomics	16
Research questions	19
Research aims and methodology	20

CHAPTER 2 UNCERTAINTIES OF NUTRIGENOMICS AND THEIR ETHICAL MEANING

Abstract	27
Introduction: expectations and disappointments of the human genome	27
Types of uncertainties surrounding nutrigenomics, its services, and products	30
Experimental uncertainties	31
Uncertainties of risk analysis	31
Uncertainties of personalized dietary advice	32
Social and moral uncertainties	33
Uncertainties of products	34
Philosophy of science and social philosophy on uncertainty	34
Three implications for an ethics of scientific uncertainties	37
Co-production of genomics and an ethics of uncertainty	39
What implications does this have for consumers and their social context?	41
Future prospects and conclusion	44

CHAPTER 3 THE GOOD LIFE: LIVING FOR HEALTH AND A LIFE WITHOUT RISKS?

Abstract	47
Introduction	47
The notion of script	49
Method	50
Three normative assumptions of nutrigenomics	51
Alternative scripts of health in the good life	62
Conclusion	63

CHAPTER 4 THE ROLE OF GENES IN TALKING ABOUT OVERWEIGHT	
Abstract	67
Introduction	67
Material and methods	71
Results	72
Conclusion and discussion	85
 CHAPTER 5 BETWEEN PATERNALISM AND SELF-GOVERNANCE	
Abstract	91
Introduction	91
Nutrigenomical constructions of consumers	94
Nutrigenomical governance of consumers	96
Nutrigenomical ethics: assumptions, implications and evaluation	101
Conclusion	112
 CHAPTER 6 DISCUSSION	
Introduction	117
State of art of nutrigenomics and its implications for an ethical evaluation	118
Three assumptions of nutrigenomics and their ethical implications	120
Matching or clashing depending on the interactional context	122
Different strategies to manage a possible clash	125
Ethical reflection on alternative strategies	126
Scope of the research	130
 I REFERENCES	141
II SUMMARY	161
III SAMENVATTING	171
IV ACKNOWLEDGEMENTS/ DANKWOORD	181
V CURRICULUM VITAE	185
VI COMPLETED TRAINING AND SUPERVISION PLAN	189
VII APPENDIX: ORIGINAL DUTCH FRAGMENTS OF CHAPTER 4	193

1

General Introduction

Nutrigenomics: a new food science

In the last few decades, food has been taken centre stage in the discourse about beauty, fitness and especially health. The food products that are offered by the food industry, like Becel pro.activ for treatment and prevention of a high cholesterol level or Vifit dairy products for the stimulation of bowel movement, are a clear reflection of this trend. These products are not sold for their nice taste or satisfying characteristics, but have mainly been designed to maintain or obtain a healthy body.

Also more and more resources have been allocated to the study on the effects of diet on the body. The mapping of the human genome in 2000 (Nerlich et al., 2002) has brought a new dimension to this health food research. The human genome has been completely mapped and most scientists believe that the occurrence of chronic diseases, like diabetes, high blood pressure and cancer, are influenced by environmental factors, such as nutrients, as well as genetic factors. Our diet has been found to change the way our DNA can be read and expressed (Müller and Kersten, 2003). By studying variations of the genome in the human population and the interaction of DNA with nutrients, scientist may be able to understand, predict and even cure chronic diseases. This type of research is called nutritional genomics or nutrigenomics (Mathers, 2003).

Nutrigenomics research may entail great opportunities for improving the health of people, but it is unclear how the knowledge that it brings will be used in the future. Theoretically there are at least three ways through which nutrigenomics could help to improve health. The first way would be to personalize dietary advice (Bouwman et al., 2005). Momentarily dietary recommendations are mainly based on epidemiological studies of large populations. These, however, are thought to be of limited value for certain people as they ignore the existence of genetic differences between individuals that might influence bodily reactions to food (Castle et al., 2007). Genetic profiling is believed to better adapt dietary recommendations to the needs of the individual. Possibly the risks of becoming ill in the future can be calculated with genetic profiling so that people know that certain preventive dietary strategies especially apply to them. These risk calculations may be based on individual genetic profiling which would make dietary advice individually tailored, or based on research on the genetic diversity between groups in order to give different dietary advice to different categories of people (Darnton-Hill et al., 2004; Penders et al., 2007; Fenech et al., 2011). Although some very unreliable commercial genetic tests for dietary advice are already available on the market since 2002 (Gollust et al., 2003; Einsiedel and Geransar, 2009; Gregori et al., 2011), the initial scientific enthusiasm on the progress made in genetic research to create individual tailored advice or population based recommendations has been tempered (Meijer, 2005; Fenech et al., 2011). Moreover, it remains to be seen if people who get dietary advice that is more tailored and have a better evidential base, are more motivated to change their lifestyle (Bouwman et al., 2008b; McBride et al., 2010).

A second way in which nutrigenomics can be used, is the diagnosis of damage in the body on a micro level done by micronutrients by studying biomarkers, like metabolites, proteins and transcripts. This can lead to more accurate and evidence-based general dietary advice (see for example de Roos and Romagnolo, 2012). In addition, better biomarker tests can make the diagnosis possible of lifestyle-related diseases, like diabetes, in a stage in which these conditions are still reversible. Such a future test can visualize damage done by eating on a cellular level in order to make dietary and life style changes that stop and reverse progressing diseases or pre-diseases (Müller and Kersten, 2003; Darnton-Hill et al., 2004; van Ommen et al., 2009).

A final application of nutrigenomics might be found in the form of health enhancing food products. The understanding of how nutrients interact with the body and the knowledge of the effect of nutrients on genetic expression could lead to the development of new functional food products. In addition, it could help to prove health claims of already existing functional foods (Müller, 2002; Brown and Michael, 2003; Castle et al., 2007).

Societal impact of nutrigenomics

Throughout history, new technologies have enabled societies to advance and prosper. Unfortunately, there are also plenty examples of applications of modern science that caused unforeseen problems (Rip et al., 1995), like oil pollution, radioactive waste or recently the frequent intrusion of strangers in private information through computer technology. Funtowicz and Ravetz (1993) therefore introduced the term post-normal sciences. They introduced this term to show that in many cases the scientific practice of normal sciences described by the philosopher of science Thomas Kuhn (1922–1996) has changed fundamentally. In post-normal sciences facts remain uncertain and are not solved but managed, values are disputed, political stakes are high and decisions are urgent. In comparison normal sciences are often non-issue driven, work on a slow reduction of uncertainties, and have research practices in which foundations and values remain unquestioned until a paradigm shift occurs. In other words, scientists that practice normal sciences solve uncertainties, while post-normal scientists can merely manage uncertainty (Funtowicz and Ravetz, 1993; Ravetz, 2004). A very clear example of a post-normal science is scientific research on climate change and its effects. Research focussed on climate change is issue-driven; many contradictions exist in the scientific results which can only be managed, not solved; various ethical uncertainties exist in the political decision-making based on this research; and the stakes of decision-making are high. Since the ideas or gained knowledge in post-normal sciences can have an impact on everyone within society, and since scientists basically have the same knowledge as anyone else of a future in which their inventions or theories are used, not only technical experts should discuss post-normal sciences, but “extended peer communities” should be created existing of a wide public (Funtowicz and Ravetz, 1993).

Food science has the characteristics of a post-normal science. Its stakes are high because it could help reverse wide-spread health problems, such as obesity. At the same time it can bring along risks and uncertainties. For example through food sciences the borderline between food and drug became vague and dietary advice became increasingly complex (Ravetz, 2002). Nutrigenomics, as being an important part of food science, can bring many risks and uncertainties (see Chapter 2). This is especially the case because it is believed to entail many ethical risks and create new moral dilemmas (Castle, 2003; Meijboom et al., 2003; Chadwick, 2004; Oliver, 2005; Lévesque et al., 2008).

Regarding these new moral dilemmas most ethicists are mainly concerned with the issues surrounding personalized dietary advice based on genetic testing, for example concerning informed decision making about nutrigenetic tests (Castle et al., 2007). An individual should be able to give his or her consent and should have enough information to make a well thought through decision. This issue raises difficulties, especially where children are concerned (Castle et al., 2007). But in the case of nutrigenomics, informed consent can also be problematic for adults. The uncertainties related to the scientifically demonstrated links between gene expression, lifestyle, eating style and personal diet are much more abundant compared to single mutation tests like genetic tests for particular forms of breast cancer. Despite a possible lack of proof, people might still feel pressured to decide about their nutritional strategies (Swierstra et al., 2001). Another issue mentioned in the literature is that undergoing a genetic test does not only have individual, but also collective consequences. If a person knows that he or she has a predisposition for getting a heart disease, this could also mean that his or her family will have the same susceptibility. This is called the issue of mutuality (Knoppers and Chadwick, 2005).

Other ethical issues are related to nutrigenomics research practices. For nutrigenomics research large databases are needed. Without protection of this data, third parties, like insurance companies and employers, are able to put people who are at risk of getting certain diseases in a disadvantage (Joly et al., 2010). Health and life insurance companies especially have a strong economic interest in the prediction of future diseases (Lévesque et al., 2008). Hence genetic discrimination can become a reality.

Also issues related to the production of foods with the help of nutrigenomics are discussed in the literature. With the advent of diets that are only focused on a healthy lifestyle, some fundamental aspects of food might be lost, like its aesthetic meaning (for example taste) or social meaning. Especially in the case of individualized dietary advices, these important aspects might be lost (Meijboom et al., 2003; Korthals, 2004). For example, personal dietary advice may help cause social isolation; because dining is a social activity, rare dietary requirements make attending dinners more difficult.

Other concerns in relation to nutrigenomics exist on a societal level. Some ethicists believe that nutrigenomics can cause a shift in responsibilities for health (FoodEthicsCouncil, 2005). Most diseases that could be prevented by nutrigenomics testing, for example obesity, are caused by a mixture of genetic susceptibility, lifestyle and diet (Bell et al., 2005). Still people with these diseases are usually held responsible for their condition. Knowledge about the fact that not just the lifestyle an individual is choosing causes the disease, but also genetic or epigenetic susceptibility that cannot be prevented (Walley et al., 2009), may take away some of the blame. But this first shift to less responsibility can change into a situation in which people are blamed when they are not acting upon those risks, if biomarker tests or genetic tests to reveal personal risks would become mainstream.

In short, nutrigenomics can be defined as a post-normal science with large stakes but many ethical and scientific dilemmas. It is therefore proposed to anticipate on possible problems of nutrigenomics by discussing its issues with a wider public than solely scientists, preferably in an early stage of the developmental process of nutrigenomics applications (Ravetz, 2002; Swierstra et al., 2009). However, the problem with such a discussion is that the rise and the relevance of the ethical issues largely depend on the way nutrigenomics will develop and will be used in the future.

It is complex to get insight into all the issues around nutrigenomics and merely impossible to predict which issues are most urgent. There are too many uncertainties. However, one could attempt to find methods to cope with these uncertainties in the best way possible. In this attempt we should consider that the development of new innovations is a process of constant interaction between science and society. This means that the scientific possibilities, as well as risk perceptions (Frewer et al., 2004) and soft concerns, like issues in the social ethical arena of the public, are crucial for the acceptance, appearance and use of scientific innovations (Swierstra and te Molder, 2012). On the other hand, innovations can change society (Rip et al., 1995). They can change norms and values and bring along new moral dilemmas (Keulartz et al., 2002b; Driessen and Korthals, 2012). This interaction between science and society needs to be taken into account when trying to anticipate on the uncertainties of nutrigenomics as a science still in its infancy.

Pragmatic ethical approach and concepts from STS

During history different approaches have been developed that are guidelines how people should handle ethical issues, for example by creating the most happiness for everyone in utilitarianism, by setting guidelines based on principles in deontology, or a combination of these approaches (Korthals, 2004). These ethical approaches, however, show a certain “technology blindness”; in other words they do not consider the dynamic character of the current technological society (Keulartz et al., 2004). Conversely, science and technology studies (STS) have a long tradition in studying the interaction between society and science. But because STS researchers do not consider judging the societal influences that have shaped a technology nor the kind of impact a technology can have, as their task, STS is

criticized for having a “normative deficit” (Keulartz et al., 2004). STS considers norms and values as parts of power structures in terms of allies and opponents and does not take any side (Keulartz et al., 2002b; Keulartz et al., 2004). Keulartz et al. (2004) therefore plead for an ethical approach that brings together both the dynamic character of sciences and society, and the moral values of the technology to ethically analyse new technologies and sciences like nutrigenomics. In this approach an ethical deliberation is created that takes into account the dynamic character of technological development by combining theories from STS with perspectives within pragmatic ethics.

The ultimate goal of pragmatic ethics is to “achieve peaceful and equal coexistence” between people with different views on the good life and “fruitful cooperation” (Keulartz et al., 2004). This goal guides its ethical decision making. Thus instead of the greatest happiness in society as utilitarian ethicists aim for, or fixed duties that are the guidelines for deontologists, pragmatists try to realize a society in which different groups with different worldviews can peacefully co-exist and cooperate successfully. This means that pragmatists recognize that when there are competing values within society, one value cannot be chosen over the other, because convictions are of a temporary nature and can be subject to reassessment and when needed re-evaluation (Keulartz et al., 2004).

Pragmatists argue that, especially in the case of new technologies, conflicting values become clear and conflicts arise. These conflicts can be prevented through deliberation that helps groups of people with disagreeing values to recognize each other’s point of view (Thompson, 2004). This entails more than merely preventing conflict by knowing and then ignoring the existence of each other’s differences. Instead pragmatists believe that by really recognizing each other’s point of view and by, when needed, using tools that use the “creative capacity for the innovation” and by creating “vocabularies that provide new meanings and open new perspectives” a situation of peaceful cooperation can be made (Keulartz et al., 2004). In other words, to avoid conflict, we should not merely ignore and remain indifferent towards varying conflicting values, but really recognize and respect them, and inquire which practical conflicts competing values may give. These practical constraints can be managed with tools such as common ground dialogue (Keulartz et al., 2002a), as well as reflection on the possibility to broaden scripts of scientific applications (Akrich and Latour, 1992; Williams–Jones and Graham, 2003).

Pragmatic ethicists use both “rational” and “romantic” methods to achieve peaceful and equal coexistence and fruitful cooperation (Keulartz et al., 2004). The rational side is most applicable when the state of art of a technology and its stakes and arguments are already clear. The rational side provides, explicates and clarifies different arguments. Instead, the romantic side is more suitable for evaluating innovations which are early in their developmental process, like nutrigenomics, because it gives room for invention and imagination. The romantic approach creates new vocabularies or reinterprets old vocabularies to solve conflicts, with the help of an ethical deliberation through “dramatic

rehearsals” (Fesmire, 2003; Keulartz et al., 2004). I will show what the concept of dramatic rehearsal entails, how this fits with modern ideas of the romantic side of pragmatic ethics from Fesmire (2003) and Keulartz et al. (2004) and how this can be combined with tools from STS and discourse analysis.

John Dewey and dramatic rehearsal

The idea of dramatic rehearsal originates from the pragmatist John Dewey (1859–1952). Dewey tried to find solutions to flaws of other ethical theories, like deontology and utilitarianism, by describing ethical deliberation as a dramatic rehearsal. It is hard to encompass all the arguments of Dewey against other ethical approaches. Therefore, I will cover only briefly the arguments most relevant for the research approach in this dissertation.

The most important criticism that Dewey had was that some theories like deontology especially focus on the intention and attitude, which Dewey calls the “inner side” or “how of activity”, and that others, like utilitarianism, only focus on the action and with this action the ultimate consequences, which Dewey called the “outer side” or “what of activity” (Dewey and Tufts, 1908, p227– p228). According to Dewey both the “inner side” and the “outer side” are important for moral judgment. The inner side and outer side merely entail different phases within a moral deliberation; attitudes and intentions are the start of a deliberation and evaluating and weighing the consequences the end.

But Dewey’s arguments are more complex. He showed that most ethical theories not only make the mistake of either ignoring the consequences of moral acts or the intentions underlying moral acts. They also solely focus on certain aspects of the “inner side” or on certain aspects of the “outer side”. One of the assumptions that Dewey liked to correct was the belief that people could escape personal desire during their ethical decision making. Immanuel Kant (1724–1804) for example, relied on the idea that human beings have a purely rational faculty of which the validity is completely independent of experience and nature. According to Dewey, however, people have different desires and tendencies. It would be flawed to ignore these in ethical decision making. Instead of ignoring desires and tendencies, people should make use of their emotions. Dewey reasoned that Kant’s categorical imperative “Act only on a maxim by which you can will that it, at the same time, should be a general law” (Kant, 1949) in reality is not really shutting out desires. The rationalization process of Kant just showed a way to make sure that “a desire shall not be accepted as an adequate motive till it has been organized into desire for an end which will be compatible with the whole system of ends involved in the capacities and tendencies of the agent” (Dewey and Tufts, 1908, p317). Dewey therefore concluded that Kant’s theory was inconsistent, as well as flawed. Dewey also opposed intuitionism which relies on the importance of direct intuition and therefore can be seen as completely contradictory to the assumptions that Kant had. Intuitionists claim that people know exactly what the right act is in case of a moral dilemma. Since a moral act is immediately known or recognized

as such by people, just as people recognize a chair or a dog, no reflection is needed. The rightness is an intrinsic characteristic of moral acts and therefore moral acts are instantly recognized as being right. Dewey argued, however, that there is no evidence to show that acts indeed can directly be recognized as right or wrong. Although people have a certain view on morality, this view is not infallible and therefore the consequences of acts should be thoroughly thought through. Not only is moral sense acquired through people's culture and circumstances that constitute people's experiences, Dewey also warned for the interweaving of character and intention. Character makes people blind to some actions and open to others: "Motives which are active in the depth of character present themselves only obscurely and subconsciously" (Dewey and Tufts, 1908, p254). Moreover, Dewey showed that, for example, giving money to the poor may come forth from good intentions and the instinct to help others. Therefore it may feel intuitively right, but because the consequences are not fully thought through, in the end may be immoral. According to Dewey, the poor can become dependent which would be an immoral consequence. He claimed that only in usual and familiar circumstances people are able to recognize the rightness of acts and even then still need to be careful not to be prejudiced and to fully think through the consequences.

In addition, Dewey showed that utilitarianism is flawed, because although it acknowledges that desires are part of ethics, it ignores or oversimplifies the fact that there are always a multitude of conflicting desires competing with each other. Utilitarianism translates desire into a universal desire that people always want to create the greatest happiness for all. Dewey argued that since calculating future happiness and pain is so complex, utilitarians rely too much on rules which are based on past experiences. This soon leads to fixed rules based on customs, or according to Dewey a "habitual way of doing things" (Dewey and Tufts, 1908, p333). He showed that only when these rules are presented in an abstract situation, for example obtaining the best health for all, a real consensus can exist, but when such a rule is applied in specific situations, conflicts become apparent. Dewey argued that though past experiences should help to form principles 'to supply standpoints and methods which enable the individual to make himself an analysis of the elements of good and evil' (Dewey and Tuft, 1908, p333), utilitarianism depends too much on abstract rules and concepts which can lead to a too narrow view within an ethical deliberation.

All in all, according to Dewey through another approach in ethical decision making important flaws needed to be corrected such as: solely focusing on either consequences, or attitudes and intentions; the idea that one can shut off personal emotions and desires in ethical deliberation; the assumption that the rightness of acts merely shows itself through intuition; and the idea that one should use abstract rules which are based on customs to calculate the greatest happiness for all. Dewey showed that the judgment of rightness of an act lies in the consequences which are foreseen and desired and a person's characteristics and motives, which are responsible for foreseeing and desiring specific consequences rather than others. In addition, judgment has an empirical base. It also presents itself on the basis

of consequences not foreseen and intended. He argued that “It is only through taking into account in subsequent acts consequences of prior acts not intended in those prior acts that the agent learns the fuller significance of his own power and thus of himself.” (Dewey and Tufts, 1908, p261) This means that when the outcomes are unexpectedly undesirable, processes can be evaluated and steered, because people can modify their behaviour.

In case of a moral dilemma, Dewey proposes that people should perform an ethical deliberation in the form of a dramatic rehearsal. This is a mental process in which a person or a group of people imagine what the different ends from different acts can be. In this way a person can experiment with different types of hypothetical situations without real consequences and without harming others. In this dramatic rehearsal different intuitions and tendencies of what is right or wrong are thought out and the potential consequences are reviewed. Emotions and thoughts should not oppose, but supplement each other. Moreover, people need to be conscious about the habits, for example worldviews and normative assumptions, and desires that are buried in their character. Otherwise, Dewey believed, since everyone has different inclinations, the most superficial habits that underlie people’s character are directing dramatic rehearsals and the habits more hidden in people’s character are ignored. Thus for performing dramatic rehearsals Dewey pleads for an introspection of all the possible habits, intentions and desires that a person encompasses (Dewey and Tufts, 1908; Fesmire, 2003). In addition, people need to be able to put themselves in the place of the other. According to Dewey in an ethical deliberation we need “to put one self in the place of the other, to see from the standpoint of his purposes and values, to humble our estimate of our own claims and pretension” (Dewey and Tufts, 1908, p335). This empathic part not only needs to be an imaginative process, also empirical data that help to explore and understand the worldviews of others are needed.

Application of the ideas of Dewey to ethics of nutrigenomics

The ideas of Dewey about ethical deliberation can also be used to deliberate about the ethical consequences of established sciences and practices (Fesmire, 2003; Collier, 2006; Parrish, 2006), but it may even be more interesting for sciences that are still in their infancy, like nutrigenomics (Keulartz et al., 2004). The concept of dramatic rehearsal that Dewey used to explore different courses of action can be applied to create deliberations with social actors of new sciences. It can be used to explore the ethical consequences of different research trajectories and their implementation within society.

As the above explanation of Dewey’s arguments shows, consciousness of the habits, intentions and motives that one has, as well as an empathic imaginations for other people’s position is important for an ethical deliberation. Though Dewey originally refers to knowledge about the character and habits of people, his theory is also applicable to a thorough evaluation of the framework of sciences like nutrigenomics. Although nutrigenomics has no emotions or desires, it does have characteristics that are relevant to be aware of. Science and technology studies show that sciences make assumptions about the society and users

by setting goals and by making definitions (Akrich, 1992). These assumptions come forth from the habits and worldviews embedded in research practices and may not fit with norms within everyday life. Thus, for a fruitful ethical deliberation it is essential to be aware of the normative assumptions hidden in the goals and definitions of nutrigenomics, as well as of the normative assumptions existing in everyday life. That is, introspection of the assumptions underlying nutrigenomics and existing storylines in everyday life on concepts important to nutrigenomics, such as health, food and genetic susceptibility, form the basis of an open-minded ethical deliberation on nutrigenomics. Not only does this give the opportunity to help shape an ethical form of nutrigenomics, it also helps to create a “pro-active sensitive attitude”, because social actors explore their own worldviews and the worldviews of others (Swierstra et al., 2009). This pro-active sensitive attitude entails that different groups in society are aware of each other’s worldviews, so that conflicts caused by technologies can better be managed and a peaceful coexistence of people with diverse worldviews can be ensured (Thompson, 2003).

The above presented interpretation of the ideas of John Dewey on ethical deliberation fits perfectly with the aim to find an approach that is able to anticipate on ethical problems of nutrigenomics in an early stage of its development while taking into account the interaction between science and society (see Chapter 3 and p7 to p8 of this chapter). The interpretation gives opportunities to study the dynamic character of science and society, as well as the normative character of technologies. It acknowledges that scientific applications can assign certain roles and responsibilities to the end-user. Moreover it shows that in the end these roles are determined by a negotiation process between the worldviews and habits underlying research practices and the worldviews and habits of the end user. In short an ethical deliberation with social actors who are aware of current day norms of the possible user of nutrigenomics and norms embedded in nutrigenomics practices, gives the opportunity to study how a negotiation process between norms in everyday life and norms embedded in nutrigenomics may evolve (see also Chapter 3). Furthermore, it helps to create an ethical deliberation that exceeds the existing normative framework of nutrigenomics in which the widest range of strategies for implementing nutrigenomics are explored and ethically assessed.

By bringing together different worldviews and norms in this dissertation, I try to take into account the complex interaction between society and science by exposing how norms within society fit or mismatch with norms embedded within the new science. A form of methodological pluralism will be used to study norms embedded in nutrigenomics sciences and norms existing in society. First, the notion of script will be used to reflect on norms in nutrigenomics research practices. The notion of script is a concept from STS, first introduced by Madeleine Akrich (1992), which sees developing technologies as a constant negotiation between the creators’ envisioned characteristics of the end-users and the characteristics of the real end-user and his network (Akrich, 1992). Some of the complexities of the development technologies can be captured, by reflecting on the way a

script can be shaped by the societal context of a technology. In addition, norms existing in the life of the possible future user will be studied with a discourse analytic method, first developed by Wetherell and Potter (1988). Instead of assessing norms by trying to measure opinions and the internal state of the consumer, the social context of arguments within everyday talk about an already existing problem has been analysed. Discourse analysis is rooted in the philosophy of Wittgenstein (Potter, 2001). Wittgenstein argued that instead of abstracting words from their natural contexts, philosophy should look at language with the multitude of meanings and contexts that it can have. He used the concept of language games to show how language in different contexts can accomplish different actions. Like pragmatic ethics he doubted that philosophy would be able and should search to find the exact truth behind words and statements. A search for the true meaning of words would give pseudo problems that obstruct a further analysis. Next to this, he argued that language is not a reflection of a stream of thoughts, but is always public and connected to certain traditions and habits (Wittgenstein, 1969; Potter, 2001; Medina, 2004). Like Wittgenstein suggested, discourse analysis focusses on the context of speech and views speech not as a representation of the internal state of people. Instead, it uses the idea that speech is part of a social practice. This means that the discourse analytic method analyses people's talk as a way to accomplish different social actions, such as accusations, defences or building up expertise. These actions and the way other participants react to these actions, give information about the norms that are followed in day-to-day speech. It shows that some formulations may be more 'available' than others, because some views on the world are more prevailing within everyday life (Edley, 2001).

The results of both these methods will be used to create an ethical deliberation with social actors of food science. By bringing together norms from nutrigenomics science practices and norms presently prevalent in the lives of the possible user of nutrigenomics in an ethical deliberation, I try to take into account the complex interaction between society and science in its ethical reflection about nutrigenomics. Moreover, I try to create a situation in which conflicting values can be exposed and used for a fruitful deliberation. Only in this way the peaceful and equal co-existence and successful cooperation that the pragmatist strives for can be reached. This deliberation should enable a situation in which people not merely tolerate the opinions of others without really understanding the underlying meanings and values of the other, but also understand underlying values and world views of others. Only then deliberative processes are brought to the next step (Swierstra and te Molder, 2012), and can a situation of fruitful cooperation be created (Keulartz et al., 2004).

By taking these steps our approach differs from other interpretations of the dramatic rehearsal. Because Dewey describes dramatic rehearsal as imagining different paths of actions, this has led to different studies which use scenarios to study ethical aspects of sciences early in their developmental process. For example the concept of dramatic rehearsal has led to the development of NEST ethics which ethically assesses New and

Emerging Science and Technologies through scenarios (Swierstra et al., 2009). In NEST ethics, ethicists sketch one application of a science and explore with or without social actors how different implementation strategies of this application can give different moral futures (Keulartz et al., 2004; Swierstra et al., 2009; Stemerding et al., 2010). For example Swierstra et al. (2009) use current arguments on consequences, rights and principles, justice, and the good life as a starting point to imagine how debates around a genomics based obesity pill unfold. They focus on how future ethical controversies will be formed and how this could result in a future in which endless fun with the obesity pill is possible and accepted. A disadvantage of this approach is that this takes one application and leaves less room for reframing scientific paths. Rather than giving input for scientists to reflect on the scientific paths that they are following, it is aimed at informing policymakers on how future controversies on new technologies can evolve (Stemerding et al., 2010). Another disadvantage is that it can cause social actors of the science to keep themselves at bay from the debate in question, because the imagined application is not plausible. Although the above mentioned type of scenario studies claims to aim for plausibility by using current ethical norms and principles to describe possible controversies of future technologies, they mostly fail to take into account the realities of the scientific practice. Their idea of plausibility comes from the likeliness of the importance of current norms in the future rather than the realities of science (Swierstra et al., 2009). Plausibility of applications used in scenarios, however, is an important issue when aiming for an ethical deliberation about new sciences. Social actors, like scientists and health professionals, have been found to escape involvement in debates by referring to the uncertainties and unlikeliness of the imagined applications of the science in question (Bouwman et al., 2008a). By focussing on underlying norms within nutrigenomics science and within everyday life, our approach avoids to use unlikely future applications to stimulate a deliberation with social actors. Moreover, rather than giving information for policymakers of how future controversies around new technologies may unfold, it focusses on how the negotiation process between the citizen–consumer and the sciences may evolve. This gives opportunities to imagine and reflect on different ways of implementing nutrigenomics science or reflect on how nutrigenomics could be shaped if another normative framework would be used.

Research questions

This thesis aims to find an ethical form of nutrigenomics by analysing and creating a deliberation about nutrigenomics with important social actors with the help of the notion of script of Akrich (1992) and the discourse analytic approach of Potter and Wetherell (1987). In addition, I want to evaluate if the approach used was successful in stimulating an ethical deliberation about nutrigenomics with social actors, while taking into account the dynamic character of the development of nutrigenomics as a science that is still in its infancy.

My research questions are:

1. What is the state of art of nutrigenomics and how does this influence an ethical evaluation of nutrigenomics?
2. What normative assumptions are embedded within one of the main scripts of nutrigenomics and can these normative assumptions lead to ethical issues?
3. In what way do the normative assumptions of nutrigenomics match or clash with the interactive goals of repertoires about genes and health risks in discussions about overweight with citizen–consumers?
4. How can we manage a possible clash between everyday life and normative assumptions of nutrigenomics with different strategies of using nutrigenomics or reshaping of its scientific path according to social actors of nutrigenomics?
5. What are the ethical issues regarding these alternative strategies of using or reshaping nutrigenomics and which of these might be ethically most preferable?

Research aims and methodology

To answer the research questions, this project used literature studies, detailed analysis of focus group material and material from a stakeholder meeting. Below I will explicate in detail the steps within this research by discussing the goals of the chapters. An overview of the structure of this research is given in figure 1 on page 16.

In Chapter 2, the first question “What is the state of art of nutrigenomics and how does this influence an ethical evaluation of nutrigenomics?” is answered. In this chapter the state of art of nutrigenomics and the ethical literature on nutrigenomics is explored. The aim was to verify if indeed the state of art of nutrigenomics demands the pragmatic ethical approach as has been described above.

Chapter 3 reflects on the question “What normative assumptions are embedded within one of the main scripts of nutrigenomics and can these normative assumptions lead to ethical problems?” This question was answered by analysing and reflecting on research papers on nutrigenomics with the help of the notion of the script. The aim of this reflection is twofold. Firstly, it gives the opportunity to explore how in the future the script of nutrigenomics may influence norms in our society and vice versa (Williams–Jones and Graham, 2003; Keulartz et al., 2004). Secondly, reflecting on the framework of nutrigenomics gives the opportunity to uncover the taken for granted positions within food sciences. This is essential for a fruitful deliberation about nutrigenomics. The reflection enables us to question how nutrigenomics could be shaped if another framework would be used. Like Dewey describes in his notion of dramatic rehearsal, it helps to see the wider picture.

In Chapter 4 the question “In what way do the normative assumptions of nutrigenomics match or clash with the interactive goals of using repertoires about genes and health risks in discussions about overweight with citizen–consumers?” was answered. In this Chapter I analyse as to what rate the normative assumptions of the nutrigenomics script fit into the life of possible users of nutrigenomics tools. Moreover, this step should enable a deliberation with social actors in which the participants are aware of the worldview of future users of nutrigenomics. I will use the discourse analytic approach of Potter and Wetherell (1987). This approach is relatively new in the field of applied ethics, as well as in other research that aims at assessing new technologies (Veen et al., 2011). More conventional methods are questionnaires and interviews based on scenarios or prototype applications. Although these conventional methods are informative (see for example Ronteltap et al., 2007), they are less suitable for the goal of this study. They miss out on at first sight not directly technology related issues. For example, Veen, Gremmen et al. (2011) show from a discussion about a gluten–neutralizing pill against celiac disease among celiac disease patients, that participants discussed price mainly to present themselves as the person that in the end decides if the pill will be accepted. More conventional analytic methods are more likely to miss out on this kind of identity work, which at first sight seems not to be related to the technology in question. These methods are likely to merely conclude that price is an important consideration for the consumer. This shows these methods do not completely suffice (te Molder, 2012).

In addition, instead of using scenarios or prototype applications, overweight, an already existing concern, was discussed. The discourse analytic method acknowledges that when new innovations are introduced, they do not fall into a vacuum, but will be adopted into a social interactional context (te Molder and Gutteling, 2003). Thus by studying talk on an existing problem relevant social interactional norms can be discovered. An important reason for focussing on an already existing issue is that scenarios may simply demand a too great an imagination from the participants. Participants experience in a reflection about future desires and worry a certain detachment (te Molder and Gutteling, 2003), which obstructs an analysis of relevant social interactional norms. I have chosen overweight as a topic, because it is an everyday problem that nutrigenomics supposedly is going to affect. In addition, nutrigenomics tools, especially those involving genetics, may bring similar concerns to consumers as overweight people or people with overweight family members already have. For example, it is expected that nutrigenomics will empower people to live healthy. This would imply that people are responsible for living healthier when they are susceptible for a lifestyle–related disease. In this sense overweight is an interesting topic, because within current day society, personal responsibility for being overweight is an important point of discussion (Saguy and Gruys, 2010; ten Have et al., 2011). It can be expected that people with overweight have to manage issues of responsibility for overweight and for the higher risk of getting overweight associated diseases, like diabetes II. Therefore, in Chapter 4 we explore in what way people with overweight deal with accounts of genetic susceptibility for overweight. For example, does genetic susceptibility

allow for an escape route to manage personal responsibility or not. Secondly, with the introduction of new technologies from sciences like nutrigenomics, people need to construct new identities (Veen et al., 2011). In the case of nutrigenomics, it is likely that people have to establish identities in relation to issues of health and personal health risks. Within the media overweight and the relation between risks on diseases, like heart failure and diabetes, are extensively debated (Rich and Evans, 2010) and therefore it can be expected that in a discussion about overweight identities in relation to issues of health and health risks will be constructed. This gives information about the identities and accounts that might be established when nutrigenomics tools will be used. By showing that some identities and accounts are more available in everyday life than others, evidence is given about the existing social interactional norms that will influence the negotiation process between nutrigenomics and society.

In Chapter 5 the questions: “How can we manage a possible clash between everyday life and normative assumptions of nutrigenomics with different strategies of using nutrigenomics or reshaping of it scientific path according to social actors of nutrigenomics?” and “What are the ethical issues of these alternative strategies of using or reshaping nutrigenomics and which of these might be ethically most preferable?” will be answered. In order to answer these questions an ethical deliberation was created amongst social actors of nutrigenomics. This step has made it possible to anticipate on nutrigenomics science early in its developmental stage, as well as create a pro-active sensitive attitude to different underlying worldviews that makes it possible to deal with upcoming issues. Such an attitude is essential for peaceful co-habitation and fruitful collaboration in a future world with nutrigenomics that the pragmatic ethicist is striving for (Swierstra et al., 2009). The form of deliberation between social actors is inspired by the ideas of Dewey. I thereby assume that consciousness of the norms embedded in nutrigenomics and norms existing in everyday life enables social actors to have a broad discussion about a great variety of research trajectories of nutrigenomics and their ethical implications. I have tried to establish this, by confronting stakeholders with the normative script of nutrigenomics which is explored in Chapter 3 and the normative assumptions of everyday life which are studied in Chapter 4.

In Chapter 6 the main conclusions of Chapter 2 till 5 are discussed. Moreover, a reflection on the steps that were taken in this research and recommendations for further research is given.

Chapter 2

What is the state of art of nutrigenomics and how does this influence an analysis of the ethical issues of nutrigenomics innovations?

Literature review to get an overview of the ethical issues of nutrigenomics and the state of the art of nutrigenomics.

Chapter 3

What normative assumptions are embedded within one of the main scripts of nutrigenomics and can these normative assumption lead to ethical issues?

Analysis of the normative assumptions of nutrigenomics in research papers of nutrigenomics with the help of the notion of the script.

Chapter 4

In what way do the normative assumptions of nutrigenomics match or clash with the interactive goals of using repertoires about genes and health risks in discussions about overweight among citizen–consumers?

Discourse analysis of conversations of consumers related to obesity.

Chapter 5

How can we manage a possible clash between everyday life and normative assumptions of nutrigenomics with different strategies of using nutrigenomics or reshaping of its scientific path according to social actors of nutrigenomics?

What are the ethical issues regarding these alternative strategies of using or reshaping nutrigenomics and which of these might be ethically most preferable?

Match or clash of normative assumptions of nutrigenomics and norms in everyday life as input for a deliberation about nutrigenomics.

Analysis of discussion with representatives from governmental agencies, the food industry, food communication, nutrigenomics science, social sciences studying nutrigenomics.

Chapter 6

Reflection on the main results, methods and future implications of this research.

Figure 1: Schematic outline of this thesis

2

Uncertainties of nutrigenomics and their ethical meaning

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Abstract

Again and again utopian hopes are connected with the life sciences (no hunger, health for everyone; life without diseases, longevity), but simultaneously serious research shows uncertain, incoherent, and ambivalent results. It is unrealistic to expect that these uncertainties will disappear. We start by providing a not exhaustive list of five different types of uncertainties end-users of nutrigenomics have to cope with without being able to perceive them as risks and to subject them to risk-analysis. First, genes connected with the human body or nutrients can have different functions in interaction with their environment (for instance, one nutrient can be healthy for the heart, but can also be a high risk in relation to cancer). Secondly, uncertainties are formed by risk analyses. Will it be possible to calculate certain risk of getting a certain condition with a certain lifestyle? Will it be difficult to separate the genetic component and the lifestyle component? How high will these risks be? How will these risks be handled by the actors? In the case of personal genotyping, it is unclear how frequent an adverse polymorphism will occur. Will every individual have a certain vulnerability to a certain disease or will it only be applicable to a small group of the population or particular populations? Thirdly, dietary advices are subject to uncertainties and still to be developed professional standards: some will have adverse outcomes, some will not delay the disease, and some will assume uncertain associations between nutrients, lifestyle, and genetic vulnerabilities. Fourth, with regard to the usefulness of tests it is uncertain to what extent risks indications about obesity and diabetes and other vulnerabilities really influence people to live healthier and therefore will help to prevent these conditions. Fifth, it is uncertain how and what nutrigenomics products will be developed and used. Will it be possible to develop more effectively health improving products? Or is this too difficult and will nutrigenomics continue to be used in not always justified health claims as a commercial and marketing tool? Present-day ethics and theories of responsibilities presuppose that uncertainties will disappear and concentrate on what seems to be fixed and stable in science. We develop provisional thoughts that assume that the dynamic of science to produce uncertainties and dilemmas is endemic, and we stress the need for consumers to institutionalize value searching, exploring, and deliberating devices in the health and food sector to find out the most important uncertainties and correspondingly socially desirable research priorities.

Introduction: Expectations and disappointments of the human genome

Knowledge of the human genome has great potential for human health. It may help us to understand the origins of diseases and to tackle diseases more precisely by using medicines that work at the DNA level. Also for the nutritional sciences it possesses immense possibilities. For decades now epidemiologists have tried to find links between health and food. Research at genome level may help to reveal the relation between food and

health. It could find the origins of diseases and help to prevent them. It may prove the healthy influence of nutrients. However, this potential is overshadowed by the enormous complexities surrounding the genome and the possible applications of genomics or, this paper's subject, nutrigenomics.

The DNA was thought to be the “language of God” (according to President Clinton) and the blueprint of the human body, concealing the secrets of life. If this blueprint would be uncovered we would “know” for certain. We would be able to solve the mysteries of our body and be able to prevent many killing diseases (Smith, 2005; Stephenson, 2008). However, when most of the human genome had been sequenced after 2000, this idea was shattered into pieces. The working of the human genome and its interaction with the environment (like nutrients) are complex, which became already clear after only 22.000 genes were identified. Interactions between genes, enormous amounts of genes reacting on one nutrient and opposing reactions of genes triggered by the same nutrient make the challenges of nutrigenomics overwhelming (Piatigorsky, 2007). Besides that it is rather difficult to test the health effect of nutrients and therefore certain diets and products, it also turns out that it is hard to determine the boundary between illness and health on the genetic level. Nutrients have to interact during a stage in which the body at that moment of time does not give any signals of illness yet (Van Roost, 2005). The literature on the influence of nutrients on health is therefore replete with contradicting evidences (Davis and Milner, 2004). It is no wonder that some food scientists express their scepticism about the scientific basis of health claims: “...the Food and Drug Administration’s oversight over health claims has eroded, and the United States now allows ‘qualified health claims’ for which there is hardly any evidence, as long as a disclaimer is included” (Katan, 2004; Aggett et al., 2005).

Besides these complexities and uncertainties of the experimental results of nutrigenomics, nutrigenomics’ interaction with society is largely unknown. How will professional groups, like dieticians, supermarkets, general practitioners, respond to the development of nutrigenomics, its complexity and uncertainties? How will they influence its applications? Will the projected end-users be able to integrate nutrigenomics products and services, whatever they may be, in their daily life?

This short history of nutrigenomics shows us a rise and fall of expectations and certainties (for similar cycles see Brown and Michael, 2003). The development of the science presents a dynamic in which “organized scepticism” (Merton, 1968) follows “organized utopianism” (our wording): taken for granted truth and certainties are destroyed or better, are unmasked as (un)truths and uncertainties. The persistent intellectual dispute among competing research teams in which established truths fall prey to critical scrutiny is an indication of the mature evolution of the scientific understanding of the world. Scientists claim the right to make promises and mistakes; that is the core of the scientific ethos (Kuhn, 1962; Merton, 1968; Pinch, 2000).

This oscillating history shows that during the period of emerging paradigms or disciplines scientists are in need of an organizing utopian idea that rallies their energy and directs their attention. Organized utopianism (promises) seems necessary too and will give occasion to mistakes and false promises; organized scepticism will unmask them later. The history of science is full of these (later discovered) mistakes, which in some cases can turn out to be big problems or even catastrophes. Examples of serious mistakes made in agriculture and food sciences are the use of lead, of radioactivity, and DDT in agriculture and food, and the claim that all vegetable oils are seen to be healthy (Bryson, 2003, (chapter 7, 10)).

Nutrigenomics is thus surrounded by internal and external uncertainties and it is for end-users wise to better prepare themselves for a genomics future with fundamental uncertainties than to expect that in the long run the uncertainties will disappear. The issue of uncertainties of genomics has been tackled earlier, e.g., from the perspective of policy making (Pinch, 2000; Gottweis, 2005), science management (Pinch, 2000; Brown and Michael, 2003) and theory of science (Brown and Michael, 2003; Jasanoff, 2005). Here we will concentrate on the impact of the uncertainties of nutrigenomics on citizen/consumers by exploring the fruitfulness of an ethical perspective that focuses on how citizens/consumers' cope with fundamental uncertainties.

Many ethical approaches to genomics or broader biotechnology have taken the development of genomics towards certainty for granted. They view the uncertainties of genomics as temporary, and discuss norms of how to regulate or even ban the expected products of this science without delving into the intricacies of the science. A good example is Fukuyama's proposal in his *Our Posthuman Future* (2002, p. 212) to put "brakes" on biotechnology. In this article we will concentrate not only on the products but on dynamics of genomics that constantly produces uncertain and dilemmatic situations. We will assume that such uncertainties are here to stay. What do they mean for consumers and citizens? How should citizens/consumers live with these dynamics of uncertainties of products and services of nutrigenomics, some of which are rather fundamental? How to select the more certain results from the hypes and the misleading ones? How to attribute responsibility to purveyors of messages that contain a lot of uncertainty or are even completely hyped up? How to deal with the different normative expectations of the different stakeholders? How can citizens/consumers orient themselves in this always changing forest, similar to Macbeth's Birnam Wood?

The paper aims at spelling out the ethical meaning of the different types of uncertainties connected to nutrigenomics for the two main stakeholders: end-users (consumers) and scientists. We differ in our approach from the usual ethical approaches to science and technology that assume a fixed, stable, and consensual position of the nutrigenomics science and apply subsequently their ethical principles. First, we will start with spelling out five different types of uncertainties and complexities of genomics. Nutrigenomics is defined as the research that uses knowledge of the genome to prevent diseases or to improve health by means of food, and is quite complex, because it also tries to take into

account non-human organisms that are involved with food intake and digesting (like bacteria). These complexities affect the types of the uncertainties surrounding the different branches of nutrigenomics. The uncertainties do not only arise due to discordant findings, but are more complex: cognitive uncertainties, i.e., uncertainties that arise from (social) scientific findings are linked with moral uncertainties, uncertainties that people encounter in dealing with the question what is the right thing to do in a certain situation. Secondly we will discuss these uncertainties in the light of theories of science and of postmodernity and how they align with other trends. Thirdly we will outline an ethics of uncertainty that enables citizens/consumers to live with more and less fundamental scientific uncertainties. Finally we will give an outlook how to cope with enduring genomics uncertainties.

Types of uncertainties surrounding nutrigenomics, its services, and products

Nutrigenomics will probably and hopefully not give rise to big risks like the ones covered by Frankenstein trajectories; however, patients and consumers of nutrigenomics are confronted with a lot of uncertainties: uncertainties galore! Most of these uncertainties are not covered by the usual meaning of risks, ie size of harm times the probability (Amendola, 2002) or by the term “incomplete information.” Mostly, one can comprehend uncertainties, but the assessment of uncertainties is something different and not dependent on more information but, as we will show later, on ethical procedures, standards, and values that are partly still to be developed.

A not exhaustive list of uncertainties that the ethical evaluation of the dynamics of nutrigenomics services and products has to consider comprises at least five types where the first three are mainly cognitive and the last two mainly social and normative. First, experimental, internal, uncertainties we talked earlier about, play a role: genes can have different functions in interaction with their environment and the cause-effect relations are until now mostly unknown. Secondly, in relation to personalized dietary advice based on personal DNA it is unknown how frequent polymorphisms will occur. Will every individual have a certain vulnerability to a certain disease or will it only be applicable to a small group of the population. Third, uncertainties are formed by risk analysis. Will it be possible to calculate a certain risk of getting a certain condition with a certain lifestyle? In how far can one exclude false positives and false negatives? How difficult will it be to separate the genetic component and the lifestyle component? How high will these risks be? Fourth, for the usefulness of such tests it is uncertain to what extent risk indications about obesity and diabetes and other vulnerabilities really influence people to live healthier and therefore help to prevent these conditions. How will these risks be handled by the actors? Fifth, it is uncertain how nutrigenomics products and services will be developed and used. Will it be possible to develop more effectively health improving products? Or will nutrigenomics be used as a commercial tool?

Experimental uncertainties

The experimental, internal, uncertainties of nutrigenomics are quite striking. Besides the more “normal” uncertainties of experimenting, like lack of standardization of data and difficulties in establishing causal connections on the base of sound scientific evidence, there are more genomics specific uncertainties. The classical idea of one gene—one protein (Beadle and Tatum, 1941) is now abandoned and genes encode a variety of transcripts and proteins (Pearson, 2006). Genes can have different functions in interaction with their environment (Piatigorsky, 2007). They code for proteins that can have different, even opposing functions. The phenomenon of moon lighting, gene–splicing, or gene–sharing allow proteins to function in distinct modes and makes the road from genotype to phenotype more complex than ever (Sriram et al., 2005). We cannot know for certain how far it ever will be known what the benign or harmful effects of nutrients, foods, or even diets will be. Moreover, many effects, tested on European populations, may not be generalized to other populations (Easton et al., 2007; Ng et al., 2009). Experimental uncertainty can be seen as a cognitive uncertainty, since we do not know what the validity is in relation to nutrients and DNA. This type of uncertainty could affect moral issues concerning tests that indicate lifestyle–related diseases in an early stage or tests that indicate susceptibilities to lifestyle–related diseases. It also raises questions with regard to the functional food industry and their claims. This cognitive uncertainty may therefore determine moral uncertainty. For example it may trigger questions about what is the right thing to do in relation to moral questions surrounding diagnostic tests or DNA–tests and choices for others.

Uncertainties of risk analysis

The second cognitive uncertainty is related to the complexity of nutrient DNA interaction and linked to personalized risk analysis (or diagnostic tests). Risk analysis can be done in two ways. Firstly, an analysis can be done of the susceptibilities that the consumer is running due to certain polymorphisms (Smith et al., 2008). A second way is that biomarkers are identified. By following the dynamics of these biomarkers by measuring mRNA and proteins that are formed after a Western diet, it might be possible to tell a person is developing lifestyle–related conditions in an early still reversible stage. Such biomarkers are as yet not available and their clinical validity and utility are still to be proven (van Ommen et al., 2008); only valid biomarkers that indicate a disease are available (Jaffe et al., 2006).

Both types of risk analysis give rise to several questions regarding the uncertainties. Firstly, in relation to risk analysis based on personal DNA it is unknown how frequent polymorphisms will occur. How high will the risks linked to certain polymorphisms be? Will every individual have a certain vulnerability to a certain disease or will it only be applicable to a small group of the population?

Secondly, how certain will the calculation of risks due to susceptibilities to nutrients be? Will it be possible to calculate a certain risk of getting a certain condition with a certain lifestyle? Or will it be difficult to separate the genetic component and the lifestyle component? What does overall calculation of risks mean, for instance, how to make up your mind if your risk for one vulnerability is 65% and for another 45%? One example of a clear indication that genetic testing might be used to predict the susceptibility to certain diet-related conditions is the current research at obesity. Jeffrey Friedman, one of the pioneers in the obesity research, believes that most of the variance of obesity is due to genetic factors (Friedman, 2004). Others like Roth et al. (2004) acknowledge the role of genetic factors but emphasize the importance of other factors such as energy expenditure due to physical activity and of influences during the period in the uterus. Despite these differences in opinion, a lot of research is being done at finding markers that could be tested to predict the vulnerability to obesity and its implied diseases. More recently, Meyre et al. (2005) have found proof that three polymorphisms for the gene that codes for ENPP1 could be a marker for increased risks for obesity and diabetes. According to the BBC news this could be the first step towards a DNA-test for obesity and diabetes (BBC-News, 2005). The operative words here are “could be.”

Moreover, a fundamental uncertainty that is applicable to diagnostic tests indicating a pre-disease, is that many health vulnerabilities do not develop into full diseases; so their identification with “prediseases” is premature. From daily life the experience of a small illness that is healed by the body is rather common. It is interesting to notice that large scale research in populations show again and again that many people have had strokes or brain damages without recognizing it, and without any later problems (Rutten et al., 2005; Obuchowski et al., 2007; Vernooij et al., 2008). There is quite a lot of chance that a “predisease” won’t develop into a disease due to the normal reactions of the body. Finally, the companies that currently offer these tests on the market (internet or elsewhere) are mostly not very reliable. An analysis of the US Government Accountability Office proved that these companies often mislead their customers (Kutz, 2006; Ng et al., 2009).

Uncertainties of personalized dietary advice

Third, there are uncertainties connected with the preventive measures and dietary advice on the basis of risk analyses. Personalized advice can be based on a DNA test that might reveal susceptibilities to certain lifestyle-related conditions or the earlier mentioned biomarker tests. Will the expectation become reality that genomics produces tailor made recommendations with respect to drugs and food? To what extent may the risks be reduced by adopting a healthy lifestyle or by eating certain products? Also these uncertainties cause moral uncertainty in relation to tests, dietary advice, and the functional food industry. For example, is it right to inform somebody about a high risk without full certainty how it can be reduced (Rose, 2001)?

The preventive actions taken to delay certain health risks on the basis of predictive testing are in many cases not fully effective. In the case of osteoporosis, "...preventive measures available to women 'at risk' do not eliminate the risk of adverse outcome" (Hjorleifsson and Schei 2006, p. 897). How will these risks be handled by the actors? Will the consultant or the consultee inform at risk relatives about test results? Or should other persons take up this task? Are they able to give meaning to these risks and these only partly effective preventive measures?

Another possibility could be personalized diets based on biomarkers on DNA level. By measuring mRNA and proteins that are formed after a Western diet and by measuring the dynamics of these markers, it might be possible to tell that a person is developing lifestyle-related conditions in an early still reversible stage. Or it might be possible to tell that a person is vulnerable to develop these lifestyle-related diseases and therefore should change his or her diet. But, such biomarkers are as yet not available, and their clinical validity and utility are still to be proven.

Social and moral uncertainties

A fourth type of uncertainty is formed by the reaction of stakeholders upon knowledge about uncertain risks and uncertain advices and is strongly intertwined with social and moral uncertainty. Firstly, from the point of view of consumers it is important to note that it is quite uncertain how governments, insurance companies, dieticians and general practitioners, food companies, retailers, and others will react to these developments. What regulations will be put in place: will they protect the privacy of consumers and will they improve the quality of nutritional recommendations? Will they make the bio-data banks accessible for all or only for limited purposes (Castle and Ries, 2009)? What will telecare and ambient intelligence mean in supplying services (Falas et al., 2003)? Secondly, the reaction of the consumers to the attitude of these stakeholders is unclear. How will end-users react? With respect to the usefulness of (individualized) tests it is uncertain to what extent risk indications about obesity and diabetes and other vulnerabilities really influence people to live healthier and therefore help to prevent these conditions (Komduur et al., 2009). It is interesting to mention that even geneticists themselves confess that they will probably not change their lifestyle when a test gives good indications that they run a risk (Hjorleifsson and Schei, 2006). Health behaviour of people is determined by a complicated set of many factors that influence the final health behaviours. Besides fear for risks, which according to most health behaviour model forms an important factor for the eventual health behaviour performed, also other factors like social ones are significant influences. For example people are more inclined to agree with a statement if others in the group endorse this statement as well because they want to conform to the opinion of the group. Norms about how to behave are important factors in this social influence (Lind and Tyler,

1988). Thus this cognitive uncertainty is strongly linked to moral uncertainty in relation to what people in the future society think is the right or wrong thing to do. This also causes moral uncertainty about decision making about dietary advice or DNA tests on a personal level.

Uncertainties of products

Fifth, it is uncertain what nutrigenomics products and services for daily use like food will be developed and how they will be used. For instance, in addition to genetic testing aiming to give advice about lifestyle and nutrition German and Watzke (2004) go one step further and foresee personalized foods. These authors see opportunities for example for people with a predisposition to get food related health problems like lactose intolerance but also for the development of foods that improve characteristics such as cognitive, musical, and artistic performance (enhancement). They predict a future for foods designed for different types of metabolism.

Will it be possible to develop more effectively health improving, disease preventive, and performance enhancing products? Or will nutrigenomics merely be used as a commercial tool (e.g., Wallace, 2006)? There are always free riders that try to get a profit with products that only in name have a health effect and there are enough consumers that are so eager to improve their health situation, that governmental regulations are necessary. Are producers able and willing to use nutrigenomics responsibly as a tool to produce more effective healthy products and will they do this? If genomics will be used as a commercial tool it may become an hype. People will then choose for the products without being able to take full responsibility. This fifth uncertainty is again strongly related to moral uncertainty.

Philosophy of science and social philosophy on uncertainty

In recent philosophy of science and social philosophy some useful ideas have been developed on how to cope with fundamental uncertainties of science and technology firstly in the epistemological and secondly in the moral sense without expecting them to vanish in the progressive development of science.

Firstly, according to traditional epistemology, knowledge and certainty are intimately linked. You are only allowed (justified) to claim you know something if you also believe it and you are certain of it. To be certain you have to have direct proof that it is true (Hospers, 1953). Therefore to be uncertain means that one does not have all the knowledge that proves that something is true. However, according to philosophy of science (like the theory of Karl Popper, 1902–1994), conjecturing and the corresponding concept of uncertainty belong to the core of the scientific enterprise; the community of researchers lives with them by a process of constantly reviewing, by organized criticism and, by developing new theories. Popper reintroduces the term “fallibilism” from the American Pragmatist Charles Peirce (1839–1940), which refers to the search for uncertainties by scientific communities. Cognitive uncertainty is made workable by the social and moral

certainty that the scientific community will eliminate in the end false negatives and false positives. Popper also makes the transition to the ethics of uncertainty; he states for example: “Ethics was based upon the ideas of personal knowledge and of the possibility of reaching certainty; and therefore the idea of authority. The new ethics, by contrast, is based upon the idea of objective knowledge and of uncertain knowledge.” (Popper, 1998, p. 63) Note that according to Popper objective knowledge is knowledge that transgresses the individual person.

Secondly, moral uncertainty in the pre-modern period is as much as possible eliminated due to the fact that ethical frameworks formed by religion, philosophy, and politics were socially imposed on the individuals. People had therefore less room for making their own choices. If one did not adapt to uniform social rules, one was excluded and punished. In the modern period this neglect of uncertainty did not change. Established modern academic and applied ethics mirrors this by its neglect of uncertainty: for instance, in *Encyclopedia of Ethics* one can find scarcely something about this issue (see Chadwick, 1990, a book of 619 pages with uncertainty only eight times mentioned; or Reich 1995, a book of 2950 pages that mentions uncertainty 13 times). However, some recent social philosophers point out that the role of uncertainty today is more complex, due to moral and social factors. The social philosopher Zygmunt Bauman (1995) argues that feelings of uncertainty have increased in the postmodern, twenty first century due to social processes. In the current post-modern society the control by authorities is weakened. Due to more leisure time, growth of material welfare and expanding social networks, people have more room for choices. Therefore the certainty of uniform, fixed, and clear-cut norms is gone. Instead people are compelled to choose among a large range of alternative action schemes and norms, while often the consequences of choices and actions are impossible to foresee. Because of the increasing impact of global networks, one cannot expect that all people located in a certain area will act according to the same norms and make the same choices; on the contrary, one can only expect increasing diversity of norms. This creates a lot of uncertainty and to overcome this, people are constantly looking for new stable anchor points that can help them to shape their own life (Bauman, 1995).

Bauman’s analysis of socially determined uncertainties is closely connected with the very influential social theory of Ulrich Beck (1990) on risk society and scientific and technological uncertainties. He claims that postmodern (he calls them late modern) societies constantly produce new problems that originate in applying modern science, due to its analytical and reductionist character. The scientific practice in the laboratory of controlling the relevant phenomena and obtaining the relevant knowledge thoroughly depends on how much one can manage to “exclude” all the factors that are not interesting (Hacking, 1983). The laboratory activity of scientists includes the effort to construct closed systems relative to the theoretical requirement to take some variables and their interactions into account, which in its turn is chosen according to the relevancy in view of the problem, aim, and interest of the researchers (Radder, 2003). These systems are never closed as

such and applying the laboratory result outside the laboratory confronts one with the excluded factors, indeed, uncertainties. When scientific results move from the laboratory to society always new problems arise that are subsequently solved with new science, giving rise, however, to new unintended and unanticipated consequences due to the reductionist character of science. Beck's theory implies that our current society is determined by the search for uncertain knowledge, frequent promises of revelation, demolishing of facts, and the constant discovery of normative disagreements.

How many uncertainties with what intensity can a person bear? According to English sociologist Mary Douglas (1921–2007), persons can only to a certain extent live with uncertainties. In everyday life uncertainty has its limits in people's desire for relative stable relationships and for social cohesion. If Douglas (2001) is right, society is providing the certain anchor point of certainties that allows individuals to tolerate a certain amount of uncertainties. Mary Douglas, in her article "Dealing with uncertainty," asks rhetorically "Where do we humans get our confidence in certain knowledge? The answer is cultural learning. ...We create institutions that protect our valued ideas" (Douglas, 2001, p. 148). Her reflections on certainty resemble very much the ones of Wittgenstein (1969). He stresses the importance of fundamental certainties that cannot be doubted, or, when doubted, get reactions like: "this person is nuts." He states in *On Certainty*, that the human condition begins with non-doubting: "The game of doubting itself presupposes certainty." (Wittgenstein, 1969; Paragraph 115). A doubt requires a ground for itself, i.e., a context we trust. Doubting is only possible because we are absolutely certain of certain basic insights like this is my hand, or it is impossible that I was yesterday on the moon.

However, can social contexts provide such an anchor point for personally experienced uncertainties? Even stable social relationships are continuously changing and new ones are developed, while others are losing their dominance. During some eras people experiment more with new relationships and accept more uncertainties. John Dewey (1859–1952), American pragmatist of the second generation, turns the relationship between certainty and uncertainty in a different light. He concedes that the search for certainty is a dominant feeling. But interestingly, Dewey points out that people pay a particular price for certainty: closure of debate, taboos, correctness, and institutions that try to uphold correct behaviour. Dewey refers to the negative effects of this desire for certainty and to the lack of stimulus to learning capabilities and to intellectual progress that it entails. "As long as man was unable by means of the arts of practice to direct the course of events, it was natural for him to seek an emotional substitute; in the absence of actual certainty in the midst of a precarious and hazardous world, men cultivated all sorts of things that would give them the feeling of certainty." (Dewey, 1960; p. 33). Certainties give birth to all kinds of taboos and biased judgments, but the progress of learning enables human beings to experiment and to live with uncertainties. Dewey is suggesting that as long as the context of humans is full of

dangers and induces feelings of uncertainty, they are prone to look for certainty; however, if the context gives rise to feelings of certainty, individuals can feel more relaxed and give more room to feelings of uncertainty. So, people can strike a balance between social and personal (un-)certainties and then they can even become “happy to be uncertain.”

Three implications for an ethics of scientific uncertainties

From both recent philosophy of science and social philosophy it is no wonder that genomics does not eliminate all uncertainties but even produces new uncertainties. Nevertheless, from the point of view of dominant ethics, this situation is very problematic, because the five types of uncertainties (or better, their fundamental resilience) we outlined go against the grain of its most cherished assumptions. Firstly, dominant ethics has not explicitly addressed uncertainties and ways of how to cope with them, because it presupposes stable and fixed conditions, in which principles and norms can be upheld. It more or less presupposes a constant, orderly and enduring universe (Korthals, 2008a). Secondly, the traditional ethical concepts like “informed choice,” “individual responsibility,” and “consumer control” (Cain and Smid, 2003) are not adequate for ethically dealing with these uncertainties (Chadwick, 2004; Burgess, 2007). Informed consent presupposes a constant and coherent flow of certain information that one can be informed about and that one can use as a foundation of decisions. Individual responsibility presupposes clear lines of connection between agents, actions, their effects and intentions. And consumer control finally requires a constant and stable personality and social context. When the collective implications of the individual choice for personalized nutrition are so huge, more collective ways of opinion and decision making should be tried in which all stakeholders have to readjust their opinions and interests according to the on-going discussion. This implies that the ethics of protection of the individual against the apparently mighty powers of state and professionals is not fruitful. More adequate is an ethics of participation in continuous discussion on the intricacies of nutrigenomics.

The building blocks of an ethics of uncertainty that we developed until now along the lines of Popper, Bauman, Beck, Douglas, Wittgenstein, and Dewey, emphasizes the positive role of cognitive uncertainties (Popper), the balance between social and personal context of uncertainties (Popper, Douglas, Wittgenstein), the positive role of living with uncertainties (Bauman, Douglas) and even experimenting with them (Dewey), and the negative role of too much certainties (Dewey). This has three implications that also can be seen as three strategies to cope with uncertainties in general.

Firstly, following Dewey’s and the general pragmatist idea of “scratch where it hurts,” it is recommendable to look for a selection of uncertainties that we should pay attention to. Citizens/consumers need an ethics of dealing with uncertainties in the sense of identifying and selecting between important, unbearable ones and less relevant, bearable, ones. There are no general tools or general guidelines to deal with that process of selection, but there are general procedures like consultations, deliberations, and exchange of stories and life

narratives. The main thing here is to find out commonalities and particularities in your own life and that of other affected ones. Some ethical support can be given by Putnam's distinction between common sense doubt, meaning the selecting of more and less certain cases, and philosophical doubt, i.e., the radical denial of all certainties (Putnam, 1995, 57–81): “We have to remind ourselves of the distinction between common sense doubt and philosophical doubt. Finishing in believing in something is not really a human possibility. Criticism cannot be a reason for universal scepticism. The fact that sometimes we are wrong is not a reason to really doubt every particular conviction.” (Putnam, 1995; p. 75)

Common sense doubt shifts between different types of doubt that are more or less realistic. The reason that “informed choice” is not a good ethical concept in this context, has to do with the fact that it does not say anything about selecting the more certain and less certain recommendations and the incorporation of well-established health considerations into one's diet and personal health. We need ethical categories that assist consumers in making these selections, i.e., we need categories of consultation and deliberation, and learning processes in which consumers can bring in their life stories (narrative input) and can be assisted to become robust vis-a-vis the health problems that run against their own interests. This ethics of cooperation, dialogue, and of sharing life experiences between consumers and professionals implies that consumer groups should try to bridge the gap between production and consumption of food and new technologies and to incorporate the new health considerations into their food style together with the main stakeholders like governments and food industry.

Secondly, in accordance with the pragmatist ethics earlier developed (Keulartz et al., 2004; Korthals 2008a), it is ethically desirable to explore the uncertainties, paradoxes, and various scenarios in debates that are organized on the basis of the Jamesian and Deweyian idea of inclusion: “The course of history is nothing but the story of men's struggles from one generation to generation to find the more and more inclusive order. Invent some manner of realizing your own ideals which also satisfy the alien demands, that and that only is the path of peace!” (James, 1897; p. 205)

Debates are to be organized not because it is the core of democracy to talk, but because only so all relevant viewpoints and interests vis-a-vis an issue get heard, and can be commented upon, and contribute to the meaning frames that in the end stand behind the political decisions that elected politicians have to make. Not for the sake of reaching consensus and of making a decision are debates organized, but to contribute to this collective process of making up your own mind. The scenarios comprise (un)desirable possibilities, not always plausible future plans, and they are made to find out what impact a certain possibility can have (Peterson et al., 2003).

Thirdly, to strike the balance between the social and the personal level, one should also pay attention to Dewey's idea of "happy with uncertainties." How to become happy with uncertainties? Again some philosophers have given here some clue. There are several possible strategies and probably a balanced mix of all is often the best choice. One can tackle uncertainty by denying being at risk, and just go on with living and preventing being reminded of the unpleasant signals that bring to mind that one is confronted with uncertain risks. The alternative is that one confronts oneself with being at risk and tries to prevent as much as possible the early stages of the diseases, although here is of course a kind of middle road as well.

There is also the possibility that one is informed about being at risks without any available therapies, as we discussed earlier. Here one can choose between confronting the uncertainty with strong emotions that induce people to forget their present state of the body. This is the line of Spinoza's Ethics: suppressing feelings of anxiety by other feelings, for instance by feelings of enjoyment while eating good food, instead of constantly worrying about your own health when you eat something. Or one can try to reason and to sublimate the anxiety feelings by having better thoughts. This is in line with Aristotle's Nicomachean Ethics. According to him, you take into account the broader meaning of feeling good for your own health, and you relativize smaller, short term evils.

Dewey again would stress that inquiry can make one happier in living with fundamental uncertainties. Inquiring with others in finding which new lifestyles, products, and tastes are more ethically desirable is something like a (moral) inquiry. In this case you are pushing the frontiers of your taste in new, uncertain fields without feeling unhappy. The balance of certainties and uncertainties is dependent on the relations between individual and context.

Co-production of genomics and an ethics of uncertainty

These three implied strategies (selection, debates, and happy with uncertainties) can be made fruitful for our original questions: How to live as an interested citizen/ consumer with uncertainties, ambiguities, and paradoxes of genomics? How to tackle the five types of uncertainties? These different strategies of coping with uncertainties are an alternative to traditional ethical strategies of analysing and emphasizing the role of informed consent and individual responsibilities in these situations.

First, *selection* covers sorting out the hypes from the truth and assessing different types of uncertainties from the more to the less reliable ones. How can the citizen/ consumer know what are the hypes and what are the real, troubling, uncertainties? As we have seen, a science like nutrigenomics does not have a directly applicable sieve for truth, in particular for the very complex issues we discussed with regard to the five types of uncertainties. But also society has not a sieve for the truth of certain knowledge and should allow some room for uncertainty. Moreover, the cognitive uncertainties about the connections between foodstuffs, genes, and their effects are intrinsically connected with the normative ones. Claims about the health effects of certain foodstuffs, or claims about

the possibility to prevent or postpone a certain disease mix up cognitive and normative claims. What claims are reliable and what not? In how far can private companies be trusted? These questions confront the patients and consumers with the question: Whom to trust? Establishing trustful relations between nutrigenomics, producers, and its end-users is therefore a requirement.

Secondly, in concrete *debates* and consultations one can identify the opportunities for new forms of cooperation by co-managing technological alternatives and selecting ethically desirable alternatives out of the possible scenarios. Living a good life in a world with genomics products and services like high tech food and drugs, implies the deployment of procedural and substantive aspects of deliberations. Deliberations require fair procedures of participation and agenda setting. They also ask for some substantive normative orientation like the values of living and cooperating. Embedding high tech technologies in daily life should mean connecting them with social interactions of peaceful and meaningful actors. Scenarios can be very helpful in imagining future possibilities and future moralities.

Thirdly, in trying to *live happily with uncertainties*, we assume that we can afford some uncertainties with respect to our health and body. But how much can we afford? It is not an easy thing, because the uncertainties do not only comprise the relation between food and genes. They also indicate that the exact boundaries between food and drugs and between health and disease are to be rewritten. Consumers have to cope with new grey zones between food and medicine. As Hippocrates' adage "let food be your medicine" shows, there have always been unclear and sometimes fussy boundaries between the two, but because of the new opportunity of prevention based on nutrient DNA interaction there is now a new situation (Korthals, 2007). As Foucault makes clear in his history of sexuality, the adage of Hippocrates was never meant as a recommendation to let health be the only value of your life and to try to prevent risks as much as possible (Foucault, 1998). Foucault contrasts the dietetic method of living with one's fate with the therapeutic method of trying to prevent diseases against all costs. With respect to health the dietetic method of living would mean that as long as we are experiencing the certainty that we are healthy, we have no reason to fear having a risk for a disease.

More concretely with respect to the first type of uncertainty: Suppose that it indeed is structurally the case that foodstuffs have multiple effects on the body, that the boundaries between health and disease are unclear, and that indeed genes can have different (for humans positive and adverse) functions in interaction with their environment. In this case, reflections on individual responsibilities with respect to certain vulnerabilities people might have and how people with these vulnerabilities should act, do not have priority because it is possible that the supposed polymorphisms produce not only vulnerabilities, but also produce opportunities in the medical sense, of preventing against certain diseases, and in the non-medical sense, of being challenges. Moreover, the kind of health system people choose produces a different social environment and consequently elicits different functions of genes depending on that environment. Scenario building in the sense of imagining

these different environments with different relationship to genes can be illuminating in finding the moral sensibilities. The ethical question for many individuals is therefore what type of health systems according to which genomics innovations, products, and services should be developed.

With respect to the second type of uncertainty, for instance about how frequent polymorphisms that determine certain vulnerabilities, will occur, this issue will be used by some individuals or groups either to deny that they have these risks and for others to affirm these because they think it is in their advantage. In the third and fourth case of uncertainty, different scenarios with types of governance of genomics products and services can elicit different moral sensibilities and make deliberative participants aware of the morally relevant issues. The fifth uncertainty concerning the use of genomics to develop more effectively health improving products or as a purely marketing tool, will be definitely solved in the last direction when consumers and governments do not pay attention to this last possibility and develop an institutional framework for integer and transparent health claims.

The types of uncertainties can be made more bearable by developing future stories or scenarios involving different genomic developments. Imaginary futures constructed by artists can be helpful as well. Last but not least, deliberations between professionals and patients/consumers/citizen are needed to find out the balance of certainty and uncertainty people can live with. Or to say the same thing differently, to sort out in a deliberative way uncertainties that are relevant and ones that are of minor importance and look only relevant. The American pragmatist John Dewey called those deliberations “dramatic rehearsals” (Keulartz et al., 2004; McVea, 2007).

These strategies with regard to the uncertainties of nutrigenomics contribute to what since Jasanoff (2004) is called the co-production of science and society: “*co-production is the simultaneous production of knowledge and social order.*”(p. 5) Jasanoff makes it clear that producing technologies means addressing and resolving problems of nature and problems of society. Technologies embody natural and social concepts and strategies, which implies that they differ according to choices people make about how to live with technologies. Living happily with uncertain technologies is possible on the basis of co-production.

What implications does this have for consumers and their social context?

In this section we will concentrate on the implications for consumers; however, these are not to be conceived independently of any context, so we will also discuss the main agencies acting in this context although only with respect to their relationship with consumers.

Firstly, *citizen/consumers* could consider not taking part in the genomics products and services network. But it is not easy to get rid of nutrigenomics and refrain from applying it to obesity. In an age of massive intellectual, economic, and political investment in genomics, of a fundamental mismatch between foods offered and lifestyles and health

profiles, this would not be the best thing to do. What to eat in the new situation of living a long life under dominantly sedentary circumstances? How to re-establish a fit between our bodies and the world? It seems that consumer/citizens are in need of nutrigenomics for fine-tuning food in newly emerging lifestyles. With these new, mostly sedentary lifestyles, one simply does not know what is healthy to eat. Traditional recipes of what to eat are connected with lifestyles that cover a lot of physical labour, contrary to the present ones. Secondly, with respect to the strategy of selection, what the consumer needs is to get assistance in selecting the important from the unimportant uncertainties and products and services. This would firstly imply new institutions for education, consultations, and deliberations; secondly, producers and consumer groups should bridge the gap between production and consumption. Thirdly, consumers could ask the government for transparent and relevant regulations of health or quasi health claims (like “light”) that comprise the whole product, and not certain ingredients. Finally, consumers could ask the government for assistance in finding out the origin and quality of foodstuffs, with the aim of better participating and organizing contributions to public debates. This connects with the special status that consumer groups have; according to a recent Eurobarometer finding, they are in the food sector the most trusted source (33%).

In the context of consumers other stakeholders play a role. Governments and their agencies, scientists, and technologists, and companies working in the field of genomics can in several ways assist consumers to live happily with uncertainties. *Governments* can assist consumers by organizing the research agenda of nutrigenomics in a democratic way, not exclusively oriented towards personalized nutrition, but oriented towards the prevention of common illnesses, common conditions, and chronic diseases. There is a role to play for public health nutrigenomics, directed at general risk profiles. Governments should regulate the three sectors, food, drugs, and the new emerging grey zone, improve research ethics and medical testing of health foods, and allow only affordable health foods. Its main policy aim in nutrition policy should be the encouragement of the (in)formal ties by pleasurable eating. Health should be a secondary goal in eating (Korthals, 2004) and consumer groups should be empowered as stakeholders and be given a voice not only downstream nutrigenomics (with respect to the final products) but also upstream the nutrigenomics research agenda. To tackle the issue of easy consumers’ vulnerabilities to expectations and hypes, it is necessary to establish independent gatekeepers to safeguard the independency of testing, marketing, communicating, and providing the services of nutrigenomics. Trust of citizen-consumers in the food and health sector can best maintained by the establishment and maintenance of independent bodies of fixing and monitoring rules with respect to health and enhancement claims.

For *genomics researchers* assisting consumers these considerations would firstly imply that more attention is paid to research ethics and professional ethics, like in medical research. No publication should be considered in case of immature or in case of provocative but irreproducible/invalid research. Secondly, publication of research on a tiny detail

without context outside scientific circles should be prevented; the inherent complexity of nutrigenomics research implies that tiny detail research results should only be published in connection with the larger context. Thirdly, the huge complexities of the interactions between genome, genetic profiles, and environments, like diets and lifestyles reduces severely the possibility of reproducing experiments in other locations and with other populations, because food and lifestyles differ so much and are impossible to exclude (Sinha, 2005). Genomics is not about a single relationship between one single gene and its expression, but about the reactive genome, contextualizing on all levels. Food has multiple effects on the genetic profile, and is dependent on the food choices that again are influenced by lifestyle factors and ethnic diversity. It means that validation and falsification of causal relationships are confronted with extremely difficult and expensive research designs. One implication is that there is a good chance for fake claims and unrealistic expectations, of which the consumers have to be (made) aware by critical nutrigenomics researchers. Finally, conflicts of interests should be prevented. In general, scientists should not refrain from complex issues but try to communicate to the public the complexities (Hjorleifsson and Schei, 2006). Due to the fact that there is indeed a slight case for developing personalized nutrition, the exact proportion between research for public health and for personalized nutrition should be subject of public debate in which scientific input is urgently needed. The research focusing on common illnesses should not come into disarray, as the one for affordable and common drugs and foodstuffs. Making healthy foodstuffs easy to get for everyone remains an important challenge for nutrigenomics.

Nutrigenomics-producers acting according to Corporate Social Responsibility codes can give consumers some assistance in deciphering marketing slogans and claims. Secondly, companies should concentrate on common illnesses that are relatively easy to cure. Thirdly, public health measures should have priority above personalized care for a few. This implies also that the products and services should be affordable products. It requires that healthy food is made easy available and affordable. Thirdly, companies have a lot to win from cooperation with networks of consumer groups.

As we have seen, the complex relationship between food and genetic profile allows for various reactions of the body on food, sometimes positive, sometimes negative. Genes influence the expression of other genes in proteins and the organism and vice versa so the genome is not one, stable, all determining command post. Moreover, traditional truths on healthy foodstuffs, like wine, chocolate, vegetable oils, and milk, collapse. For some wine is healthy, for some it is not; first all—vegetable oils were seen as healthy, later not, etc. Still, we need serious research, i.e., validated results of nutrigenomics for fine-tuning food in lifestyles, although it will be difficult, because of these uncertainties and ambiguities, to incorporate the aspirations and results of nutrigenomics in our daily life, in adequate policy measures, and in ethically acceptable research agendas.

Future prospects and conclusion

Granted that indeed there is a role to play for personalized nutrition oriented towards health, one is faced with particular ethical issues in connection with the scientific peculiarities of nutrigenomics. Genomics' applications have an uncertain future; cognitive and normative uncertainties galore and "mistakes" and fundamental uncertainties are inevitable. A lot depends on the interaction between research developments, research priorities, prospects for profits and ethical concerns. It is unmistakably the case that a more personal appeal to customers of food and medicine to incorporate recent health standards into their food styles can have some effect. From this perspective, it seems ethically desirable that citizens/consumers learn to cope with the hypes, the (fundamental and relative) uncertainties of this new approach. They have to learn to deal with the most important (un-)certainties, which means that they have to sift the more important from the less important uncertainties. This implies not only room for informed choice, but also for consultations and deliberations on these uncertainties. Complementarily, from a public health point of view, the potentialities of nutrigenomics in improving the health of the population, in particular of the least well off, should be developed as well. This implies for governments that in certain areas they have to make tough decisions, like making clear distinctions between food, medicine, and a grey zone and subsequently doing a lot of regulatory work for this grey zone. Moreover, consultation is necessary with the public. Thirdly, governments should oversee that public health research and care should remain the most important share of the research agenda for nutrigenomics. Finally, the public should be involved in deliberating on upstream nutrigenomics development, not only downstream the services, products, and Biobanks (Burgess, 2007). All in all, individualized nutrition needs strong government. In situations of fundamental uncertainty, one is in need of mapping different arrangements of the interaction between genomics and societal developments. This requires non-traditional ethical perspectives, like deliberations, imaginary futures by aesthetic explorations, future explorations by scenarios of different moral screenplays, and dramatic rehearsals. Notions of consumer control and of informed consent are rather helpless in these situations.

3

The good life: living for
health and a life without
risks?

On the present script of
nutrigenomics

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Abstract

Like all scientific innovations, nutrigenomics develops through a constant interplay with society. Normative assumptions, embedded in the way researchers formulate strands of nutrigenomics research, affect this interplay. These assumptions may influence norms and values on food and health in our society. To discuss the possible pros and cons of a society with nutrigenomics, we need to reflect ethically on the assumptions rooted in nutrigenomics research. To begin, we analysed a set of scientific journal articles and explicated three normative assumptions embedded in current nutrigenomics research. Firstly, values regarding food are exclusively explained in terms of disease prevention. Health is therefore a state preceding a sum of possible diseases. Secondly, it is assumed that health should be explained as an interaction between food and genes. Health is minimized to quantifiable health risks and disease prevention through food–gene interactions. The third assumption is that disease prevention by minimization of risks is in the hands of the individual and that personal risks, either revealed through tests or through belonging to a risk group, will play a large role in health prevention. Together these assumptions suggest that the Good Life (a life worth living, with the means to flourish and thrive) is equated with a healthy life. Our thesis is that these three normative assumptions of nutrigenomics may strengthen concerns related to healthism, health anxiety, timeframes and individual responsibilities for health. We reflect on these ethical issues by confronting them in a thought experiment with alternative, philosophical, views of the Good Life.

Introduction

Genomics has brought a new field of nutrition research namely nutrigenomics. Nutrigenomics studies how food and nutrients influence gene expression, protein expression and metabolic production and thereby tries to understand how nutrition influences human physiology. Moreover, nutrigenomics aims to reveal how differences between the genotypes of individuals can cause variances in the metabolism that ultimately influence the health status of individuals. Nutrigenomics encompasses “omics” research, such as genomics, transcriptomics, proteomics and metabolomics (Corthésy–Theulaz et al., 2005).

Although a great deal of uncertainty still exists in nutrigenomics research (Corthésy–Theulaz et al., 2005) and although many scientists doubt if dietary advice or food products for individual genotypes will ever be possible (Arab, 2004), these new developments in food sciences are believed to have new ethical, legal, regulatory and social implications (Castle et al., 2007). Here we will argue that a set of normative assumptions is embedded in the way researchers (co)design strands of nutrigenomics research and that these assumptions may influence our everyday orientation towards food and health in various ways (Akrih, 1992). The aim of this paper is to explicate and reflect upon parts of the normative framework bound up in nutrigenomics research.

According to our view of scientific and technological innovations such as nutrigenomics, these developments are not neutral but contain norms and suggest policies. Moreover, innovations such as nutrigenomics co-evolve with social arrangements (Winner, 1986; Bijker and Law, 1993). This means that not only technologies change society because they invoke new social actions and behaviour, but that society also influences scientific and technological developments. Part of this co-evolution of society and science is evoked through the interplay between the representations of the scientists that work on the innovation and the ideas of the future users. On the one hand, innovators embed norms in their innovations on how their designs will be used. On the other hand, users shape innovations according to their visions and how the design is actually used. New scientific developments such as nutrigenomics, therefore, develop through a constant interplay between the different actors involved. The way nutrigenomics is presented and how this fits with the ideas of the end users form an important part of the interplay between the different actors. Within this process, norms and values may change, implying new moral dilemmas (Keulartz et al., 2002b).

We argue that actors envisioning and designing strands of nutrigenomics research make largely unnoticed assumptions about the role of health, food and genes. Some of these assumptions are about the norms and values of future nutrigenomics users. The interplay between these assumptions about food and health, and existing norms and values may change consumer perspectives on food, with the potential to reinforce existing social norms and values about food and health within a broader social political context or marketing context while other ideas about food and health change or disappear.

In this paper we discuss three normative assumptions underpinning strands of nutrigenomics research as we found them in current representations of nutrigenomics developments by scientific experts, food industrialists and health advisors. For this analysis, we first introduce the notion of script (Akrich, 1992). The idea that strands of research contain normative assumptions is based on this notion. Finally we compare the three normative assumptions with the philosophical ideas of what a good, i.e. meaningful and happy, life comprises.

The first assumption found in current nutrigenomics representations is that values regarding food are exclusively explained in terms of health. Health itself is narrowed down to disease prevention but, on the other hand, broadened towards an unremitting responsibility for active prevention. This conceptualisation is explained with the help of two contradictory images of end users. The second assumption suggests that health can and should be explained in relation to quantifiable risks. This notion holds the promise of control and the minimisation or even banishment of risks. The third assumption is that disease prevention by minimisation of risks is ultimately in the hands of the individual (although

perhaps on the basis of group membership), and that this kind of risk information should motivate personal health prevention. We propose that the three normative assumptions of nutrigenomics may strengthen concerns related to health anxiety, timeframes and individual responsibilities for health.

The notion of script

As previously mentioned, the idea that strands of research contain normative assumptions is based on the notion of script (Akrich, 1992). This concept helps to describe and to understand the interaction between technology and society during technological development. It considers more than the immediate function of technologies and describes the roles that technology plays in different “contexts of use” or, in other words, the roles that technology plays in physical and social environments. According to this perspective, technologies are part of a complex network of actants, which are both human and non-human factors such as people, tools, products, machines and money, all of which cause or shift actions.

Akrich (1992) argues that the creators of new innovations envision or “inscribe” what a network around a new technology will look like. She calls this vision a “script” and argues that through this script, technologies contain and produce a specific “geography of responsibilities” or determinants (Akrich, 1992). This means that while inventing and creating new innovations, developers decide what kind of actions a technology should prescribe for the actants involved and what kind of responsibilities it should delegate, and to whom or to what it should delegate these responsibilities. The designers also envision assumptions about the specific preferences, competences, motives, norms and values of the end-user. A very simple example is a potato chip designed in such a way that its fat is only partially digested. The assumption here is that consumers buy this type of low-fat potato chip because they consider it to be healthy.

The functioning of an artefact is, however, unpredictable (people may for example eat more potato chips). A script can be criticized and rejected. This critique and rejection may cause the technology to fail or its end users to redefine the original script. The negotiations between the designer’s visions of the proposed user and technology network, and the actual end-user and network will in the end produce the final script of the technology, and result in a network with unforeseen connections and responsibilities (Akrich, 1992). For instance, a functional food product on the market may not be exactly the product that a food producer envisioned, but the product can be seen as a compromise between the capability to measure health, legislation, law enforcement about health claims and safety, consumer values concerning what a product should encompass, and consumer behaviour.

The notion of script can be used to understand and assess the development of not only new products (Verbeek, 2006), but also innovations such as genomics (Williams-Jones and Graham, 2003). Also within nutrigenomics research a script including assumptions about how people will use its knowledge or products in the future is embedded in the way

the research is framed and its goals and function for society are formulated. This involves implicit assumptions about morality, technology, the science economy and its end users. Here we will focus on issues of morality embedded within nutrigenomics, especially in relation to the role of food and health in our society.

Although the way the nutrigenomics script gets shaped in the end is not predictable – since users, and economical, moral and technological developments outside nutrigenomics can play a role – analysing the already existing script gives us insight into how the script may influence norms and values in our society and vice versa. This can be done by studying how normative assumptions embedded within representations of nutrigenomics diverge from or correspond to norms and values of the possible end-users and network, how norms and values may have to change to merge or resist the script, or how these normative assumptions strengthen already existing norms and values within society. Here we will take the first step in an ethical assessment of nutrigenomics by making some of the normative assumptions of the current script of nutrigenomics transparent and available for moral deliberation.

We will explicate three main normative assumptions within an existing nutrigenomics script as it is envisioned by main representatives of nutrigenomics. The script that we have analysed encompasses the same assumptions about life, health and disease, but some exhibits a different emphasis on what an individual should do to live a healthy life. Nutrigenomics is still in its early development and its network is not yet fully shaped. At present there are different and sometimes contradicting visions about the role of the consumer in the network around nutrigenomics, and where relevant, we will devote attention to these differences (Williams-Jones and Graham, 2003).

Method

We conducted a literature survey in order to find out more about the script of nutrigenomics research. In this survey we were primarily interested in the choices made within research by framing research goals and defining nutrigenomics. Additionally, we looked at the meaning of nutrigenomics for society and consumers. Note that our goal is not to analyse the motives of researchers but to unravel the underlying normative assumptions in the choices that are made within nutrigenomics research. To this end, we searched Google Scholar, Scopus and Web of Sciences for articles containing the words nutrigenomics, nutrigenetics or nutritional genomics written between 2000 and 2007. We selected articles about nutrigenomics research that were cited more than 15 times. Apart from the script within nutrigenomics research, we were also interested in scripts of intermediaries, such as the food industry, dieticians and research programs to find out more about the role of the consumer and society within nutrigenomics.

We tried to find patterns in the assumptions made within definitions and aims within nutrigenomics research and will present excerpts of articles that reflected these patterns. Definitions, aims and descriptions of processes and phenomena all contain choices about what should be studied within nutrigenomics research. These choices also imply choices about the way nutrition should be viewed by the consumer. Secondly, we tried to find patterns in descriptions of society and consumer. Our search resulted in descriptions of health, disease, society and the consumer. Most of the fragments we used could be found in the introduction and discussion of the articles. Our analysis provides a grounded indication of current, largely unnoticed and taken-for-granted assumptions that deserve further attention, both in research and societal debate.

Three normative assumptions of nutrigenomics

The strands of research of nutrigenomics

Before starting the analysis, we first outline the four research strands that we distinguish within nutrigenomics research. All strands of research focus on the relationship between food patterns, the genome, and health risks (susceptibilities), but they aim to give different applications.

Three of the strands attempt to offer information that can help find susceptibilities for lifestyle-related diseases of individuals and groups. The first strand tries to gain risk information by DNA-tests (Ordovas and Mooser, 2004). The second concentrates on the relationship between ethnicity, genome, and susceptibilities (Kaput, 2005). The third strand of nutrigenomics research aims at developing new diagnostic tools to detect changes in homeostasis in an early and still reversible stage with the help of genomics, metabolomics and proteomics tools (Kaput et al., 2005). The information about susceptibilities found within these strands of research can be used to adjust diet and to make lifestyle changes. The fourth and final research strand studies the influence of nutrients on genome level and tries to create foods especially tailored to individuals or groups with certain needs or certain lifestyles, and functional foods that improve health or other characteristics or capabilities such as the ability to focus (German and Watzke, 2004).

The healthy life is life without disease

The first assumption that the nutrigenomics articles draw upon equates the healthy life with a life without disease. This is assumed in the way that health and disease are described, and the crucial role that eating has in generating a healthy state. Figure 1 and Quote 1 show a similar construction of health and disease within the script of nutrigenomics. Essentially, health and disease represent two extremes of a continuum. Unhealthy foods cause metabolic stress and disturb the homeostasis or balance in the body, pushing health into a grey zone that can be seen as a pre-disease state where a person is at risk of becoming ill. Over time, the balance becomes more and more upset until the damage is irreversible

and a pathological state can no longer be prevented by healthily eating, but can only be treated pharmaceutically. This representation of the relationship between health and disease reduces health to ‘the absence of disease’ in which unhealthy eating is an important determinant of a shift from the health pole to the disease pole.

Quote 1

The shifting balance between health and disease states involves the complex interplay of genes and the environment, which includes diet. (Kaput et al., 2005).

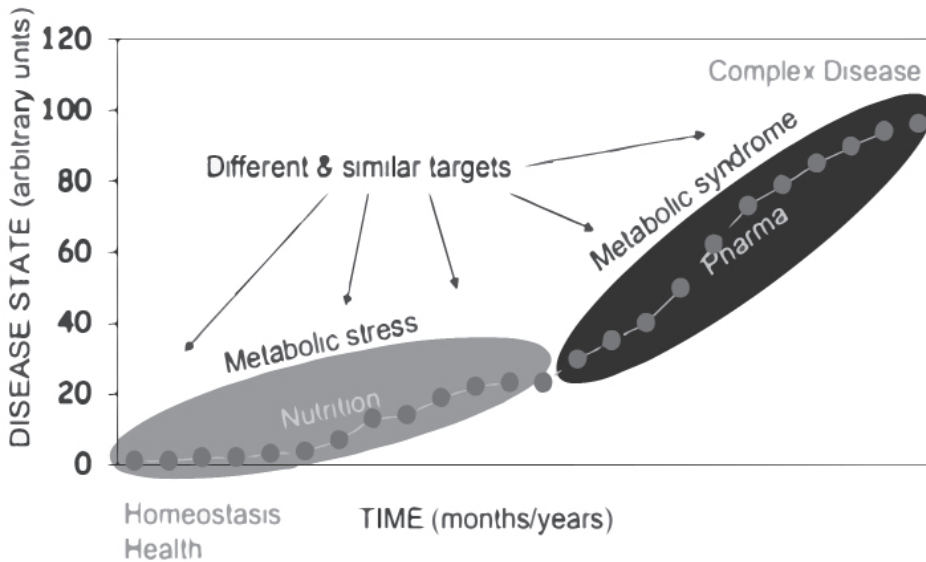


Fig 1 Explanation of how multifactorial polygenic diseases such as the metabolic syndrome may develop and how in the earliest phases nutrition is crucial in preventing disease pathology (Afman and Müller, 2006).

A life without disease for as long as possible is presented as the ultimate objective in the aging American society by this article for dietitians. Quote 2 claims that the healthy life is the right path, something that “we” naturally strive for, which will allow us to “die young as old as possible,” meaning with as few diseases as possible. By framing it as the right path, striving for healthy, disease-free living is constructed as a moral obligation.

Quote 2

The social implications of more people living longer revolve around quality of life, health status, and resource requirements of an increasingly aged population. With a focus on and adequate resources available to implement prevention-oriented, life cycle approaches that successfully reduce risk, delay chronic disease onset, and mitigate nutrition-related morbidity in disease, it should be possible to achieve the desired outcomes. To bring this about, we must think about nutrition and other

preventive measures early and often. The ultimate objective is to achieve more years of life with minimal years of compromised health. We do this *by starting on the right path, staying on the right path, and dying young as old as possible*. This is the *best way* to live to 100. (Dwyer, 2006)

Within this framework, two contradictory images of the consumer were constructed In Quote 3, food industry representatives claim that people should gain knowledge about what is healthy and what is unhealthy. Here, the consumer is a knowledgeable and disciplined individual who has the power and the responsibility to follow the right (healthy) path.

Quote 3

Consumers must recognize that they will become more empowered to improve their existing health and their prospects for future health but will also need to take responsibility for pursuing self-knowledgement. (German and Watzke, 2004)

Taken from an article outlining a European research project that studies the link between genes, obesity and lifestyle, Quotes 4 and 5 suggest that people are not able to resist all the pleasurable unhealthy foodstuffs around them and should therefore be helped by changing their food environment. To benefit the consumer, science and industry need to develop products that are tasty but not fattening. These products may be adapted to personal differences in taste perception by increasing a feeling of satiation and by adding chemicals that resemble, for example creamy or fatty taste sensations.

Quote 4

Whilst there is considerable genetic variance in individual susceptibility to obesity, the current obesity epidemic is significantly influenced by adverse lifestyle factors. Given our general genetic background, it appears very difficult for humans to self-regulate food intake under current environmental circumstances. This worrying trend has challenged the scientific community to expand its research efforts using a wide variety of innovative approaches. (Saris, 2005)

Quote 5

It is possible that differences between consumers in taste perception (i.e. sensitivity profiles to specific tastants) may influence development of satiation and food intake behaviour....Findings about triggers for satiation will then facilitate the tailored development, and prototype production, of new food products. (Saris, 2005)

Some reflections on the healthy life as a life without disease

The underlying script of these representations of health and the role of the consumer therein shave problematic characteristics. Defining health as the absence of a disease, makes striving for health problematic. In view of the number of diet-related diseases, the pre-disease state is therefore a state in which not one disease but a sum of diseases

is contained and prevented. An individual's health can always be threatened by a disease that the individual has not been previously exposed to, and new diseases are constantly emerging, so as one disease is delayed or prevented, the next may be already on the way. Consequently, maintaining a healthy state becomes an on-going responsibility.

Although food naturally plays an important role within nutrigenomics, framing it in relation to maintaining a healthy state brings about a second problem. By focussing on prevention of disease through food, health becomes to a large extent a main concern of everyday life. Food plays such a tremendous role in our lives (Fischler, 1988; Chamberlain, 2004) (a person needs to eat several times a day) that eating logically demands constant attention. Therefore, attaining a state of health through foods requires constant attentiveness expressed in exhibiting the right dietary behaviour. When one considers that controlling disease and health pharmaceutically is generally restricted to a specific point during the day, we can conclude that diet has an even greater impact on a healthy state than medicine. Healthy living in the sense of staying disease-free through foods thus forms a distinct element of everyday life.

We have seen that there are two different constructions of to whom and how responsibilities for this representation of a healthy life can be attributed. In both cases, the suggestion is that a healthy state is strived for in order to suit the consumer's needs, but one representation assigns responsibility to the consumer, thereby making health a substantial duty in life, while the other attributes responsibility more to the collective, the industry and science. Both push healthily living into this everyday existence, although they do this in two different ways.

German and Watzke (2004) envision a consumer that should become "empowered" to lead a healthy life through nutrigenomics. Consequently, their representation implies that the consumer is responsible for a healthy life. Taking the earlier observations about food into consideration, German and Watzke's vision of the consumer automatically intimates that health will form a large part of life with less time for other aspects. The healthy life can therefore only be achieved when the individual organizes his day around healthy food and lifestyle.

Saris (2005) envision a consumer that is simply incapable of dealing with all the temptations around him, and therefore his food environment needs to be changed. This representation suggests that the time and effort needed to achieve the healthy disease-free life comes from producers, food innovators and scientists. The burden of responsibility is taken away from the consumer by simply making products healthy and by copying the taste of unhealthy tempting products. Although in this model, attaining health seems less time-consuming for the individual and some responsibility is taken away, this vision of the consumer also has significant implications for everyday existence. Making drastic changes in the food environment changes the meaning of food. Food has many more meanings than simply its significance in terms of health. It is connected to ritual, symbols, and belief systems.

Food binds people to their faith and to others (Korthals, 2004). Food is also part of an individual's identity. It shapes group membership or sets groups apart in terms of ethnicity, race, nationality, class, individuality and gender. If food is only produced with a view to health, or more specifically, with a view to disease prevention, these other meanings may be lost (Meijboom et al., 2003; Korthals, 2004). Furthermore, changing the food environment raises issues of free choice, especially since food is traditionally a part of our identity and culture.

Health is quantified risk minimisation

Another assumption in the script is that instead of searching for cures for diseases, diseases can be prevented with the help of nutrition before any detrimental effects can be identified. Risks can be reduced or eliminated by changes in diet. To achieve this, methods need to be developed or improved to measure the health state of the body and to calculate health risks.

Quote 6 asserts that nutrition should primarily focus on health and disease prevention, and consequently genomics-based biomarkers are needed to detect the pre-disease state. The goal is to measure the “grey,” or pre-disease, zone. The ultimate aim is to estimate disease risk. Health is therefore constructed as a state that can be measured and subsequently dealt with in the form of adequate risk management through food.

Quote 6

[lines omitted] ...nutrition should focus primarily on health and disease prevention and be complementary to pharmacological therapy, which targets the pathophysiological aspects of disease. To realize this goal, new genomics-based phenotypical biomarkers are needed that allow early detection of the onset of disease, or ideally, the predisease state of the metabolic syndrome, a condition referred to as metabolic stress [lines omitted]... Ultimately, the aim is to extrapolate findings from studies with mice and cells to human beings, where the impact of the genotype must be taken into account in order to *estimate the disease risk related to dietary stress*, overweight, and obesity. We will discuss strategies that use nutrigenomics to answer nutrition problems. (Afman and Müller, 2006)

Quote 7 presents a similar idea. While still presented in terms of ambitions, accurate predictions of health effects are framed as a precondition for staying or becoming healthy. Both the quantification of the disease risk and the promised accuracy of the predicted health effects suggest a sense of control over the individual's health once this data is within reach.

Quote 7

An ambitious challenge for the next decade is to translate this type of nutrigenomics data into *an accurate prediction of the beneficial or adversary health effects* of dietary components. The main goal is prevention of diet-related diseases. (Müller and Kersten, 2003)

Quote 8, excerpted from a scientific paper sponsored in part by the food industry, refers to the fact that risks can be altered and managed by diets and dietary components. Optimising health by gaining risk information is primarily a technological problem that needs to be resolved. The whole process of processing data and translating this information into dietary advice is displayed as a very “attractive aspiration”.

Quote 8

It is enticing indeed to imagine that a drop of blood could be *rapidly analyzed for its comprehensive metabolite profile*, uploaded into software capable of comparing this profile with those present in a massive database, and return information enabling a physician to make dietary recommendations to optimize health; however, several important points must be resolved if we are to achieve such an attractive aspiration. (Mutch et al., 2005)

While epidemiological studies had already introduced the notion of risk prevention by food before nutrigenomics, nutrigenomics goes a step further and presupposes that these risks can be accurately measured in relation to certain foodstuffs and genetic profiles. The script thus presents health as a technological problem waiting to be resolved.

Some reflections on health as quantified risk minimisation

First of all, the assumption that ‘health’ can be split up and translated into predictable and alterable risks seems a utopian idea. Nutrigenomics itself has already revealed contradictory messages about food. One foodstuff can be healthy for the heart but detrimental to other organs. For example, beta-sitosterol, which is found in soy and coconut oils, competes for cholesterol uptake in the intestine, but it is also converted by gut microflora to androstenedione, a precursor to oestrogen. Because it decreases cholesterol uptake, beta-sitosterol might benefit heart health. However, it is also proposed that the level of oestrogen resulting from beta-sitosterol’s conversion is a risk factor for breast cancer (Kaput, 2005). It can be expected that more foodstuffs with contradictory health messages will be discovered in the future. As such, a perfectly healthy life and diet becomes utterly complex and essentially unachievable; while a person anticipates on one risk, and this particular risk may be delayed, it may be substituted by another weak point in the body – a new risk on which one needs to anticipate. Needless to say, this delay–new risk scenario may become a vicious circle.

Secondly, controlling homeostasis in the body, calculating risks and performing risk prevention on this calculated basis is a very narrow definition of health. If this narrow ‘risk’ definition of health in the nutrigenomics script is compared to the notion of health that is promoted by one of the most important drivers of health promotion nowadays: the World Health Organisation (WHO), the script only partially corresponds with this notion. The WHO redefined health as quote 9 shows.

Quote 9

....not merely the absence of disease but the total physical, psychological and emotional wellbeing of individuals... (World Health Constitution, 1946)

Recently, the World Health Organisation added a wellness dimension to health promotion (Hayden et al., 2001), which is the optimal state of health of individuals and groups. The optimal state of health has two focal concerns: the realization of the fullest potential of an individual – physically, psychologically, socially, spiritually and economically –, and the fulfilment of an individual’s expected role in the family, community, place of worship, workplace and other settings (Smith et al., 2006). The meaning of health compared to the notion of health of the WHO is rather limited.

Nutrigenomics may decrease a feeling of well-being because of its focus on risk prevention and its emphasis on increasing risk by eating the wrong foods. This focus on risks may strengthen anxiety early in life about the link between risk of disease and food. Risk information about food, in particular, may increase anxiety because of the contradiction of the necessity of food and the risks that it imposes (Chamberlain, 2004). Moreover, because of the pleasurable nature of food this risk information may increase feelings of guilt if an individual fails to meet the “health standards” (Holm, 2003). Since nutrigenomics will not only reveal more health risks but will also suggest that health risks associated with certain diets can be accurately measured, and for that matter, controlled, it may make health standards even more problematic than former health messages in relation to food.

A final concern is the formation of new time regimes. According to Hans Harbers (2006), the focus on future risks may absorb the pleasures and concerns of the present. Taking seriously the present script of genomics implies that time is no longer cyclic or linear. The distinctions between the future, past and present are blurred. Where an attitude of “time will tell us” and “let fate take its course” was normal about future health and disease, nutrigenomics makes it possible and desirable to deal with possible future problems at this very moment. Harbers argues that the separation between past, present and future has an important function in making it possible to deal with everyday life. Nutrigenomics is a possible spoil-sport in this respect (Harbers, 2006).

Health is personal risk minimisation

Food scientists have traditionally used averages to calculate what is healthy and what is needed to stay healthy. By contrast, the nutrigenomics script assumes that the dietary needs to sustain this healthy stage differ between populations, (ethnic) groups and individuals. Nutrigenomics thereby focuses on differences in diet-related health risks between different (ethnic) groups or populations and individuals based not only on genetic research and testing but also on diagnostic tools from proteomics and metabolomics. Nutrigenomics thus assumes that health needs to be seen in terms of personal risk minimisation either by knowledge about groups or by diagnostic and genetic tools.

The following two fragments illustrate the idea that the consumer will become healthier through health advice and special functional products based on certain genetic susceptibilities. Quote 10 from the nutrigenomics scientists Ordovas and Corella (Ordovas and Corella, 2004) focuses on ethnic groups and on improving their health by gaining knowledge about genetic markers within these groups. Quote 11, from nutrigenomics scientists Afman and Müller (2006), shows another variant of the script. The quote shows that nutrigenomics aims to improve health with the help of special food products for groups and populations that can be identified by genetics tests.

Quote 10

The current hypothesis is that the dramatic increase in morbidity and mortality due to cardiovascular disease and other age related diseases that the world population has been experiencing during recent years is due in part to the higher frequency of deleterious alleles that predispose certain ethnic groups to be especially sensitive to the influence of environmental CDV risk factors, such as diet and a sedentary lifestyle. Therefore, elucidating such ethnic-specific genetic markers will be important for efficacious prevention of chronic disorders in countries undergoing Westernization of lifestyles. (Ordovas and Corella, 2004)

Quote 11

Can food products be tailored to promote the health and well-being of groups in the population identified on the basis of their individual genomes? The potential is there and exciting new developments are unfolding. (Afman and Müller, 2006)

In addition to the assumption that health can be best sustained by measuring personal risks either through genetic testing or through risk group membership, it is assumed that the end-user wants to know his personal risks. The idea is that when people know their personal risks, they are more inclined and empowered to change their lifestyles. Interestingly, this contradicts our earlier observation that some nutrigenomics scientists believe it impossible for individuals to adopt a healthy lifestyle in a society full of temptations. Quote 12, again from Moskowitz et al (2006), illustrates the direct link that is made between (quantified) knowledge about a personal risk and the drive to act upon it:

Quote 12

Each individual, of course, is interested in his/her own cholesterol level, and far less interested in the population mean. To make this knowledge actionable, each person must know how his/her own cholesterol relates to his/her particular health and risk of disease. Once known, the individual consumer can then take a variety of actions to change his/her own personal metabolic status in terms of cholesterol quantitatively assessed. (Moskowitz et al., 2005)

Some reflections on health as personal risk minimisation

In practice, it is questionable if personal risk information, either directly acquired or inferred from group membership, will indeed trigger changes towards a healthier diet, even if people are open to this kind of information. Food studies show that people experience a dissonance between informing themselves about healthy food and enjoying the pleasure of an abundant food supply. People tend to connect healthy eating with eating less and with less pleasurable food. While the overall risk may be accepted, the personal relevance is easily denied. This strategy helps people to accept health information without being forced to change behaviour (Simons and Katrin Lensch, 2006). The assumption is that such an escape route is no longer available if an individual receives personal risk information. Apart from the fact that this assumption reflects a (too) simplistic notion of change in human behaviour (Bouwman et al., 2008b), it also remains to be seen if people are still open to personal risk information on a large scale if this implies that they have no choice but to accept the health information and act accordingly.

While the focus in nutrigenomics has gradually shifted from individual to group profiles, the implications in terms of risk prevention are still personal, albeit on the basis of group membership. Advice based on group instead of personal information may be more — rather than less — problematic, both in terms of efficacy and legitimacy. Not only is this membership imposed rather than self-chosen, but the information on which health advice is based is also general rather than strictly personal. This aspect of the information offered may undermine rather than support such advice.

Furthermore, knowledge of belonging to a certain risk group — while providing possibilities for escape — can also evoke associations of social pressure, especially when the risks are evident for the outside world. An illustration of this phenomenon is the situation of women who are visibly pregnant and are refused hard cheese in some restaurants in the Netherlands because of the possibility that it contains traces of soft cheeses that may endanger their pregnancy. These restaurants are not willing to take the responsibility of serving the cheeses to this group of women. The example shows how the social environment (and probably the fear of liability) forces these women to behave in a certain way.

It is doubtful whether such a situation is desirable. Measuring health in terms of personal risks strongly implies that a person should be interested in his own risks. Advice easily becomes a social norm that prescribes that, depending on their personal risks, individuals should not spoil themselves with unhealthy food and lack of exercise. Indulgent behaviour is punished with a disease or, for instance, higher insurance costs. The danger is that such a script presupposes an individual who knows his personal risks and acts upon them as the only responsible citizen. The outside world may then put pressure on individuals who do not act “responsible” – see our example with pregnant women. While this action may be seen by many as an unjustified intervention into the personal sphere, it also implies that, in the end, responsibility is only attributed to the individual actor.

The healthy life is the good life

To summarize, the script that scientists and food advisors use for nutrigenomics draws on three different but related assumptions. First, a healthy life is a life without a disease. This healthy life can be achieved either by creating a “healthy” market that protects consumers from the temptations of unhealthy foods or by providing personal risk information that empowers them to make the healthy choice. In both cases, the suggestion is that a healthy state is strived for in order to suit the consumer’s needs. A second assumption is that health can be conceptualised in terms of risk minimisation. A last assumption is that risk prevention is first and foremost a personal matter, both in terms of motivation and in terms of responsibility and accountability.

We argue that these assumptions, taken together, suggest that striving for health is one of the most important goals in life. Therefore this suggests that the healthy life equates to the good life. We have seen that once food is related to health only, striving for health can no longer be isolated from daily life because of the everyday nature of food. This is especially problematic because of the narrow definition of health that nutrigenomics suggests. Contradicting health messages about food-related health risks could cause anxiety early in life and the emphasis on maintaining a disease-free state causes an unremitting responsibility for maintaining health. Even though the vision that nutrigenomics empowers the consumer to live healthy and the vision that the consumer is incapable of dealing with his food environment suggest different attributions of responsibility for this healthy life, both imply that perfection in healthy living should be achieved. Nutrigenomics may increase the tendency in society to overestimate the significance of health in a narrow sense. Because of the obvious importance of food, nutrigenomics is something that has the capability to change our everyday existence tremendously, and accordingly it occupies a prominent place in this trend.

Health may become a social norm to which everyone should comply. Achieving this norm may become so demanding in terms of time that individuals have no time for other activities. This concern was first raised by Crawford (2006) in the 1980s. Crawford used the term *healthism* to describe this phenomenon, suggesting that health had become

a “super-value,” meaning that the health concept absorbed everything in the personal search for well-being or wellness: the pursuit of the good life was changed into a quest for health (Crawford, 2006). The idea of health as a super-value makes health an absolute standard. The failure to achieve or strive for health is then seen as a failure to embrace life. The quest for health becomes such a demanding individual responsibility that the individual hardly has time for any responsibility beyond personal well-being.

Besides the fact that an equalisation of the good life to the healthy life causes people to neglect responsibilities other than striving for health and wellbeing, other philosophers and sociologists suggest that such a search does not increase overall well-being (Achterhuis, 1988). For example, Callahan (1995) and Achterhuis (1988) fear that aiming for a healthy life is actually a desire for a longer life. They argue that if people strive to live as long and as healthy as possible, their needs can never be fulfilled; people will always desire an even longer and healthier life. While science and society may never be able to answer to this perceived ideal state of health, people will continue to chase more and more expensive health solutions in an attempt to achieve it. A person or society pursuing such an unattainable goal will be disappointed. There are indications that in some areas, the availability of medical services leads to a decreased feeling of health with declined satisfaction with personal health. Some argue that unrealistic expectations of medicine’s influence on subjective health, well-being and quality of life play a role in this diminished satisfaction. In short, medicine could be giving the illusion that people can live without disease and symptoms and with both physical and psychological well-being, resulting in an overall dissatisfaction with health (Barsky, 1988; Greenhalgh and Wessely, 2004). If this is so, nutrigenomics may be a never-ending hunt for healthier foods. Or, if nutrigenomics helps to improve our health, our opinion of what is healthy may change and our thirst for increased health may still persist. The focus on health in nutrigenomics and the promise of a healthy feeling may cause a similar feeling of discontent in people, especially when significant effort is required for living healthily through diets and special food products. As we have seen above, striving for a narrow meaning of health as represented in the nutrigenomics script may compromise a feeling of overall well-being even more. We have seen that feelings of unease about contradicting messages and guilt feelings associated with the pleasurable nature of food might be problematic.

In short, equating the good life with the healthy life, as the totality of assumptions within the nutrigenomics script suggests, seems problematic. Moral theories of the good life may open our minds and suggest different scripts of health and its potential contribution to a thriving existence.

Alternative scripts of health in the good life

Since the ancient Greeks, many philosophers have argued that it is typically human to ask questions such as: “What do I want out of life?” “What is the meaning of life?” and “What makes life worthwhile for me and others?” The common thread running through concepts of the good life is that human life is only worthwhile if its meaning is examined in terms of values and if these values are then used as guidelines and perspectives for living (Graham, 1990). In short, humans should examine what they really want, taking into account their abilities, talents, networks, interactions and changing vulnerabilities as time passes in order to have a good life. As such, the idea of the good life covers not only issues of living in a decent, just or moral way together with other people, but also issues of “human flourishing” in which people strive to let their personal excellences bloom in order to reach what the ancient Greeks called *eudemonia*. According to Martha Nussbaum (2001), who comprehensively studied historical and systematic functions of the good life, *eudemonia* meant to the Greeks in ordinary discourse to “living well and doing well”. According to this definition, the idea of the good life involves both social aspects and an individual, personal take. The training of human excellences also needs external sources to receive the actions representing excellence (for example, generosity involves giving to others). Therefore, *eudemonia* can also be seen as something concerned with the well-being of the community and future generations (Nussbaum, 2001) and is therefore used in philosophical reflections on ecological and social challenges such as environmentalism and consumption (Crocker and Linden, 1998). Other critical studies are dedicated to examining the role of modern technology in an updated concept of the good life (Higgs et al., 2000).

Ideas of how to live the good life vary widely. Some philosophers argue in favour of happiness (e.g., Epicurus and John Stuart Mill), while others emphasize religion or philosophical meditation (e.g., Plato and Aristotle), and still others advocate a life of passion (e.g., Nietzsche). We would like to examine at least two longstanding and well-established ethical approaches of the good life and the role of health: the deontological approach and the virtue ethical approach.

The deontological approach values the intention that a person has to fulfil his duties over the consequences of a person’s actions. Deontology is focused on the question of how a person should lead his life. The good life is a moral life, i.e. a life in which a person acts out of good will and not out of the consequences of his actions. Rationality makes it possible for an individual to know his duties and the right thing to do. Kant’s categorical imperative “Act only on a maxim by which you can will that it, at the same time, should be a general law ” (Kant, 1949; Ree and Urmson, 2005) is the law that guides a person to make the right decisions and perform the right actions. According to this law healthily living and following a healthy diet seems rational. Obviously, leading a life and following a diet that will cause disease is not something that you would want to be a general law. However, if this rule is put into a broader perspective in which pursuing health and

following a healthy diet becomes complicated and time-consuming, and causes people to worry about the future, matters change. Other duties, such as caring for others, might be given a lesser priority. Leading a life in which one is concerned with one's own wellness in a selfish way is not something that one would wish to see become a general law. In essence, in the deontological ethical approach pursuing health and following a healthy diet is an important duty, but one that should be in balance with the other duties that a person has in life.

Within the virtue ethical approach, life's ultimate goal is to reach the state of eudemonia, which means flourishing or happiness. To live the good life, people need to let their personal excellence bloom (Ree and Urmson, 2005). Health only plays a subordinate role in this view. Health is merely a tool that is necessary to pursue the goals that lead an individual to eudemonia. Too much attention to physical health would only distract a person from the development of his virtues. When a person loses external functions like health, this may hinder the individual's reaching eudemonia, but it may also cause a person to let certain virtues bloom. For example, when a person suffers, he can still be generous, noble and courageous. Thus, in essence health is only a means to allowing some virtues to flourish and should not be an end in itself. Along the same lines, a healthy diet is only important in making an individual happy and facilitates the pursuit of certain virtues.

In the foregoing, we have seen that according to the deontological ethical and virtue ethical approach, health should be in balance with other duties and values or should only be a means to leading a virtuous life. This means that nutrigenomics should at a minimum enable us to balance health with other aspects of food and life.

Conclusion

The goal of this article is to make explicit normative assumptions of an important present script embedded in nutrigenomics research. We have seen that this script assumes that the pursuit of health is a crucial goal in life and that such a pursue can have negative aspects, especially when health is reduced to risk management. Moreover, according to two important ethical perspectives of the good life, an excessive concern with health does not contribute to a good, ethical life; these require that nutrigenomics allow health to be in balance with other aspects of food and life.

The present script embedded in nutrigenomics research is obviously not the only development that might help shift our norms towards a view that equates the healthy life with the good life. For example, within policy circles the healthy life is frequently promoted as the good life. The reason for this focus is not only the protection of individuals against future diseases, but also the prevention of possible future economic difficulties in EU countries due to the rapidly aging population (Rauch-Kallat, 2006). Ignorance of the underlying assumptions of the present script in combination with other forces within our society may reinforce the idea that health is overly important in comparison with other values. This, however, implies all the disadvantages that are discussed in this paper.

We do not intend to claim that preventing misery and disease through healthy diets should not be promoted. What we principally intend to argue is that the vision of life in which pursuing health is the dominant motivation is just one vision of what the good life means. If this is not discussed, and we as a society just “go with the flow” of present normative assumptions of technology development, this would eliminate vital aspects from the sphere of public discussion, choice and politics (MacKenzie and Wajcman, 1999). Furthermore, we may lose a rich and diverse society with a variety of interpretations of the good life. Consciousness of the diversity of meanings of the good life and an open discussion about the possible integration of other visions of the good life in a new nutrigenomics script would be an appropriate means of addressing the spheres of public discussion, choice and politics and help co-shaping nutrigenomics in such a way as to enable it to incorporate alternative normative assumptions about health and nutrition in nutrigenomics.

Food does, of course, have an important role in maintaining the functioning of the body. Studying how this happens and how diets affect this functioning is one of the very fundamentals of food sciences. Logically, health is very important within nutrigenomics research. So how can nutrigenomics researchers make sure that nutrigenomics developments stay open to alternative views of the good life? How can alternative normative assumptions play a role within nutrigenomics research? One way would be to broaden some of the already existing alternative scripts within nutrigenomics. As quote 13 shows, in some representations of nutrigenomics research attention is given to local- cultural aspects of eating, although these aspects still seem to be treated in the light of controlling and surveilling a healthy life in the narrow sense (Kaput et al., 2005)

Quote 13

In addition to accurate food intake information, databases are needed on the macro- and micronutrient content of local foods, a challenge for the diverse cultures and diets throughout the world. (Kaput et al., 2005)

Attributing a more dominant role within nutrigenomics research to cultural facets would not only help protect other meanings of food than health, it will also open up the possibility of more and more diverse scripts. Paying more attention to cultural aspects may protect the other functions of food referred to earlier, such as how food helps to bind people together, shape their identity, and give pleasure in life. Broadening these research strands would acknowledge the importance of balance between different values, duties and priorities in life besides health. Moreover, by actively embedding different normative assumptions within its scripts, nutrigenomics will help to contribute to more diversity in the meaning of food and health within our society.

4

The role of genes in talking about overweight: an analysis of discourse on genetics, overweight and health risks in relation to nutrigenomics.

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Abstract

This study examines whether the assumptions embedded in nutrigenomics, especially the alleged relation between information about personal health risks and healthy behaviour, match with how people account for the relation between food, health, and genes in everyday life. We draw on discourse analysis to study accounts of overweight in six group interviews with people who are and who are not overweight. Results show that explicit “gene talk” is interactionally problematic whereas less overt genetic explanations for (over)weight such as “build”, are treated as less contentious. Furthermore, healthy behaviour appears an accountable matter in interaction. The results implicate potentially contradictory normative orientations towards behavioural explanations of (over)weight on the one hand, and being relaxed about possible health risks, on the other. It is discussed how bringing these interactional concerns to the surface is essential for understanding future users’ response to nutrigenomics and emergent technologies more in general.

Introduction

New technologies are envisioned and produced in ways that embed certain assumptions, for example with regard to future users’ competencies and ideal usages of the proposed innovations (Akrich, 1992). To take the role of users into account, programmes from a constructive or real-time Technology Assessment perspective (Guston and Sarewitz, 2002; Oudshoorn et al., 2004) aim at integrating developments in natural science and engineering with insights from social science from the outset (Schot and Rip, 1997). The presumption is that early user-involvement in technology development furthers the domestication of technologies (Silverstone and Hirsch, 1992), i.e. the incorporation of technology into the everyday lives of users. Scenarios, questionnaires, qualitative interviews, and observation methods provide for anticipated evaluations of a future technology or evaluations of already developed or partially developed technologies in different user contexts. But future technologies do not allow for easy assessment. Research into participants’ needs, expectations, and desires regarding future products is hampered by the fact that these needs are often not clear-cut and readily available. Even the use of prototype applications of the technology starts from the assumption that an individual knows or is able to predict his or her needs and desires, thus requiring an imagination, commitment, or investment that is often not there – at least not yet.

This paper focuses on nutrigenomics-related technologies and therapies as a high profile and rapidly developing research area on the relationship between health, food, and genetic differences. Our presumption is that new technologies interact with everyday problems and concerns that, to a large extent, already exist but often have gone unnoticed, including by (future) users themselves. These concerns are normally not technology-imbued or, rather, will predominantly not be constructed as such by users; but they may be a decisive factor in whether or not technologies in a particular environment will germinate. A

major advantage of analysing current concerns is that they do not allow for the kind of detachment and aloofness that characterize the reflection on future worries and desires. Moreover, our approach enables us to map accounts and concerns that are typically so self-evident and implicit that they are often overlooked.

The aim of this study is to help gain insight into the extent to which there is a match or clash between assumptions incorporated into the technology and socio-interactive practices embedded in everyday life. In the present context of nutrigenomics-related technologies, we focus on how participants account for problems in the domains that these technologies supposedly affect, namely issues of overweight, the role of genetic susceptibility therein, and participants' ways of coping with lifestyle-related health risks more generally. More specifically, we examine the different interactive goals that these accounts may work to accomplish, consciously or not, such as managing cause and responsibility regarding overweight and overweight-related disease, and establishing particular identities in relation to issues of health and health risks.

Bringing these broader interactional concerns to the surface is essential for understanding (potential) future users' response to new technologies (te Molder and Potter, 2005; Veen et al., 2011). The results may help to translate differences and similarities into relevant technology characteristics and also help users to articulate their needs and expectations towards future technological developments once their everyday concerns have been made explicit. Our starting point is that technologies need to find "points of reference" in daily life if they are to be successful at all.

Nutrigenomics

Nutrigenomics studies the interaction between nutrients and genes and aims to develop diagnostic tools that can detect (pre-)diseases in a still reversible stage or reveal genetic susceptibilities for lifestyle-related diseases (Ordovas and Corella, 2004; Barroso, 2005b; Barroso, 2005a; Johnson and Williams, 2006; Dembinska-Kiec, 2008). Developments in nutrigenomics parallel, and have stimulated the ambitions for, a so-called personalized diet, that is, the tailoring of nutrition to individual needs (Castle and Ries, 2009). Although these early aspirations have been tempered, for example in the direction of group rather than individual profiles, the promise of a genetically based differential dietary advice remains. Developments in nutrigenomics go hand-in-hand with the increasing importance of health in modern society, the attribution of personal responsibility for one's health (Crawford, 2006), and emergent preventative medicine (Harvey, 2009). We look at the emerging field of nutrigenomics as an example of how genomics may influence everyday life at the intersection of health, risk, and genetics, for example through functional food products and personalized nutritional advice, e.g. on the basis of tests for the genetic susceptibility for overweight (Castle and Ries, 2009).

As with many emerging disciplines and technologies, nutrigenomics is controversial. Supporters of nutrigenomics presuppose a match between nutrigenomics applications and already existing ideas and use of knowledge about obesity, health, lifestyle, and food in people's everyday lives. Critics, however, are not so certain that such a match really exists. Some argue that the presentation of eating and healthy living in terms of risk management and disease prevention that nutrigenomics presupposes may not be feasible or desirable; it may not square with notions of eating and healthy living that people have or aim for (Komduur et al., 2009). Others question the efficacy of nutrigenomics information for healthy behaviour. They wonder whether the idea of empowerment brought by providing genetic risk information entails too simplistic a notion of change in human behaviour (Bouwman et al., 2008a).

The aim of this study is to find out whether the assumptions embedded in future nutrigenomics tools, especially the alleged relation between information about personal health risks and healthy behaviour, match with how people account for the relation between food, health, and genetic differences in everyday life.

Effects of genetic risk information on healthy behaviour and lifestyle

A handful of studies have been done on the effects of giving people genetic risk information on obesity or other lifestyle-related diseases. Although these studies suggest that people are better motivated to adopt a healthy lifestyle after receiving genetic information on increased risks for lifestyle-related diseases, no proof has been found that this information actually changes people's behaviour.

Regarding obesity, there are no indications to suggest that providing genetic risk information to obese people has psychological disadvantages (Harvey-Berino et al., 2001; Rief et al., 2007; Segal et al., 2007; Hilbert et al., 2009). Positive effects on behaviour could not be measured either (Rief et al., 2007; Hilbert, Dierk et al., 2009), although there are signs that a higher genetic risk for obesity increased people's motivation to live healthily (Frosch et al., 2005).

Similar results have been found in research on the effects of genetic testing in relation to other lifestyle-related diseases. Genetic information about lung cancer or heart disease (Sanderson and Wardle, 2005; Sanderson and Michie, 2007) and colorectal cancer increased people's motivation to adopt a healthy behaviour (Lucke et al., 2008).

With respect to behavioural change however, the results are mixed. People who received genetic test results indicating a higher risk for thrombophilia, for example, reported that the genetic information had not changed their lifestyles (Saukko et al., 2006). Another study showed that, after a genetic test for lung cancer in both an increased and decreased risk group, both groups showed participants who quit smoking (Sanderson et al., 2008). It seemed that it was not the genetic risk information itself but rather the procedure followed that was responsible for the reported effects.

These results show that the relation between genetic risk information and healthful behaviour is at best indirect. One of the questions that can be raised is the extent to which the information offered connects with people's everyday realities. A closer look at the understanding of genetic influence shows it to be a mixture of everyday knowledge about heredity and scientific insights. New scientific knowledge about genetics is integrated into already existing "lay" knowledge and beliefs about inheritance (Emslie et al., 2003). Lock et al. (2006) showed a similar pattern for risk perceptions: relatives of people with Late-Onset Alzheimer's Disease (LOAD) picked out a relative who resembled the one with LOAD, e.g. in terms of looks or behaviour, as the one who was most likely to be at risk of the disease. The latter results indicate the importance of not restricting research to overt "gene discourse" but also looking at accounts that are more indirectly linked to possible hereditary characteristics, such as participants' orientations to physical appearance.

Gene discourse

Discourse studies on generic genetic influences on health and illness show that the notion of genes is predominantly used to debate the moral responsibility for being ill (Crossley, 2002; van Exel et al., 2006). Patients with Family Hypercholesterolemia were found to draw upon gene talk so as to manage feelings of guilt and shame (Frich et al., 2007). Crossley's (2002) focus group study shows that participants use "genetic predisposition" to highlight the ultimate lack of control over health when individual responsibility had been given much emphasis in the discussion. In her analysis of a Finnish Internet discussion, Kokkonen (2009) points out, however, that genetic explanations are not automatically accepted. Forum participants tended to construct the parents of obese children as the primary cause of their child's fatness.

The same ambivalence is found in dealing with health risks more generally. Although self-responsibility and discipline are deemed important, the importance of pleasure, and insurgence against control and regulation of health, are also emphasized (Crossley, 2003; Pajari et al., 2006). As Hodgetts et al. (2005) show, people relatively easily resist health messages in the media by constructing other notions of health, such as the need for a psychological balance in life through pleasurable unhealthy habits.

These studies demonstrate that people use different or even contradictory accounting practices when addressing the influence of genes in achieving health, and acting or not acting upon health risks more generally, but they pay hardly any attention to, or fail to address, the social actions that people establish in doing so. Therefore we propose to use the discourse analytic notion of an interpretative repertoire.

A discursive approach to health and genetic risks

The method adopted in this article is informed by a discourse analytic perspective as originally developed by Potter and Wetherell (1987). This perspective treats speech as constructed and constructive. Rather than simply reflecting the outside or mental world, talk is social practice, i.e., it is drawn upon to accomplish different social actions such as accusing, defending, building expertise, complaining, and complimenting. The perspective thereby focuses on the ways speakers construct different versions of the world as they move across various interactional situations. The concept of interpretative repertoire is used to describe these situated descriptions. More specifically, it represents a vocabulary or register of terms and metaphors that people draw upon to characterize and evaluate actions and events (Potter and Wetherell, 1987; Lawes, 1999).

On the basis of group interview data, we first show that both overweight and non-overweight participants display reluctance to use or accept overt genetic explanations for being overweight and rather attribute it to “build” or “stress”. Part of the interactional business performed with these accounts differs, however, for the overweight and non-overweight groups.

Second, we show that participants, despite their normative orientation to behavioural explanations of overweight, treat a healthy lifestyle as accountable, i.e. behaviour that is not self-evidently appropriate but requires a special account such as family history or health tests.

Material and methods

We organized a total of six group discussions with people who were selected through a recruiting agency that informed them that the topic of discussion concerned overweight and that the study could help find new ways of giving advice on nutrition. Self-reported body mass index¹ (BMI) was a selection criterion. Because of possible differences in explaining one's own weight and the weight of others, three groups of people with a BMI above 28 and three groups with a BMI below 25 were selected. Second, to take into account possible genetic explanations that involved family members, both the overweight participants and the normal weight participants had at least one close relative who was overweight. Third, to explore the issue of parental responsibility for child health, people with children were recruited, leading to a total of 22 parents with children from 4 to 40 years of age. Finally, a sample with a wide age range (between 24 and 68 years old) and diverse socio-economic and ethnic backgrounds was collected and divided into groups with a mix of these characteristics. The participants were reimbursed for their travel expenses and received an honorarium of 35 Euro. To protect the identities of the participants, all names and other information were disguised.

The interviews were analysed by studying the role and purposes of accounts that suggested genetic susceptibility to being overweight, e.g., constructions that described or implied unalterable components in the body that make people vulnerable to overweight. Secondly, the role of health risks in relation to accounts of healthy eating, living, and overweight were studied by focusing on accounts in which risks, diseases, and disease-related complaints were presented. The interviews were organized in such a way as to allow informal conversational exchanges between participants. In the analysis, all contributions including those of the facilitator/interviewer were examined (cf. Lawes, 1999). The analytic levers to identify the repertoires were as follows:

- variability of descriptions: usage of different variants of the same concepts is known to signal different interactional goals;
- rhetorical character of the talk: reports from the participants automatically resist other possible constructions of the world. By reflecting on these other possibilities, the analyst gains insight into the conversational issues that are handled by the participants in present versions;
- participant uptake: looking at how the participants (including the facilitator) treat each other's talk, what they make relevant, and to what interactional ends.

The study involved a semi-structured group interview about a broad range of topics concerning overweight in society and people's daily lives, and possible causes and consequences of being overweight. Organizing the discussions in a manner that allowed informal conversational exchange helped us to take interaction into account and to allow for new issues to be raised by the participants. The interviews were facilitated by the first author of this paper and were held between June and August 2006 in Wageningen, the Netherlands. They were tape-recorded, videotaped, and transcribed to word level accuracy, including speech errors, pauses, and overlap in talk². Relevant fragments were translated into English by a native speaker, after having been informed by the analysis that was performed in Dutch³.

Results

We start this section with the finding that participants used three different repertoires to negotiate the role of responsibilities played by individuals in relation to their overweight, namely:

- The "In the genes" repertoire: accounts that literally used the words "genes" or "genetic susceptibility";
- The "Build" repertoire: accounts that referred to body composition;
- The "Stress" repertoire: accounts that referred to involuntary weight gain and loss through stress.

Subsequently we show how healthy behaviour more generally is both being downgraded and accounted for by reference to family history and health checks.

The “In the genes” repertoire: an interactionally risky account for overweight

We labelled sets of accounts in which participants used the word “gene(s)”, or referred to hereditary factors in an explicit way, as the “In the genes” repertoire. Like in other studies (Crossley, 2002) participants used repertoires about genes to mitigate responsibility for their overweight in the overweight groups, and for overweight in general in both groups. However, contrary to what was expected (Crossley, 2002; van Exel, de Graaf et al. 2006), in both groups the use of “genes” for this purpose was treated as problematic. That is, people accounted and needed to account for the fact that they used gene-related explanations. Extracts 1 and 2 illustrate this:

Extract 1 (overweight)

1. Rose: For some people it's just in the genes.
2. Yeah, I mean on my mother's side of the family
3. every, everybody is too heavy. I wish I got
4. my father's genes. Everybody on my father's
5. side is very thin.
6. Interv: Hm
7. Rose: But yes, I have my mother's genes (laughs).
8. So. Yeah, no um Yeah. Th, that's indeed just
9. the way it is. Yeah, I've, Yeah at a certain
10. point, um. I've dieted a lot. Yeah, the yoyo
11. uhm effect then.
12. Interv: Yes
13. Rose: Yeah. (.)
14. John: [It's just]
15. Rose: [It's just] eating=
16. John: It's eating and it can also be predisposition
17. Rose: It's also predisposition=
18. John: =It can also be predisposition

Extract 1 demonstrates the kind of resistance that the gene repertoire evokes when it is used to account for overweight. First, it was used after a whole range of other explanations for overweight had been discussed, such as too little physical activity and eating too much. This demonstrates that the participants were reluctant to use it. Second, while drawing on the “In the genes” repertoire, attempts were made to normalize the fact that genes are indeed involved in being overweight. Rose starts with a general remark that for some people it is “just” in the genes (line 1). “Just” is a direct translation of the Dutch word “gewoon” and it can be used to make something sound normal, e.g. just a cold instead of a

more serious disease (Lee, 1987; Verkuyten, 2003). “Just” in this context thus emphasizes that genes are a self-evident explanation of overweight that is obvious and beyond discussion (cf. Verkuyten, 2003). In this way, possible counter explanations are resisted. Third, accounts about genes were offered and treated as requiring specific evidence. In this case, Rose supports her claim by describing that everybody on her mother’s side is heavy (lines 2–3). Finally, participants with overweight introduced the gene accounts with jokes or laughter. In line 7 Rose laughs and makes a joke about her own bad luck, thereby distancing herself from a genetic explanation while introducing it (cf. Barnes et al., 2001 on laughter). Note as well, in lines 16–18, that predisposition as a cause is constructed by Rose as something that (also) is, whereas susceptibility is rearticulated by John as a cause that can be, again displaying the reluctance to treat susceptibility as a legitimate account for overweight. Extract 2 is another example of the “In the genes” repertoire used to account for overweight:

Extract 2 (overweight)

1. Ellen: Well actually I agree with with them with
2. them. But it’s also a little bit in the genes with
3. us as well. My mother is as well. She’s eighty–
4. five, but she’s still just like me. The– I am so
5. hefty. And well yes the rest is also fat of
6. course.
7. Interv: (Laughs) (more laughter)
8. Ellen: I don’t mind that you know that.
9. Ralf: That is why you you [unclear]
10. Ellen: [It’s just so] totally
11. hefty. big boned.
12. Interv: Yes.
13. Ellen: heavy too. Just heavy.
14. Interv: Yes. (.) So predisposition.
15. Ellen: Predisposition. Yes.
16. Jorien: Yes, but I also think that if you’ve had
17. children.
18. (eight lines omitted)
19. Ralf: Psychological [they say then]
20. Ellen: [No I’ve] actually always had
21. it actually. ‘v always been. Sometimes I say I
22. just skipped size thirty six

As with Extract 1, the “In the genes” repertoire is the last account drawn upon to explain overweight. Ellen supports her claim by describing her mother’s physical appearance (lines 3–4) and introduces her account with laughter and a joke (lines 5–6). Moreover she uses the word “just” (lines 10 and 13) to emphasize the obviousness of her overweight, and its

genetic nature, which is subsequently formulated by the interviewer (line 14). Note how the participants resist Ellen's account, for example, by describing the influence of having children (lines 16–17) and by characterizing her explanation as psychological (line 19), which is then again undermined by Ellen's suggestion that she has always been heavy (lines 20–21), without, however, giving an overt reference to her genetic background.

The problematic character of genetic explanations for overweight is also clearly illustrated by the way in which the non-overweight groups treated gene accounts, namely as self-serving and subjectively motivated rather than just true. Predispositions are described as an easy excuse for being heavy, and contrasted with more desirable attitudes:

Extract 3 (non-overweight)

1. Anneke: It is easily used as a cover (1)
2. Johan: Yes
3. Anneke: I'm predisposed. But there are of course
4. people, but they are mostly, (1) they have
5. uhm problems with something (2)
6. (three lines omitted)
7. Anneke: But yes, of course it's easy (1) to say (1) I'm
8. uhm (2) predisposed to it.

Anneke treats genetic explanations for overweight as suspiciously motivated. Interestingly, she presents herself as predisposed to being overweight although she is part of the non-overweight group. This suggests that *despite* her predisposition she is able to remain thin: she has not been using it as an excuse. Thinness is thereby constructed as a personal merit (see also Extract 12).

Our results show that although the “In the gene” repertoire is used to negotiate reduced personal responsibility for being overweight, in both the non-overweight groups and the overweight groups it is treated as a problematic and personally motivated explanation. Overweight people were reluctant to use “genes” as an explanation for their overweight and their fellow group participants resisted gene accounts. Non-overweight groups treated genetic explanations as motivated, i.e. as believing what it suits one to believe. This uptake suggests a normative orientation to behavioural explanations for overweight in both types of group.

The “Build” repertoire: constructing evidence of predisposition by visible thinness

Descriptions of body size were regularly constructed in relation to overweight so as to provide evidence of a genetic predisposition to overweight. We labelled these constructions the “Build” repertoire. The “Build” repertoire was often drawn upon after the “In the gene” repertoire had been used – in the overweight groups for explaining one's own weight

(see for example Extract 2 lines 10–13), and in both groups to account for overweight more generally. The latter use of the “Build” repertoire mostly consisted of a comparison between thin and overweight children, so as to provide visible and thus neutral proof of the existence of a genetic component in weight.

Extracts 4 and 5 show how the “Build” repertoire is used to give evidence of an unchangeable bodily component in relation to overweight in general:

Extract 4 (non-overweight)

1. Paula: I can see it sometimes very clearly in families
2. that um one, one of the children is getting
3. horribly fat
4. Jan: [Yes yes yes
5. Paula: And the other one stays [just fine
6. Bea: [Yes
7. Jan: Yes
8. Paula: And then you don't know for sure, but you
9. can assume there are fairly similar ways of=
10. Jan: =Yes=
11. Paula: =How we deal with food in this family.

Paula presents the differences in body sizes of children in families as strong and clear evidence of the existence of susceptibilities for overweight. Jan immediately and straightforwardly accepts this description. Visible differences in body size are thus constructed and treated as unproblematic proof of the differences in predisposition between children. Extract 5 shows a similar pattern for the overweight group:

Extract 5 (overweight)

1. Ewald: Uhm I uhm. I uhm have three girls as I just
2. said
3. Interv: hmhm
4. Ewald: Uhm And the oldest and the youngest (.) are
5. super slim. Superuhm thin. That oldest one
6. eats all day long. (2) She doesn't put on a
7. gram, she just stays at her (1) And the middle
8. one we really have to cut back. Because she
9. can. She she's just getting big as a house.
10. (four lines omitted)
11. Ewald: You can see very clearly the difference (1)
12. between the one child and the other child
13. Interv: Yes
14. Merel: Yes very apparent

Ewald proves the existence of an unchangeable bodily component by describing the thin appearances of his oldest and youngest daughters, and comparing their appearances with the tendency of his middle daughter to gain weight. In lines 11 to 12 he connects the visible differences to a difference in susceptibility of his daughter for becoming overweight. Merel seems to accept this as straightforward and neutral proof.

After describing how he prevents his second daughter from putting on weight, Ewald presents his oldest thin daughter as a person who eats the whole day and eats unhealthy foodstuffs (e.g., bags of chips disappear):

Extract 6 (overweight)

1. Ewald: Because the oldest one she stuffs herself all
2. day long. She she can eat Bags uhm uhm
3. disappear. Chips it doesn't matter what.
4. Interv: hm hm
5. Ewald: She doesn't put on a gram.

By constructing a contrast between his one daughter who needs to be “cut back” and the older daughter who eats constantly, he resists the idea that parents need to stimulate a thin child to eat healthily. Thereby he presents his older daughter as someone who is more or less resistant to becoming overweight.

Secondly, in both sub-groups a build that indicated thinness was used to make available explanations about parents taking responsibility for the eating habits of their children. In Extract 7 the link between build and resistance to becoming overweight is constructed to legitimate possible unhealthy eating habits in the family:

Extract 7 (overweight)

1. Ellen: Quickly eats a pizza, or quickly eats some
2. French fries or quickly eats a small
3. something
4. Peter: Yes
5. Ellen: And that's also that that's also a big
6. [cause you know]
7. Peter [We try t–] We try to limit that as much as
8. possible. We do it sometimes
9. (ten lines omitted)
10. Peter: No but that uhm.(2) They also don't have
11. that build at all. (2)
12. Ellen: No no

Peter uses the “Build” repertoire in relation to his children (lines 10–11) after Ellen has claimed that people often eat unhealthily because of a lack of time. Ellen’s explanation invites an account from Peter that he and his family are careful not to eat too much. “They also don’t have that build at all” (10–11) suggests a low chance of becoming overweight anyway because of their physique.

Extract 8 shows another example of how people draw on the “Build” repertoire to account for the eating behaviour of their children:

Extract 8 (non-overweight)

1. Johan: But yes right, what is checking one’s
2. children?
3. (Everyone speaks at the same time)
4. Tessa: Well, as long as you still have a lot of
5. influence as [as a mother]
6. Johan: [Yes but] yes right you have
7. some influence on uhm=
8. Tessa: =But [(.)but] that wouldn’t be right to to
9. check those things
10. [continually checking with that lot (laughs)]
11. Johan: [And I mean, they look fine] the two of
12. them, and then I don’t have a problem if
13. they get a uhm some chips or something
14. in the evening
15. Anna: No of course not

Here Johan and Tessa negotiate about the extent to which parents can be held responsible for the behaviour of their children. Johan resists Tessa’s idea that it is possible to monitor the dietary habits of your children to a great extent. Additionally, he draws on the “Build” repertoire to account for the fact that he approves of his daughters’ “unhealthy” habits. Anna’s reaction – “No of course not” (line 15) – suggests that Johan’s “Build” explanation is acceptable and obvious.

Participants in both the overweight and non-overweight groups designed and received the “Build” repertoire as visible and neutral proof of the possibility of being predisposed to overweight. The “Build” mostly contained a comparison between lean and overweight children. Moreover, a version of the “Build” repertoire – where a thin appearance was referred to – was used to make available explanations about taking or not taking responsibility for the diet of one’s children. Thereby constructions of the children’s physique were used in a black-and-white manner: either the child had the “build” that made her/

him susceptible to overweight or s/he had not. In the case of overweight children, the “Build” repertoire worked as a parent’s account for taking responsibility and making them eat less, and in the case of slim children, as a powerful account for allowing them to eat “anything”, including unhealthy foods.

Hepburn and Wiggins (2005) point out that body size is a compelling account to give evidence. Their research on helpline conversations in which child neglect was reported showed that a thin appearance was treated as visible and neutral proof of not feeding the child enough rather than a prejudiced or paranoid vision of the caller. Possibly, in relation to overweight, the “Build” repertoire has this same aura of visibility and therefore the objectivity needed for a strong account for the child’s eating habits and the parents’ responsibility in this.

The “Stress” repertoire: accounting for overweight and thinness in asymmetric ways

The “Stress” repertoire was used to explain both thinness and overweight in both the overweight and the non-overweight groups. As in the “Build” repertoire, the “Stress” repertoire leaned on a comparison between the thin person and the heavy person: some people lose weight because of stress whereas others gain weight. Extract 9 is an example of the “Stress” repertoire:

Extract 9 (overweight)

1. Jelle: So that lady that walked away a minute ago.
2. (.) She is my wife. And she is exactly the
3. opposite. If she’s a little stressed or starts to
4. live her life irregularly, then she goes bad and
5. then (1), like she is now, sometimes fifty
6. seven kilos. She is one meter eighty
7. centimetres tall. (2) I am one meter ninety–
8. four tall. I am hundred and ten kilos. (3)
9. Exactly the opposite.
10. Interv: Totally different reactions uhm
11. Jelle: Yes

In this extract, Jelle uses a description of himself and his wife having opposite reactions to (the same kind of) stress in order to account for his overweight. As in the “Build” repertoire, the thin person is used to support the notion of genetic influence in being overweight. The fact that both the “Stress” repertoire and the “Build” repertoire need

“thinness” to construct evidence of genetic predisposition makes available the notion that heaviness creates bad evidence – i.e. evidence that may be treated as governed by self-interest rather than facts – of genetic influence. A related asymmetry was found with regard to participants’ responsibility regarding their own weight:

Extract 10 (overweight)

1. Peter: have some who because of stress they lose
2. weight
3. Ellen: Yes
4. Peter: and others [they put on weight again]
5. Jose: [Those people become fa] I simply
6. start to eat
7. Ellen: Yes

In this extract, Peter suggests a straightforward connection between stress and overweight by distinguishing between two different kinds of bodily reactions to stress that people may have. This link is immediately acknowledged by Ellen and Jose. Jose, however, explicitly refers to herself as a person who starts to eat while under stress (line 6). She thereby constructs herself as a stress eater, implying an action on her part instead of “simple” involuntary weight gain.

Interestingly, in the non-overweight group also, some of the participants referred to themselves as stress eaters:

Extract 11 (non-overweight)

1. Jasper: Once on the lips, forever on the hips, that’s
2. what they say
3. Karijn: They just do it secretly
4. Interv: eating you mean
5. Titia: Bu [but you can also almost not]
6. Jasper: [Yes, but if you are fr- frustrated (.)] or
7. nervous or whatever then it seems to me
8. that actually, (1) the introvert, he doesn’t
9. gain weight, I think. (.) Seems to me (2)
10. Karijn: Well (.) [I disagree]
11. Jasper: [You can, you] can also lose weight
12. because of it
13. Karijn: Yes, that’s also possible, because of nerves or
14. something. (2) Yeah. (.) There are people that
15. can lose weight because of stress, yeah.
16. Jasper: Yeah.
17. Karijn: But people who are stress eaters, they get

18. really fat because of it. (2) I look at myself.
19. (laugh)

Like in Extracts 9 and 10, bodily reactions to stress are used to prove the existence of a predisposition for overweight. Jasper suggests that people who are stressed can also lose weight (11–12). Karijn aligns with this observation but then comes back with a description of the stressed overweight person (7–19). Note how, contrary to the stressed lean person who is presented as losing weight involuntarily, the stressed overweight person is constructed as a person who starts eating because of stress. Like Ellen in Extract 10, Karijn refers to herself as a stress eater (line 18), accompanied by laughter (line 19) perhaps to display awareness of her exaggeration (she is part of the non-overweight group). Here stress is used asymmetrically in terms of responsibility for one's weight: the overweight person is constructed as accountable whereas the thin person is susceptible to involuntary responses of his/her body.

The fact that in both groups people explicitly refer to themselves as stress eaters suggests that accounts about eating through stress are more acceptable than suggestions of involuntary weight loss. Besides, accounts about stress eating used by the non-overweight suggest that they can cope with these impulses since they are still thin. This idea of thinness as a personal merit came back in accounts by the non-overweight groups that claimed a normal weight despite a lot of stress:

Extract 12 (non-overweight)

1. Walter: Just had three, four very intense years at
2. work. Well, that's fine. But uhm (.) you
3. certainly pay a price. At one point you start
4. to exercise more, and then you think (.) gosh
5. (.) I've got a lot more energy because of it.
6. So then you have a discussion with people
7. who you see are heading for the same
8. situation (.) or who are already further down
9. that road (.) and then there are people who
10. say (.) 'Yeah (.) yeah, I know (.) I realize it.
11. Yeah, I think things are fine just the way they
12. are' (.) and they have another beer.

In Extract 12, Walter explains that he, unlike other people, has been able to cope with the intensive work over the last couple of years by doing sports. With this account he constructs his thinness as a personal achievement. Moreover, it enables him to show that he can cope with stress.

To summarize: the “Stress” repertoire was used in both groups to prove a predisposition for overweight in general. Like the “Build” repertoire, the “Stress” repertoire contained a comparison between people. The people who gained weight through stress were referred to as stress eaters, whereas people who lost weight were constructed as losing weight through bodily reactions. This suggests that, unlike the non-overweight person, only the overweight person is treated as accountable for his/her weight. In the non-overweight groups, stress accounts were also used to construct thinness as a merit: despite stress, they had been able to cope.

Healthy behaviour as a form of risk prevention: an accountable phenomenon

Participants in both groups displayed a normative orientation to behavioural explanations of overweight. This could be seen for example in the reluctant receipt of the explicit genetic version of overweight by the “In the genes” repertoire, and the affiliative receipts of less overt versions of a genetic influence, i.e. the “Build” and the “Stress” repertoire. Moreover, in both the “Build” and the “Stress” repertoires overweight people were held accountable for their weight (increase).

In addition to, or despite, this normative orientation towards overweight as caused by behaviour rather than genes, however, participants accounted for any pro-active behaviour concerning the management of their health.

Extract 13 shows how the need to be health conscious in terms of risk prevention is immediately resisted by Joris. His father, on the other hand, is allowed to be health conscious:

Extract 13 (overweight)

1. Joris: I’m not even thirty surely I’m not going to
2. think about health risks
3. (two lines omitted)
4. I uhm if I look at my father indeed he is well
5. indeed (.) more on the— not not excessively
6. large or something
7. Interv: Hm
8. Joris: But well that’s also with a diabetes diagnosis.
9. And yes (1) then it’s the case that almost
10. everything that he eats or does (.) Just think
11. about it for a minute and I mean that he one
12. day (1) you know you hear it and you’re
13. shocked like gosh yeah how did that happen.
14. Well yeah that you think about it at one
15. point. Yeah, I don’t have that
16. (five lines omitted)
17. Joris: No (.) I think that my problems with my

18. weight are more like if I wake up in the
 19. morning, or if I sit in a chair with a white shirt
 20. on that I think like (.) Well that I find worse
 21. than the health risks

Joris resists the idea of thinking about health risks in relation to his own overweight. He uses a description of his father with diabetes to construct a contrasting situation in which it would be legitimate to think about health risks. Joris accounts for the fact that he, unlike his father, does not need to think about health risks because he is young and has no complaints that are directly related to overweight. He constructs his physical appearance as a more legitimate account to have a health-conscious diet.

Extract 14 is another example of accounting for health consciousness in terms of concrete medical reasons.

Extract 14 (non-overweight)

1. Interv: Do you ever think about these health risks?
 2. (1) these health risks,
 3. [and when]
 4. Karin: [sure]
 5. Interv: Yes, when?
 6. Karin: If I let myself be examined, I regularly let
 7. myself be examined. (1) Uhm, when I feel my
 8. heart beating. That- tha- that I think, hey I
 9. feel my heart beating in my throat, you
 10. know? Or when I can't talk anymore after I've
 11. climbed the stairs.
 12. Interv: Hm
 13. Karin: Then I think like uhm yeah, I just have to or
 14. exercise much better, or just eat better. (2)
 15. Just more vegetables, more fruit
 16. Interv: So a reason to change your lifestyle?
 17. Karin: Yes. (2) Because I think, I love myself a lot.
 1. And I love life a lot.
 2. Interv: Yes

Karin refers to concrete medically oriented reasons, such as a health check and unpleasant bodily sensations, after the interviewer has asked her if she ever thinks about health risks. At the same time, Karin constructs the solutions to the complaints she experiences as simple and obvious: "just have to (...) exercise much better (...) just eat better (...) just

more vegetables” (lines 13–15). With the repeated use of just and the ease with which she produces a list of activities she resists the idea that the solutions offered are complex or that she is paying specific attention. This relaxedness is confirmed by her account of changed behaviour, namely “love of life” (line 18) instead of, e.g., fear of disease.

In Extract 15, Maja presents a description of a medical situation to account for the fact that she worries about health risks.

Extract 15 (overweight)

1. Maja: I have uhm two sisters with diabetes. And my
2. father has uhm Type 2 Diabetes. And uhm I I
3. then think like oh uhm it really runs in the
4. family. And I think yeah like being overweight
5. (1) I wasn't doing well with my weight either.
6. And that's also the reason, what I said earlier,
7. that I go to the doctor every six months. And
8. every time I think like now, Maja, now it's
9. going to be bad. Now you're going to get it.
10. (four lines omitted)
11. Maja: How can you be so stupid. Because it runs in
12. the family and then you en-en-encourage
13. overweight
14. (five lines omitted)
15. Maja: When I get the same results again, that
16. everything is fine and you're in perfect health
17. (1) then I also push that very easily away, you
18. know?
19. Others: Yes

Maja draws upon a family history of diabetes to account for a constant worry about her health. The description (lines 15–18) of the disappearance of these concerns after she has been found healthy, however, also carefully constructs a balance between being health conscious (for a reason), on the one hand, and being relaxed about it, on the other.

In the above excerpts, we have seen that participants treat healthy behaviour, especially in terms of risk prevention, as an accountable phenomenon. They showed themselves to be health conscious, but for a reason. Overall, the participants showed a concern with being relaxed about their health in terms of medical risks even if they were taking preventive measures.

Conclusion and discussion

In this study, we examined the extent to which the presuppositions embedded in future nutrigenomics tools, in particular tests for genetic susceptibility to overweight, matched with socio-interactive practices embedded in everyday life. More specifically we looked at how the notion that information about genetic susceptibility empowers people to live healthily is treated in current everyday talk, and to what extent the presentation of healthful living in terms of personal risk management connects with the way people account for this relation in everyday life.

First of all, the study demonstrated the interactional delicacy of drawing on overt genetic explanations for overweight in both the overweight and non-overweight groups, indicating a normative orientation towards behavioural explanations of overweight. Other repertoires suggesting rather than claiming a genetic component – through descriptions of different physiques and reactions to stress – were more easily accepted. These repertoires leaned on comparisons between thin and overweight adults who responded differently to the same food, or between thin and overweight children, thereby making available “visible” evidence of a genetic predisposition concerning overweight (Hepburn and Wiggins 2005). The repertoires show that an overweight person on his/her own is not treated as sufficient “proof” of genetic influences, whereas the comparison with an unsuspected thin person – who is not supposed to have a stake in producing a genetic explanation – is. A similar asymmetry was found in relation to parental responsibility for children’s eating habits in relation to their genetic susceptibility: whereas overweight children were held accountable for their eating behaviour, thin children were not.

Interestingly, stress accounts enabled thin people to display their thinness as a personal achievement (despite stress, or stress eating, they kept their weight), whereas overweight people successfully used it to claim a genetic component without having to make it explicit, perhaps also because it suggests the kind of active, stressful life that counters negative explanations of overweight such as lack of discipline and laziness (Wang et al., 2004).

The indirect focus on behavioural explanations as the norm and the related treatment of gene explanations as implying a denial of personal responsibility for one’s overweight shows the extent to which gene accounts are still connected with attributions of responsibility and blame, and the need for self-discipline. Whereas overweight people were systematically held accountable for their weight, the non-overweight constructed themselves as accountable for their weight. Gene explanations were only claimed to be relevant for thinness where it concerned parental responsibilities for thin children. In contrast to e.g. Crossley’s (2002) study where genes were used to relieve a person from responsibility especially after that responsibility had been (over)emphasized, this study shows behaviour being treated overwhelmingly as the normatively correct explanation for overweight (and thinness for that matter). This difference may be explained by our more detailed look at the action orientation of the talk. The orientation to the behavioural

norm was especially present in participants' accounts regarding their own weight, i.e. accounts that may be more susceptible to being treated as subjectively invested (rather than just true) than is the case with general explanations. And perhaps also as a result of including participants' own weight in the discussion, there was relatively little explicit self-responsibility talk that could have invited the gene talk (and vice versa), as was the case in Crossley's study.

Despite the normative preference for explaining overweight in terms of behaviour, we found that participants in both groups had to account for acting in response to health risks by referring to concrete complaints or health checks. Participants' accounts also retained the emphasis on enjoying life and not being too concerned. This normative orientation to being relaxed about possible health risks and the allied resistance against health fanaticism has also been found in other studies (Sneijder and te Molder, 2004; Bouwman et al., 2009). The double focus mirrors Crawford's (2006) classic argument about the tension between the need to control on the one hand and to release on the other, but also shows how the separate deployment of these themes may serve as an account for not taking preventive action.

Given the normative orientation to behavioural explanations on the one hand and the accountability of health-conscious behaviour on the other, genetic tests for obesity may fit, as well as clash with everyday discourse. For overweight people, a nutrigenomics test that reveals genetic susceptibilities for overweight could be treated as an invested account. For the non-overweight, taking a test may be treated as a preoccupation with health risks, and negative test results may undermine the idea that thinness is a personal achievement.

On the other hand, test results could also be used to construct a health conscious identity. People with normal weight may use low test results to show that they are health conscious but relaxed. Letting one's children take a test could be treated as advantageous: positive outcomes may account for health-responsible behaviour towards children, negative outcomes may account for being relaxed about an unhealthy lifestyle.

This study draws on a small sample of Dutch participants and has not aimed at representativeness. The grounded indications that our analysis put forward could be, however, used to inform a larger study with a more diverse set of participants. Unlike studies that look at how people cognitively understand science, we have shown how "gene talk" can be deployed to shift responsibility for overweight problems, or how it can be drawn upon asymmetrically so as to allow thin children to eat fatty foods, or claimed irrelevant to portray thinness as a personal achievement. It is not the perception of genes per se, or health risks for that matter, but the way these notions are put to use. The acceptability of a future nutrigenomics test will depend not only on scientific quality, but also on the extent to which it is treated interactionally as an appropriate piece of evidence and reason for health conscious behaviour, in particular, if genes can be dealt with as an account and thus an incentive for preventive behaviour instead of being used for negotiating

blame and doing so asymmetrically, and if it is compatible with displaying oneself as (also) leading a relaxed and pleasurable life. Harvey (2009) argues that nutrigenomics differs from traditional genetics in that it promotes a genetic entrepreneurship by which people create their own healthy future in terms of optimal wellness. Looking at current everyday talk on health and genes, we find that genetic information is not (yet) constructed as a window of opportunity – an incentive for pro-active health behaviour – but as an opportunity for responsibility talk.

However, technologies develop through constant interaction with society (cf. Akrich, 1992). A gene-based “wellness” focus on health may prove to be a helpful account for preventive behaviour – more in tune with the broader everyday notion of health – but also, again, as a device for turning prevention into a completely private and personally binding matter. This also depends on the extent to which consumers are and can be provided with adequate information (Einsiedel and Geransar, 2009), especially where it concerns products marketed as lifestyle products, with an as-yet-unclear status somewhere between medicine and consumer culture (Saukko et al., 2010). It is just as important, however, to develop a better societal understanding of the relation between genetic make-up and behaviour. Here lies an important task for (nutri)genomics scientists. As long as the relation between genes and behaviour is reproduced as a dichotomy, there is little chance of turning gene talk from a blaming device into an accountable incentive for healthy behaviour.

Notes

¹ BMI is an index for categorization between underweight, overweight and heavily overweight: below 18 is underweight; above 25 is overweight; and above 30 is heavily overweight.

² The notation used here is a simplified version of the original transcription system developed by Gail Jefferson. See also Potter and Wetherell 1987; Lavves, 1999.

(1)	Timed pause represented in seconds
(.)	Short pause of less than 1 second
period	Falling intonation.
comma	Continuing intonation
question mark	Rising intonation
–	A cut-off or self interruption
A:=	The end of one speaker's utterance runs straight into the beginning of the next
B:=	gap
(text)	Clarifying information
[text]	Overlap in talk

³ The original extracts in Dutch are available with the author.

5

Between paternalism and self-governance: reflections on possible applications of nutrigenomics in the Netherlands

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Abstract

Research shows that the normative assumptions behind visions of applications of nutrigenomics do not sufficiently fit with norms existing in the everyday life of the consumer. This can give new ethical dilemmas. This paper describes and reflects on the way social actors of nutrigenomics construct strategies to implement nutrigenomics during a deliberation about nutrigenomics. The clash between the normative assumptions of nutrigenomics and norms in everyday life is constructed as a shortcoming of the consumer. Social actors construct the consumer as either incompetent or unwilling to understand information about health and nutrition, or unable to cope with the temptations in their food environment. Therefore, the participating actors propose to change the food environment through legal measures, corporate responsibility or a healthy tasty food market. These mechanisms must persuade consumers to avoid unhealthy foods or protect them against unhealthy tempting products. Moreover, participants suggest different mechanisms through which information about the relation between food and health is made accessible and useable for the consumers, either by presenting the bare facts in simple messages, by persuasive educational strategies or by a personal coach. Although changing the food environment may seem paternalistic at first sight and enforce a healthy food style, some proposed solutions still enable choice and stimulate other values of food than health, whereas strategies that are aimed at providing information about nutrigenomics may be problematic in terms of protecting a co-existence of different food styles.

Introduction

Since the twentieth century the life expectancy has risen and a great number of infectious diseases can be treated. Less progress has been made with the treatment of chronic diseases. This has caused people to spend a relatively longer time in ill health, as they now get sick because they acquire chronic diseases (Barsky, 1988). The last quarter of the twentieth century, medicine therefore expanded the management of illnesses, accidents and diseases with managing chronic diseases and the maintenance of the body. Thereby medicine promotes discourses in which dietetics and exercise are constructed as an important activity in the self-governance of the individual (Rose, 2007; p10). At the same time hedonism is a societal trend. Pleasures and enjoyments are widely marketed in our consumer society and bodily enjoyments are an ultimate purpose in life (Bauman, 1995; 93, 94).

Within these societal trends new biomedical sciences have emerged that are able to visualize the functions of biological systems on a molecular level. Instead of studying the body on a molar level, now bodily functions and parts are visualized with the help of proteins, mRNA and the genome. One of these sciences is nutrigenomics. Nutrigenomics parallels the trend of maintenance of the body and the prevention of chronic diseases through dietetics and exercise. It is a new branch of nutritional science that studies the

interaction between nutrients and the genome, for example by visualizing how nutrients influence DNA transcription, by analysing formed metabolites and lipids in the cell and by studying how differences in the genome between people may cause them to react differently to nutrients.

At the moment, nutrigenomics is a young science and only forms a relatively small part of the nutritional sciences. Nevertheless interesting tools for medicine and dieticians can be expected from nutrigenomics, for example tools that can diagnose diseases in stages in which they are reversible and tools that reveal susceptibilities for lifestyle-related diseases (Ordovas and Corella, 2004; Barroso, 2005; Johnson et al., 2006; Dembinska-Kiec, 2008). Also for the food industry nutrigenomics can be useful. If nutrigenomics gives the means to measure the rather small effects of nutrients, especially compared to the effects of pharmaceuticals, they could help to prove health claims on foods in humans (Jones et al., 2008). Such tools are now desperately needed to comply with the new European legislation on nutrition and health claims (Regulation (EC) no 1924/2006 of the European Parliament and of the Council of 20 December 2006). According to this legislation the health claims on food products need to be based on evidence that is accepted by the majority of the scientific community.

In other words nutrigenomics sciences could become essential for the development and the marketing of food products with a health message and help medicine to provide people with the tools to keep their body in good shape. Its applications could help dieticians to personally assist their clients to improve their diet and help public health campaigns to adapt their communication strategies to different groups within the public.

It is questionable, however, if nutrigenomics fits current everyday life. In defining their research goals and objectives, nutrigenomics researchers make implicit assumptions about how knowledge derived from their work can be used in everyday life. In this connection certain presuppositions concerning norms and values about how people should lead their life stand out. To begin with, researchers describe values regarding food exclusively in terms of prevention of diseases. Any ostensibly healthy person is thus seen as potentially liable to a multitude of diseases. Secondly, health is defined in terms of interactions between nutrients and the genome and the risks that lie hidden in this complex interplay. This means that quantifiable risks become an important factor in the way one should look at health. Lastly, the prevention of diseases by controlling food–gene interactions is ultimately in the hands of the individual. This task is tremendously complex, considering all the existing interactions between nutrition and genes and the sum of diseases a person can get. Together these assumptions suggest that the consumer will act upon the available information about the risks of foods and his or her vulnerabilities every time he or she eats. In other words, nutrigenomics proposes that health in terms of disease prevention and risk minimisation can and should be a constant concern in people's lives (Komduur et al., 2009).

The results of earlier studies within this project, as well as other studies in social sciences, show a mismatch between the above mentioned assumptions and ideas in everyday life about the priorities in life and health, risks and eating. For instance unhealthy foods are seen as fun and pleasurable and leading a healthy life is defined as having a positive mental state (Courtenay, 2000; Pajari, Jallinoja et al., 2006; Harrison and Jackson, 2009) and unhealthy lifestyles are related to a masculine identity (Harrison, 2009). Furthermore, people show that it is especially important to be relaxed about one's health (Bouwman et al., 2009) and resist the idea that they are health fanatics (Lupton and Chapman, 1995). Overall, health is important in everyday life, but it is undesirable to pay too much attention to it. Nutrigenomics' focus on disease prevention and the quantification of health in terms of risks might therefore conflict with the idea of being relaxed about health and enjoy living especially when it concerns eating (Komduur and Te Molder, 2013).

Assuming that the development of techno-sciences is a process that involves an interaction between social actors and sciences (Akrich, 1992), existing social norms within a broader social, political and marketing context may be strengthened, stay the same or may be weakened. Nutrigenomics can reinforce ideas of maintenance of the body and risk minimization, while other norms about food and health, like pleasure and being relaxed, become less important. Or nutrigenomics and its tools may be used in another way than foreseen. For example, consumers may use stories about taking diagnostic tests to display that they are health conscious and at the same time relaxed about food and health risks, or use stories about genes solely to negotiate issues of blame and responsibility (Komduur and Te Molder, 2013).

This paper presents a study and an ethical reflection on the way social actors around food and nutrigenomics in the Netherlands frame the mismatch between nutrigenomics and everyday life and how they construct strategies to overcome this mismatch. During a one day meeting representatives from governmental organisations, food communication, food sciences, social sciences studying nutrigenomics and the food industry have discussed nutrigenomics research and the gap between nutrigenomics and everyday life (see table 1).

Table 1 Participating organisations

Organisation	Actor
Full professor of nutrigenomics Wageningen UR	Food Sciences
Full professor of nutrigenomics Maastricht University	Food Sciences
Dutch Academy of Food Sciences	Food Sciences
Dutch Ministry of Health, Welfare and Sports	Government
National Institute for Public Health and the Environment	Government
Food and Consumer Safety Authority	Government
Federation Netherlands Food and Grocery Industry	Food Industry
Food and Dietetics of the Hague Applied University	Food Communication

Organisation	Actor
Netherlands Nutrition Centre	Food Communication
Science and Technology Studies from Nijmegen University	Social Sciences
Communication Sciences Wageningen University,	Social Sciences
Applied Philosophy Wageningen University,	Social Sciences

In this paper, I will illustrate various ways in which these representatives construct the gap and the roles they attribute in this regard to nutrigenomics science and the consumer. In addition, I will show the proposed strategies for bridging the gap between nutrigenomics and everyday life. And finally, the constraints and ethical implications of these strategies for bridging the gap will be discussed with the concept of paternalism and the good life. It turns out that the strategies that the social actors propose for overcoming the mismatch are mainly focussed on changing the capacity, interests or willingness of the consumer. These ideas range from notions of self-governance, in which no direct coercion is used, but discourses guided by expert knowledge about pursuing health and happiness are created, to paternalistic measures that, to a greater or lesser extent, proactively restrict the freedom of choice of the consumer. This paper provides a better understanding of implementation strategies of nutrigenomics that are preferred by social actors of food sciences to govern three constructions of the consumer, that is the incapable, uninterested or unwilling consumer, and which moral constraints are attached to these strategies.

Nutrigenomical constructions of consumers

Although nutrigenomics scientists are rather optimistic about what people will do with more differentiated dietary recommendations and diagnostic tools, other actors, like industry and professionals from food communication, believe that the step from knowledge about health, risks and food to changing dietary habits is the main obstacle for implementing insights from nutrigenomics. They doubt that supplying more and better information will help people to change their diet and suspect that there is too little knowledge about why people eat what they eat: *“We assume that knowledge about food assists people to change their diet. We as dieticians presume this often groundlessly. That is the gap that we run into. Changing dietary habits is all in all the goal of nutrigenomics. But I do not see how it is going to work with more knowledge.”* (Dietician)

“...and then the main question is how this knowledge about risk groups and the changes one should make in one’s diet can be translated. There is a fundamental problem. Why do humans eat what they eat and why is it so hard to change.” (Food scientist)

Three characteristics of the consumer are constructed by actors that explain the difficulties of applying nutrigenomics: the incapable, the uninterested and the unwilling consumer. First of all consumers are assumed to be incapable of understanding certain concepts that help them to eat healthier or are incapable of withstanding the urges of their bodies.

For example, about the knowledge concerning the risks of food for certain groups or individuals in the population, a concept inextricably linked to nutrigenomics, one of the stakeholders says: *“Knowledge on a personal level. Forget it! People won’t understand it.”* (Food scientist)

But also general concepts used to translate knowledge from food sciences, some relatively new, others already used for decades in the food and health communication, are believed to be too complex for the incapable consumer. The actors believe that people cannot work with the idea that combinations of foods are risky, but that the consumer instead assumes that there is a strong divide between healthy products and unhealthy products: *“I believe that the consumer wants it. Like they demand safe food, they demand healthy food as well... People do not understand the concept of healthy dietary behaviour.”*(Government)

Likewise the recommendations about the combination of different types of food that people should eat are thought to be creatively interpreted: *“I wonder if clarity, neatly quantified information about healthy and unhealthy, works for the consumer or that it is similar to the way people use energy saving lamps. Everyone knows that they should use them because they are environmentally friendly, however people then turn on three or four lamps more, because they are energy saving lamps anyway...If an advice is given with the exact proportions of nutrients that people need, then people might follow these proportions, but eat more of it.”* (Social scientist)

Another construction of incapability is the idea that people are not able to withstand the urges of their bodies: *“Unfortunately that’s in our genes as well; that we have a motivation to eat like it is our last day, which is tricky when there is food in abundance. Then one should stop and think. And this demands discipline.”* (Nutrigenomics scientist)

Not being interested in nutritional information is a second characteristic that is constructed by the actors. This means that consumers may be capable of understanding information or are disciplined enough to withstand bodily impulses, but simply are not interested in information about the risks or healthy aspects of food: *“The consumer should know more about nutrition, how nutrition works and what happens in our intestines. (Nutrigenomics scientist) But what if they do not want to know this!”* (Food communicator and dietician simultaneous) In this fragment, consumers are thus considered capable of understanding the available information, but do not want to actively seek out or know this sort of information.

And finally, consumers are constructed as unwilling: *“If a test shows that you are shifting from healthy to a little bit unhealthy, then from a scientific perspective there is reason to act, but the one who gets the diagnosis shrugs his shoulders. I think that the main problem is that the reasons to act are absent. People can understand the information they get, but the reasons have to exist as well.”* (Social scientist). This fragment implies that the consumer might be willing to get the information up hand and understands it, but will do nothing with it.

In short, while talking about the discrepancy between nutrigenomics and everyday life, social actors emphasize especially how difficult it is to change dietary habits of the incapable, uninterested and unwilling consumer. Thus social actors around food problematize the use of knowledge and tools from nutrigenomics rather one-sidedly. The consumer is mainly seen as the actor that does not fit in with potential nutrigenomics tools. The finding that the ideas imbedded in nutrigenomics do not fit in everyday life remains underexposed. In the next paragraph we will see which strategies are proposed by the social actors to bridge the gap between nutrigenomics and the everyday life of the consumer and which constructions of the consumer play a role in these strategies.

Nutrigenomical governance of consumers: changing the food environment or communication

Various solutions are given to overcome the discrepancy between nutrigenomics and everyday life. All these solutions are focused on changing the dietary behaviour of the consumer, entailing changes on different levels of society and on the diversity of products with which consumers are confronted. The proposed solutions can roughly be divided into two strategies. The first focuses on changes in the food environment of people. The second tries to make changes by improving the communication with the consumer.

Changing the food environment

The idea of an unhealthy food environment arises from the opinion that the market has a big impact on the way consumers choose their foods: *“As is mentioned by the World Health Organization¹, not only consumers are responsible, but also the industry is partly responsible for the dietary behaviour of people and the awareness about nutrition.”* (Food communication) According to this view, the societal actors along the food chain such as agriculture, retailers and manufacturers, determine the food market. Agriculture is overproducing foods with high amounts of fats and sugars, manufacturers produce products containing excessive amounts of unhealthy ingredients in portions that are too big, and retailers advertise the wrong foods for the wrong prices (Lang and Rayner, 2007). Because restaurants, supermarkets and food producers are at an advantage if people eat more, some even argue that the market deliberately keeps the food environment as it is, because more profit can be made from unhealthy diets (Nestle, 2003; Brezis and Wiist, 2011). Thus regardless of the personal characteristics that may lead people to unhealthy dietary behaviour, the societal actors in the food market shape the food environment in such a way that the unhealthy choice is the easy choice (Nestle, 2003; Food Ethics Council, 2005). According to the participants, consumers therefore need mechanisms that change their environment to push or force them to the healthy choice: *“I think that the idea of free choice is complex. Other values exist behind the products that are in the stores, like money instead of health. For this reason one could plead*

within the liberal establishment for a bit of pressure against the pressure from the market...Currently the options are not free either, but pre-sorted. And we could change this pre-sorting.” (Government) The mechanisms proposed for changing the food environment vary in the way they interfere in the lives of the consumers and in the amount of free choice the consumers have.

Coercive measures

First of all, the composition of common foods can be changed without compromising the taste of products or by making existing healthy products healthier. This strategy forces the consumer to eat healthier even without him being aware of it. One of the social actors refers to a covenant between retailers, government and institutes that offer foods called the Task Force “Transvetzuren”², which is an example of a successful initiative that made products healthier without changing the taste. The amount of trans fatty acids in fast food offered in supermarkets and food served in restaurants and snack bars has been reduced after nutritional science has proven their ill effects (Katan, 2006). According to the social actors, with new knowledge obtained from nutrition and food sciences also other measures could be taken: *“In the case of the reduction of trans fatty acids even though no concessions were made to taste and the likes, it had a great impact on health. Jaap Seidell³ said that if the amount of salt in chips would be reduced, this would help a lot. People will eat chips anyway and a reduction would make sure that they get a better product without them knowing that it’s better for their health” (Food advisor).*

A second more radical coercive strategy that is mentioned follows the example of the legal measures taken for smoking such as taxes, prohibition of advertisement and prohibition of smoking in public areas. In this view, the food environment should be reformed by changing the kind of products offered in supermarkets, restaurants or institutes like schools and canteens, and by influencing the prices of food products: *“Let’s be honest. If you compare it with smoking, each pack of cigarettes contains a warning for the smoker. But this does not work. Only legal instruments were able to reduce smoking. Overweight prevails especially in the lower socio-economic groups. Food selection of those people depends primarily on price. It then turns out that the high energy foods with a lot of sugar and fat are just cheaper. That’s the argument. The argument to act is price. So as long as the government does not intervene, and ensures that food on the shelves has a healthier composition, nothing is going to change” (Food scientist).*

“The groups that would profit the most from food advice are doing the least with them. Possibly one could do something with prizes, although I am not such a big fan of the fat-tax. If one could change the offers at schools a lot could be done to profit health.” (Food advisor)

Also these more radical coercive strategies are not completely novel. EU member states have taken legislative measures that restrict contracts between companies selling soft drink and candy vending machines and schools (Hyde, 2008), and some member states are about to implement the fat tax (Herald News Services, 2011). In the US, legislation has been implemented that subsidizes the growing of fruits and vegetables, regulates the nutritional value in canteens available to students, and interferes with contracts that soft drink vending machine companies have with schools (Dietz and Hunter, 2009).

Obviously, both strategies, changing the content of products, as well as decreasing the choice of products offered at institutes or shops, will force the consumer to eat healthier. However, they tackle a change in the food environment very differently. When producers make products that are healthier or less “harmful” without changing the taste, this might compel the consumer to eat healthier; nevertheless he will not notice anything in his daily life. Changing the way foods are offered, on the other hand, is observable. In that case the consumer will experience that he is forced to change his behaviour or that it is harder to keep the dietary behaviour he has. The same goes for putting tax on foods.

The above section shows that a range of measures, varying from weakly to strongly coercive, are being proposed. The extent to which the consumer may experience coercion depends on the amount of freedom that individuals have. For example, if the portion sizes are changed, people may take two portions instead of one. Or when the offer in canteens is changed, consumers can decide to take food from their homes or go to a food store or other restaurant facility. The same goes for price regulations. When healthy foods are subsidized, more people have more choices to make and the products become more accessible. If, however, changing the food environment means that certain products are prohibited or if prices are increased in such a way that it is not accessible anymore to everyone, one may talk about strong coercive measures. In the following strategies for overcoming the mismatch between nutrigenomics and the consumer, consumers observe a change in their food environment as well, however, not force but choice, seduction and persuasion with the help of technologies derived from nutrigenomics sciences, are used to change dietary behaviour.

Moralizing food products

Another proposed strategy that changes the food environment is the development of new food products that are tastier, more convenient or more satisfying. By making healthy products tastier, consumers may be seduced for example to eat more vegetables:

“The industry is involved in making healthy tasty products, for example by taking away the bitter taste of vegetables to seduce children to eat more vegetables.” (Nutrigenomics scientist)

“I believe that we need to make sure that knowledge is wrapped in products which are both tasty and healthy with the help of, for example, nutrigenomics. But I do not know how this can be done, it seems difficult.” (Food industry)

Next to making healthy products like vegetables tastier, the participants propose to make food products that direct the dietary behaviour. For instance by making products that contain the nutritional components that a person needs in the right proportions: *“One could make food products that incorporate as much as possible the elements that one needs in the right proportions.”* (Government) This solution persuades the consumer by convenience instead of taste. It should make the knowledge derived from food sciences easy for the consumer.

Likewise, social actors believe that enjoyment and convenience can be combined with the help of new technologies. For example by making products that fulfil the cravings of the body, but make sure that people will not eat too much. Novel ingredients could help people to feel saturated quickly and stop eating: *“For me nutrigenomics is a tool to look at how food works. How can we serve the long bowel in such a way that a feeling of saturation comes before we eat too much. Especially foods that are processed industrially give these problems. For this reason we must know how the body works and adapt our food to the body. The consumer will notice this because he will get to know new products.”* (Nutrigenomics scientist)

The characteristics of the imagined products, tasty, easy and satisfying, suggest seduction rather than coercion. They should help the incapable, interest the uninterested and persuade the unwilling consumer. The idea of persuasion and seduction implies that the constructed products do not force people to change their behaviour and do not necessarily replace existing products. Instead these products become the alternative for the unhealthy seductive products that the consumer already knows. Evidently there is no coercion involved in this strategy of offering new products, provided that there is enough information available. Enough information is especially important in the case of products which contain elements that make people feel saturated quickly. When people do not get enough information, they are forced to change their dietary behaviour without knowing it, which would result in coercion.

Offering products with a healthier composition, in addition to products that are unhealthier, seems less an issue of corporate responsibility or governmental interference, than fat tax and prohibition of food products mentioned earlier. Instead market forces are important here. The idea that more choice is good for the economy lies in the heart of consumerism (Gabriel and Lang, 2008). Companies (operating within our capitalistic system) are constantly developing new or altering existing products that enhance their market share and increase overall sales and revenues. These products find their way to more shelf space or replace other products with lower profit margins. In short, these solutions can change the food environment, and change the product choice available for the consumer. However, unlike the exercises of corporate responsibility and government interference, the product choices can only change if consumer's interest is triggered, and consumers are capable and willing to buy these novel food products which incorporate health, taste and fulfilment. In this case, the consumer does not necessarily need to understand and live by

the complex information nutrigenomics is providing. In the following proposed strategies to overcome the discrepancy between nutrigenomics and everyday life, communication and understanding complex information should help change dietary behaviour, instead of alterations in the food environment.

Communication, education and personalized coaching

Some of the social actors believe that instead of an unhealthy food environment the main obstacle is getting the consumer to work with the complexity of the health effects of food: *“How can the message that people belong to a potential risk group or people might respond to certain interventions and need to change something in their diet, be translated and communicated.”* (Food scientist) This fragment holds the promise that it is possible to change people’s dietary behaviour by delivering objective information about health and food, provided that the information given can be offered in a proper way. The stakeholders have different opinions on the amount of persuasion needed to make people change their behaviour.

The first strategy proposes that the true facts need to be simplified and communicated in a way that everyone can understand: *“According to the Minister knowledge is very important. We⁴ want a translation of the knowledge that highly educated people have, to a level that is understandable for the Telegraaf⁵ reader. We want to get truth-based knowledge to the Telegraaf audience. Making laws and regulations is all very well, the Government is the creator of those, however, under the current political system this is not going to happen.”* (Governmental organization) The underlying idea of this fragment is that people ought not and do not need to be swayed, but should be able to make objective choices. It assumes that communicators can translate the complicated messages of nutrigenomics to the consumer who is capable to use this information. It is up to the consumer, if he is willing to use the information that is available.

Also in the next fragment communicating true knowledge is important. However, instead of giving general information, personalized information is given with the help of applications of nutrigenomics: *“If you ask people what they normally eat and they eat only fatty sausages and then you check their muscles and there is only fat in them. At that point you could say: You have to change your lifestyle.”* (Nutrigenomics scientist) The following fragment shows that a personal coach should help consumers how to use the information that they get from the tests that nutrigenomics provides: *“It would be wonderful if the dietician becomes the expert of health. Obviously the doctor is not.”* (Nutrigenomics scientist)

The idea of personally tailored nutritional advice triggers a debate among the social actors. Some of the participants see many negative consequences of such a development. They underline some of the norms that exist in everyday life, namely the “freakishness” of personalized advice and fear that health and medical monitoring become the norm with possible detrimental effects. Moreover, they wonder if a diet to avoid health problems will become the norm. The participants for example mention a society of hypochondria with people that distrust their bodies: *“Hypochondria, we do not want that, do we?”* (Governmental organisation) and *“I think, however, that when these become possible, a kind of distrust will arise*

towards one's health or positively formulated people are going to watch over their health." (Governmental organisation) Moreover, the social actors fear that by putting food and pre-diseases under the scrutiny of dieticians, more people will be under medical surveillance for a longer time and claim that the health care system will benefit from this: *"The conceptions of what is healthy and sick will change. The more people are and become a subject of medical monitoring, the better it is for people who are working within that field."*

The following fragment emphasizes that more is needed than communicating the true simplified facts about risks and health effects, either personal or for a general public. For information to be effective people need to acquire the right kind of dietary behaviour through education. In other words, consumers need to learn how nice healthy food is: *"The consumer needs to familiarize himself with the idea that a healthy diet is delicious and needs to be motivated by this experience. At the Netherlands Nutrition Centre we are more concerned with changing the behaviour of people. Of course we as well have tried things from a cognitive perspective, like if people know what is healthy and unhealthy they perceive this as such and change. But what we need is that healthy behaviour becomes routine in the life of people. For example, the exemplary role of parents or schools is important. People need to acquire healthy behaviour."* (Food communicator) This quote illustrates the idea that people should be persuaded by education, that is, they should learn to appreciate and exhibit healthy behaviour through actual practice. Not the knowledge about risks should help to adapt the right kind of behaviour, but enjoyment of healthy foods. Thus social actors presume that through education, children can be brought into contact with different kinds of foods and can be raised to become adults who appreciate the right kind of healthy dietary behaviour.

In short, simplification needs to help the consumer to understand the bare facts, a personalized coach needs to persuade and help the consumer to use the bare facts that nutrigenomics tools reveal, and education needs to persuade people how nice a healthy diet is. All three proposed strategies presume that the consumer is or can be made willing and interested. It also suggests that people are capable of using information and can withstand the bodily urges that they are confronted with while living in a certain food environment. Instead of forcing the consumer or persuading him with changes in his food environment, the type of information and the ways to deliver this information need to be changed.

Nutrigenomical ethics: assumptions, implications and evaluation

So far, this paper showed that actors within the network around nutrigenomics envision a consumer who is incapable, uninterested or unwilling. This incapable, uninterested or unwilling consumer should be either persuaded, coerced or protected. In addition, some stakeholders presume that consumers will be empowered by changing the way health information is delivered, in some cases with the help of nutrigenomics. Thus in the field of food and nutrition opposing strategies for overcoming the discrepancy between nutrigenomics and everyday life are posed. A tension can be seen between making nutrigenomics knowledge available for the consumer and changing his food environment.

The strategies that have been given to find a solution for this tension range from “self-governance” to governance based on, to a greater or lesser degree, coercion. Here I will evaluate these measures from two perspectives: “paternalism” and “self-governance and the good life”. These two concepts give different perspectives on how the proposed strategies influence the freedom for choosing different eating styles and norms in relation to food and health. My assumption is that the co-existence of different eating styles should be protected, given the importance of food for people’s identity, cultural lifestyles and substantial meaning in day to day life (Rippe, 2000; Keulartz et al., 2002b; Korthals 2008b). First, a short introduction on paternalism, and self-governance and the good life will be given. Then I will reflect on the ethical implications of the strategies given by the social actors.

Paternalism

Paternalistic interventions are measures that constrain the freedom of people solely because they would improve their wellbeing, happiness, aspirations and needs. Some paternalistic mechanisms to restrict individuals for their own sake include penalties, for instance the law that makes it illegal not to use seatbelts when driving a car. Others make the desired behaviour impossible to accomplish. For example, by fortifying the community’s water supply with fluoride, it is difficult for people to avoid fluoride intake (Dworkin, 1972). The same can be said for fortifying basic food products such as bread and rice.

A distinction can be made between hard paternalism and soft paternalism. Hard paternalism is narrowing down the freedom of people to perform conscious voluntary behaviour that may harm them. Soft paternalism is interference in not fully intended behaviour that can negatively affect a person’s happiness, health or wellness. Hard paternalism is mostly thought not to be acceptable within a liberal democratic society, whereas soft paternalism mostly is. The objections against hard paternalism are based on the presumptions that a) people are thought to know best for themselves what they want and b) coercing people for their own good is thought to lead to suppression within society (Mill, 2011[1859]).

Unfortunately, the distinction between hard paternalism and soft paternalism is not always clear. Interfering in the behaviour that is influenced by culture or family in which an individual grew up is, according to some, no hard paternalism. This behaviour is seen as not fully rational, but influenced by social pressure or habits (Thaler and Sunstein, 2008). One could, however, also argue that it might be very difficult to distinguish between opinions and norms that people consciously have, and herd behaviour. Thus the difference between behaviour that is fully intended and behaviour that is the result of non-voluntary actions is problematic. Other problems concern voluntary actions of people that may irreversibly change people’s voluntary conscious behaviour in the future. Arguably also paternalistic measures are allowed if people make a choice that may endanger the ultimate ends that they foresee for themselves in the future (Dworkin, 1972). For instance, Dworkin (1972) gives the example of drugs. The addictive characteristics of drugs irreversibly change

voluntary behaviour and may obstruct the goals and desires people envision for the future. In short, taking drugs endangers one's future freedom and autonomy. However, also in this case one may wonder in which circumstances this argument holds true. On a genomic and proteomic level in rats and possibly in humans as well, sucrose and highly addictive drugs work similarly on the reward system in the brain (Avena et al., 2001; Van den Oever et al., 2006). Thus one could argue that, like is the case for drugs, hard paternalistic measures are allowed to control sugar intake, because of its addictive characteristics.

Likewise, different opinions exist on defining “causing harm to others”. For example, when people are eating too much salt there is a risk that they do impose harm on others. In case a person with a family gets a chronic kidney disease, this may harm his family members, because this person may not be able to take care of them. Mill, for example, claims that the government can interfere if people would like to marry without having enough money to sustain their family, because then they actually impose poverty on their family (Mill, 2011 [1859]; 109). The same argument exists within our current society in relation to social health insurance and unhealthy lifestyles. Some argue that when people have unhealthy lifestyles they harm others because their future health care costs might be higher, thereby undermining the social health insurance system.

In short, the difference between soft paternalism and hard paternalism, and the meaning of causing harm to others is rather unclear and needs to be seen on a case by case basis. One form of soft paternalism that tries to avoid this debate is “asymmetric” paternalism or “liberal” paternalism. Liberal paternalism tries to change non-conscious involuntary behaviour with methods that do not restrict conscious voluntary choices (Loewenstein et al., 2007; Thaler and Sunstein, 2008). It uses knowledge of behavioural economics to “nudge”, which means something like a “small pat” in the back, people into what they think is the accurate direction (Thaler and Sunstein, 2007). For example, according to behavioural economics the presentation of foods in canteens can strongly influence the choices people make (Loewenstein, Brennan et al., 2007). Although one could dispute in some situations if one would agree with the ultimate goals that are aimed for when people are nudged (Desai, 2011), liberal paternalism tries to overcome the drawbacks of paternalism.

Self-governance and the Good Life

Earlier research has shown that visions of nutrigenomics contain certain assumptions about the good life. Health is equalized with risk minimization and the prevention of a multitude of diseases and the healthy life can only be realized by monitoring and measuring health and by following complex diets. The pursuit of the healthy life is so comprehensive that health becomes an ultimate end in life. In short the healthy life becomes the good life (Komduur et al., 2009). This means that nutrigenomics could reinforce ideas of self-governance (Clarke et al., 2003; Rose, 2007). This is a term introduced by Foucault and later applied to bio-medicalization to describe a situation in which people with the help

of innovations and interventions discipline themselves to strive for happiness and health in terms of prevention of illnesses and risk minimisation. This form of self-discipline is not caused by strong coercion; instead it is led by discourses of observing, measuring and monitoring populations and individuals. Now regarding the good life, this encompasses within philosophy the search for the meaning of life. The good life incorporates the idea that a life is worthwhile when humans search for the right values and use these values as guidelines for living. People should pursue what they truly want and can do with the abilities, surroundings and networks they have. Next to living in a proper, just or moral way, people should search for their ultimate ends and activities that make them flourish as human beings (Graham, 1990; Nussbaum, 2001). Within philosophy, ideas about what a good life is and the role of health within those views can differ fundamentally (Komduur, Korthals et al., 2009). For example, health can mean health of the soul in the virtue ethical theory of Aristotle (384–322 BC). For the soul to be healthy one should not be preoccupied with one's health, as spending too much time and attention to physical health would only distract a person from the developments of his virtues and talents. Or, according to Kant, healthy living can be a duty. People should feel well enough to resist the temptation of transgressing from their duties (Kant, 1949; Kant, 1977). Thus maintaining health is just one of the duties people have and should be in balance with other duties, like caring for others and being a good citizen. Likewise, between cultures, groups within those cultures and individuals, views of the good life and the position of health within the good life, vary substantially. When the discourse on pursuing a healthy life in terms of risk minimisation and prevention of a multitude of diseases by measuring health and adapting diets becomes too dominant, the plurality of lifestyles in our society and the plurality of ideas of the good life may be endangered.

Between self-governance and paternalistic governance

All the interferences proposed by the participating social actors from the food and nutrition network try to make people healthier. Health is the main goal. The ideas that prevail in everyday life, which I mentioned in the introduction of this chapter, like people who eat unhealthily are more fun to be with and too much attention to risks is freakish (Lupton and Chapman, 1995; Bouwman et al., 2009), are mostly ignored by social actors. Thus if it is up to them, nutrigenomics with its particular meaning of health and nutrition, as a means to improve health, diminish risks and manage and prevent a multitude of (pre-) diseases, will persist.

However, in the proposed manners at which knowledge can be implemented and what this will mean for the meaning of health in the good life for consumers, differ fundamentally. In this section, I will review when and in what form paternalistic measures proposed by the stakeholders are sensible and in what way these influence the good life. I will question if paternalistic forms of using nutrigenomics or self-governance through discourses inspired by nutrigenomics, can endanger the plurality of lifestyles within our society and choice for the good life.

Ethical evaluation of paternalistic measures

Some of the proposed strategies to implement the tools and knowledge of nutrigenomics can be seen as paternalistic. Especially risk minimization by changing the offer of foods is a measure which protects the incapable consumer that is willing and interested. Seen from the point of view of the good life such measures would prevent people from being preoccupied with eating in order to minimize health risks. This saves time they can spend on other aspects in their lives than risk minimization and disease prevention. But it is obviously restricting the freedom of the unwilling or uninterested consumer. I will here consider the arguments for as well as against such paternalistic measures in relation to foods.

As I have mentioned before, some foods can have the same effects as hard drugs (Van den Oever et al., 2006; Avena et al., 2008). One could, therefore, argue that foods that contain for instance a high amount of sugar can prevent the consumer from being able to make fully conscious choices in the future. Seen from this perspective, hard paternalistic measures can be allowed (Dworkin, 1972). Another argument for strong paternalistic measures, is the idea that people unconsciously eat too much of a product, because they do not feel satisfied or because it is processed in such a way that food can be too easily absorbed by the body. If this is true, eating is involuntary behaviour. Following this way of reasoning, controlling the offer of foods is thus interfering with unconscious behaviour (Thaler and Sunstein, 2007; Loewenstein et al., 2007). Consequently, one could argue that it is justifiable to regulate foods like drugs. However, clearly not everyone is incapable of dealing with the foods surrounding him. There are enough people able to withstand tasty high caloric foods or who are not becoming addictive to sucrose when taking it. This means that restricting the food supply for these people is narrowing down fully conscious voluntary behaviour and the freedom to consume the things people want, while their future conscious behaviour was never endangered.

Even when one assumes that most people are indeed incapable of withstanding the subtle pressures and seductions inherent to their food environment, there are three important arguments against changing the food offer. First of all, unlike proving the danger of drugs, proving that food indeed poses a threat to people is very difficult, if not impossible. In the case that nutrigenomics proves that some foods are dangerous for people's health, the threat that these products would form for people are long term and unclear. One could argue that all foodstuffs can be poisonous within a short period of time; even water can, when consumed in large quantities, kill people. However, consuming an overdose of a foodstuff is normally very hard and painful, while taking an overdose of drugs is relatively easy and fast. Thus the situation for food is very unlike the situation for drugs, since taking only a small overdose of drugs can damage the body tremendously.

Furthermore, the question is how far one should go with prohibiting foodstuffs. It is very likely that nutrigenomics may find new risks in relation to foods. Should legal measures be taken for every new risk that is found (Resnik, 2010)?

Finally, food has a special position in people's lives. Foods are part of a culture, part of people's identity and essential for people's survival. When products are completely prohibited, consumers will observe not having their desired products around on a daily basis and cannot lead the lifestyle they choose. Some argue that only "traditional" products, like meat, cheese or eggs, can be part of a lifestyle, and that other products like soft drink are part of an "artificial" lifestyle that is created by marketing strategies (Rippe, 2000). Therefore, they argue that selling products like soft drinks can be controlled by the government. The question is how a distinction between artificial lifestyles and traditional lifestyles can be made. Not only soft drinks and junk foods are promoted through smart marketing strategies. Also products like cheese and meat are marketed extensively (Verbeke, 2005).

Currently, hard paternalistic laws that regulate the food offer do not exist in the European Union. Instead law focuses on food safety, thus harm done to health by third parties through, for example, the contamination by bacteria or herbicides (Van der Weijden and Hin, 2004). However, there are some other hard paternalistic measures taken. For instance changing the food composition without changing the taste of normal foods can also be seen as hard paternalism. People cannot avoid the intervention if they really want to (Resnik, 2010). The unwilling consumer can of course avoid the food products that are upgraded. But if people want to consume the traditional composition of these products, they cannot anymore. However, there are reasons why changing the food composition without changing the taste of normal food is ethically desirable.

This case seems to be similar to the classical example given by Dworkin (1972) of making driving without seat belts illegal. Dworkin argues that people who think that putting on a seatbelt is too much work, and therefore fail to use them, should be forced. The consequences of not wearing a seatbelt during an accident are severe enough and the change in behaviour is small enough to make it compulsory to wear belts. In my opinion, taking away certain ingredients without changing the taste is similar. The intervention for the consumer is small enough and the possible consequences of for example consuming salt, such as chronic kidney failure, are serious enough to justify a hard paternalistic measure.

From another perspective, not wearing belts is unlikely to be part of one's lifestyle and ultimate goals in life to accomplish a good life, while foods may be. The question then is if basic ingredients or substances can indeed be important for someone's lifestyle. For example, can trans fatty acids be essential in a lifestyle? Or can consuming chips with the current amounts of salt be vital for a person's identity? This seems rather questionable.

People may find that products which contain trans fatty acids, like hamburgers or French fries, belong to their identity. Or people may have the opinion that chips are crucial for their way of life. But it seems unlikely that taking away one ingredient of chips or other products may endanger a lifestyle, if the taste is unaffected.

Other strategies that were proposed are introducing taxes or subsidies to steer people's behaviour. Nutrigenomics then solely gives the information and the evidential support to tax some products or subsidize others. These interventions can be seen as soft paternalistic as well as hard paternalistic, depending on the kind of consumer that is constructed by the proponents and opponents. Taxes on foods that have unhealthy characteristics are often dubbed as sin tax or fat tax. Some proponents of sin taxes base their idea on the incapable consumer. They argue that people actually want to quit their unhealthy habits, but sometimes temporarily forget about their long term goals. A tax helps to give incapable consumers an extra argument to stick to their goals whenever they have a weak moment (Gruber and Mullainathan, 2005). Other proponents base their arguments on the unwilling rational consumer. The unwilling rational but capable consumer weighs the hedonistic advantages against the long term advantages on health and wellbeing. The tax on the product they want is then another thing to consider, while balancing the pros and cons (Just and Payne, 2009). According to proponents of fat tax, the tax is not a paternalistic measure but a punishment or coercive measure to prevent people from doing harm to others. The capable rational consumer needs to be punished for the economic burden that his unhealthy behaviour imposes on the health care system. In addition, supporters argue that people are not really coerced to change their behaviour, because they still have the choice to consume the products that are taxed (Green, 2010). Also these arguments are flawed. First of all, it is rather unclear if keeping people as healthy as possible indeed saves the community money. In fact some studies show that preventive measures for some diseases increase the health care costs in the future (Kahn et al., 2008). Secondly, it is questionable if sin tax is keeping open all the possibilities for all people. Especially because taxes on foods hardly touch the rich, while the poor are unevenly affected by it.

On the other hand, subsidies on healthy foods may have other effects. Some argue against incentives for good behaviour because they find it unfair to persuade people with money to behave in a way they should anyway. Opponents see it as bribing (Marteau et al., 2009). This may be true for paying high amounts of money to stimulate people to adhere to, for example, withdrawal programs. But subsidies for foods are in my opinion different. With these measures both the rich and the poor have an advantage. Next to this, there is no coercion for some people within society. Instead the poor have more choices to make. This still means that people need to be willing to buy for example more vegetables. But at least most people have the choice to choose whatever lifestyle they think is best for them. Nutrigenomics can give the knowledge about which foods should be subsidized and which not.

A final proposed strategy for changing the food environment is producing products that have, next to healthy aspects, other characteristics, such as taste, convenience and fulfilment. High tech solutions should create properties that persuade people to eat less of the foodstuffs that are overeaten and eat more of the products they may fail to eat. When people consume these products their longing for certain tastes, convenience and satiation are fulfilled, and while eating the consumer does not need to be preoccupied with the healthy or unhealthy impact of different nutrients. This proposed strategy for using nutrigenomics is fundamentally different from the often criticized functional food product. Functional food products are foods with a health value next to their traditional nutritional value. Consuming a single functional food product is not really helping to enhance health, let alone public health (Schroeder, 2007; Sibbel, 2007). Moreover, functional foods seem to target especially on people with health worries (Devcich et al., 2007). In addition, experts argue that the proof of efficacy of many functional food products is inconclusive (O'Connor, 2011).

The products proposed by the social actors should change a whole food pattern in a way that improves health, seem to be based on evidence and do not use health worries as a marketing strategy. These products in themselves have a paternalistic goal, namely steering the consumer into healthy behaviour. However, whether changing the food environment by creating these products can be seen as paternalistic depends on how the intervention proposed would be implemented. Firstly, if the taste of products that are considered healthy would be changed, for example fruits or vegetables, people may notice a change in taste. It is thus, unlike removing ingredients without changing the taste, a noticeable change. If there is no choice anymore to eat products with the original taste, the intervention can be seen as hard paternalistic, because by changing the taste, a new product is created. Removal of the “original” product may prevent people from having a certain lifestyle. Thus, both the original product and the enhanced products need to be accessible in order for this strategy to be an acceptable soft paternalistic measure. Of course the market often steers this process. When a new product is profitable and the product with the “original” taste is not, then, instead of a paternalistic premeditated plan that chooses for the consumer, it is the market that decides which product should be accessible.

Secondly, the idea of products that incorporate all the elements that one needs in the right proportions is based on the fact that most people unconsciously consume the amount of food they have on their plate. If people get a large portion, they tend to eat much more than when they receive a small portion (Rolls et al., 2002). Thus by smartly composing meals one can nudge the consumer into eating the exact nutritional value that he or she needs. This is a liberal paternalistic measure, because it interferes in the unconscious behaviour of the consumer. One could argue that this is manipulation and that the industry should not be allowed to make such choices to protect its consumers. However, nobody can deny that choices about products sizes and its content need to be made, and increasing healthy dietary

behaviour is ethically preferable to increasing the portion sizes for economic purposes (Young and Nestle, 2002). Moreover, people who consciously want to eat more than the product contains, can eat two meals. Of course, in order for it to be liberal paternalistic, accessibility and price are important considerations.

The third option, offering products with satiating characteristics, is arguably most controversial. These products not only interfere in behaviour controlled by unconscious psychological processes, but steer physiological mechanisms in the body. Thus people cannot choose to eat more of the product, even if they would like to. The consumer, therefore, clearly has to have a choice not to consume such products, in order for it to be an acceptable measure. This means that he needs to have access to alternatives and needs to be informed about the effects it has on the body.

In short, changing the food environment prevents a situation in which people need to be preoccupied with risk minimization and risk prevention. The ethical desirability of measures, such as tax and regulating the food offer, is however questionable. These can be seen as hard paternalistic measures that coerce people into certain behaviour and endanger the freedom to have a certain eating style. Arguments that propose that hard paternalistic measures concerning food are legitimate because people who lead an unhealthy lifestyle harm third parties, because food can undermine future conscious behaviour or because a distinction can be made between foods that are valuable and foods that are not valuable for a certain lifestyle, are flawed. On the other hand, changing ingredients and emphasizing and improving other values of foods to change food patterns, have major advantages without endangering people's choice for a certain lifestyle and their idea of a good life.

Ethical evaluation of self-governance

The proposed options to use nutrigenomics tools and knowledge are to provide people with more information or educate them, demand fundamental changes from the consumer, but preserve a certain freedom of choice. There is, however, difference in the effect the proposed communication strategies can have on discourses of health. Communication in relation to health and food can create 'discourses' on what the right kind of behaviour is for people. These discourses make people act according to the proposed norms in these communication strategies. In the case of nutrigenomics, eating becomes equal to preventing a multitude of diseases and minimizing risks. Pursuing health becomes a main task within the good life. No paternalistic measures directly interfering in people's behaviour, but social control and regular health checks and self-surveillance are directing people's actions (Clarke et al., 2003).

The first proposed strategy, providing true objective information about the effects of food may not be able to change discourses effectively. However, the chances are rather small that this will happen if one merely delivers the dry objective facts. Firstly, it is rather time consuming to deliver and get informed about the complex knowledge that nutrigenomics sciences may give, that has an additional value to the general food recommendations that

already exist. Thus, at most, the already highly motivated consumer might be influenced by this strategy. Secondly, it is questionable whether objective true and simplified information is in fact possible, because the framing of information about food is necessarily biased. Especially in the case of nutrigenomics, much of the information that comes from nutrigenomics will be lost, since it is about a multitude of (pre) diseases, a multitude of risks and a multitude of effects of nutrition. Thus the communicators need to make choices when they would like to simplify the knowledge from nutrigenomics in a way that can be used in health campaigns. More importantly, although hard paternalism is not at stake here, liberal paternalistic measures can be. One can use techniques when information is communicated to the public or use marketing techniques that appeal to emotions such as fear (Buchanan, 2008) to manipulate people into a certain direction. For example, showing smiling emoticons with “correct” behaviour and non-smiling emoticons with “bad” behaviour can influence people’s actions tremendously (Thaler and Sunstein, 2008). These marketing tools are already used and might be more effective in creating discourses to which people adhere. It is questionable if these strategies should be used especially if they are used in relation to “bad” behaviour since this might increase feelings of being under social pressure (House of Lords, 2011).

Education at schools might have better chances of creating practices of self-governance in relation to health and nutrition. Since everyone needs to go to school, all consumers of the future would be in that case compelled to experience different healthy foods and recipes. One can debate about the fact if learning about food, something as natural for human beings and fundamentally embedded within cultures, should be done at schools, instead of at home steered by the intuitions of parents (O’key and Hugh-Jones, 2010). But also knowledge about other natural issues that are a fundamental part of our culture, like information about sex and religion, are part of educational programs. And one could structure the educational programs in such a way that they are better connected to norms within everyday life. Participants mentioned that people “have to learn that healthy food is nice”. One could rephrase this goal, when educational strategies are used. Instead of focusing on the risks of the wrong dietary behaviours one can emphasize taste, combining tastes, cooking, and culture.

The third option in which the food environment is not changed, demands a change in the medical system. Food, health and eating become a part of medical scrutiny. The unwilling and uninterested consumer can choose not to use services that provide tailored nutritional advice, so there is no direct coercion involved. And the incapable consumer can be helped intensively. All the nuanced knowledge that nutrigenomics encompasses can be delivered. However, this option demands a change in norms within our society. Eating and health needs to be seen in terms of risk minimization and disease prevention. This has some ethical drawbacks (Komduur et al., 2009) as was recognized by the social actors. It

might cause anxiety and make people distrust their body, people would be under medical surveillance for a longer time, and food might lose its social and hedonistic meanings. People would not be coerced to adhere to these norms, but would feel social pressure through the surveillance of medical services.

In addition, it is questionable if measures might be used to increase the pressure on people into using dietary services. When tailored nutritional advice would not be part of the basic medical system, only the rich can afford it. Hitherto in the Netherlands stratified health services are seen as undesirable and unfair (Bago d'Uva et al., 2009). Thus it should be made part of the basic health care. Then one can wonder how these services can be offered and what kind of measures will be used to stimulate people to use the services since they are for their own good. If similar methods are used that, for instance, now are used to stimulate people to go to the dentist, more people will feel obliged to go. Research shows that if regular checks are scheduled and one needs to actively cancel the appointment, if one chooses not to participate, participation is much higher (Junghans et al., 2005). Moreover, if incentives are used by insurance companies, as already is the case with failing to go to the dentist in the Netherlands, people are stimulated to partake (Thaler and Sunstein, 2007). Both methods can be seen as liberal paternalistic since people have the choice to opt-out, or, if they can afford it, accept the incentives attached to their actions. However, these liberal paternalistic measures seem to give more options for choice, than people in reality may experience. Third parties, like medical staff, dieticians and insurance companies, stimulate people actively and strongly to undertake self-governance. Thus the social pressure felt by people to discipline themselves to minimize health risks, caused by discourses of monitoring, measuring and observing, may be much higher because of these liberal paternalistic measures.

In short, these three strategies are all aimed at changing the discourse within society on health, food and illness. Especially personal dietary advice of a personal dietician or lifestyle coach may endanger a plurality of lifestyles and other meanings of food. Following personal complex dietary advices needs to become the norm. It would be too easy to assume that with the coming of such services people have just another choice. Under influence of discourses on striving for health by risk minimization and disease prevention, people might not use the available services because they choose these services, but because the social environment expects them and stimulates them to use the services available. The power of social pressure should not be underestimated. When such discourses become too dominant, other ideas on health and the good life can be threatened. Educational strategies in which norms like fun, taste and culture can be incorporated seem ethically more desirable. This gives room for lifestyles in which other norms than health play a role.

Conclusion

The way social actors frame the mismatch between nutrigenomics and everyday life is rather one-sided. It is especially the consumer who is unwilling, incompetent or uninterested in changing his dietary behaviour with the help of nutrigenomics. In all the strategies constructed by the social actors to implement the knowledge of nutrigenomics in a meaningful way, health remains the ultimate goal and the consumer should either be stimulated by discourses on health and risk minimization or by a change in the food environment to shift towards healthy dietary behaviour. Solutions are sought in creating discourses of health by providing the consumer with information based on the knowledge derived from nutrigenomics, or by changing the food environment with the help of nutrigenomics. Other possible strategies, for example incorporating other normative assumptions within visions of nutrigenomics that better match hedonistic everyday ideas and health is irrelevant (Komduur et al., 2009), were not discussed. However, although health remained the ultimate goal, some of the strategies proposed give more room for a co-existence of different lifestyles than others and leave more opportunity for the existence of different meanings of food.

Although at first sight education, objective information or personalized advice with the help of a health coach, seem to empower the consumer and protect the autonomy of consumers, social coercion can be a real problem in terms of pluralism of lifestyles and choices for the good life (Komduur et al., 2009; Clarke, 2001). Especially the model of providing personalized advices with the help of tools derived from nutrigenomics and a health coach or dietician can be problematic seen from the perspective of the good life. Pursuing a healthy life by risk minimization and the prevention of a multitude of diseases is probably so complex and time consuming, especially because it concerns an everyday activity like eating, that disciplining oneself to the demands of such a monitoring system may become a priority of life that threatens other priorities which are now seen as important for leading a good life. In addition, liberal paternalistic techniques that nudge people into certain behaviour that is aimed at health can be used to even increase the pressure on people to use such services. Although these kinds of techniques are already used in many ways (Thaler and Sunstein, 2007), we need to ask ourselves for what goals they should be used and if it is desirable to nudge people into a lifestyle in which risk minimization by means of food is the ultimate goal (Desai, 2011). More ethically desirable in terms of the protection of different lifestyles and meanings of food, is education. Education has the most opportunities to incorporate other aspects than health in relation to food, such as taste and culture.

By changing the food environment health remains the higher goal, but ensures that people do not need to handle the complex information of nutrigenomics and need to make healthy eating a major priority in their lives. Nonetheless, also some of these strategies endanger the plurality of lifestyles. Especially measures that force also the unwilling consumer to change his dietary behaviour, such as tax and changing the food offer on the

shelves, need to be evaluated and discussed critically. Changing products by taking away certain unhealthy ingredients in such a way that the taste is unchanged does not limit a choice in lifestyles and is therefore unproblematic. However, when certain products are prohibited or when a new product is created by changing the taste of other products, the freedom of choosing a certain lifestyle may be narrowed down. Not the industry or government, but market mechanisms should therefore be able to determine the offer. The idea of persuading the consumer into eating more products that are considered healthy or to eat fewer products that are considered unhealthy by using techniques that improve other values of food than health, such as taste, convenience and fulfilment, seems very promising. This is fundamentally different from the often criticized functional food products. Instead of being a utopian quick fix, in which one product gives unrealistic promises for the consumer's future health, these techniques change the total consumption of a wide range of nutrients. Still, we have to take care that choice and access are realized so as to avoid unnecessary coercion and the emergence of a stratified health society. These aspects need to be evaluated critically.

Notes:

¹ Participant refers to: World Health Organization, The 2008–2012 action plan for the global strategy for the prevention and control of non-communicable diseases (WHA, 61–41), Geneva: World Health Organization; 2008

² “Transvetzuren” are trans fatty acids

³ Jaap Seidell is a Dutch food scientist

⁴ “We” refers to the Dutch Ministry of Health, Welfare and Sports

⁵ Largest Dutch newspaper with arguably the most populist content, bold headlines and large glamour section

6

Discussion

Introduction

The aim of this thesis was to find an ethical form of nutrigenomics by analysing and creating a deliberation with social actors of nutrigenomics. A pragmatic ethical approach has been used, inspired by the ideas of John Dewey, in which ethical deliberation is seen as a process of dramatic rehearsal. The concept of dramatic rehearsal which was originally developed by Dewey to ethically evaluate different courses of action, has been applied in order to structure a deliberation on nutrigenomics. I have tried to find and ethically reflect on different strategies for using nutrigenomics or reshaping nutrigenomics science practices by exposing the main norms embedded within nutrigenomics with the notion of script of Akrich (1992) and norms in everyday life with the discourse analytic approach Potter and Wetherell (1987) so that social actors of nutrigenomics could be confronted with the clash between these norms. In addition to insight into the interaction between current norms of the potential users of nutrigenomics applications and norms in nutrigenomics practices, these steps also enabled an empathic component and consciousness on the implicit assumptions made in nutrigenomics. Empathy for other people's values and worldviews and being conscious about normative assumptions of nutrigenomics, enabled an exploration of all of the possibilities for nutrigenomics instead of only those most obvious to the group of people that participated in the ethical deliberation (Dewey, 1908). Besides giving ideas for shaping nutrigenomics in an ethical way, this study has also provided new insights into how ethicists can ethically assess sciences early in their development. The major findings and conclusions that can be drawn from this research will be brought together in this chapter by focusing on the following research questions:

1. What is the state of art of nutrigenomics and how does this influence an ethical evaluation of nutrigenomics?
2. What normative assumptions are embedded within one of the main scripts of nutrigenomics, and can these normative assumptions lead to ethical issues?
3. In what way do the normative assumptions of nutrigenomics match or clash with the interactive goals of using repertoires about genes and health risks in discussions about overweight with citizen–consumers?
4. How can we manage a possible clash between everyday life and normative assumptions of nutrigenomics with different strategies of using nutrigenomics or reshaping of its scientific path according to social actors of nutrigenomics?
5. What are the ethical issues regarding these alternative strategies of using or reshaping nutrigenomics, and which of these might be ethically most preferable?

Since the combination of steps taken in this research is novel, I will not only discuss the findings but also reflect on the methods that were used. Finally, I will reflect on the future implications of this research.

State of art of nutrigenomics and its implications for an ethical evaluation

In Chapter 2, research question 1, “What is the state of art of nutrigenomics, and how does this influence an ethical evaluation of nutrigenomics?”, was answered. A non-exhaustive list with cognitive uncertainties, e.g., uncertainties in social scientific and scientific research around nutrigenomics, and moral uncertainties, e.g. uncertainty of what the right action is in a certain situation, were presented. We show that moral and cognitive uncertainties are strongly intertwined.

First, there are many experimental uncertainties with nutrigenomics. For example, problems need to be overcome in regard to the standardization of study designs which give unwanted variation (Kaput et al., 2010). Other uncertainties include questions about to what extent the complex relationships between the genome, environmental factors like diet, mRNA and metabolites can ever be understood (Tomba et al., 2005; Panagiotou and Nielsen, 2009). Finally, there are uncertainties concerning risk assessments based on nutrigenomics research. For example, we do not know what the substantiality of risks related to certain genotypes and the relevance of lifestyle components in these genotype related risks will be. Nor is it known if nutrigenomics will reveal that high risk genotypes are common within the human population.

In addition, there are uncertainties related to reactions of social actors to nutrigenomics services and possible nutrigenomics food products. As Chapters 1 and 2 of this dissertation demonstrate, nutrigenomics can be used for personally tailored dietary advice based on genetic tests (Smith et al., 2008) or based on biomarker tests (van Ommen, 2008) for dietary recommendations of populations (Penders et al., 2007; Fenech et al., 2011) or for general advice (de Roos and Romagnolo, 2012). These different types of advice raise varying social scientific questions. For example, in the case of personally tailored advice, it is important to know how nutritional advisors or public health communicators should communicate to people that lifestyle changes may not sufficiently help to minimize future health problems (Rose, 2001; Castle, 2009). Moreover, it is questioned whether consumers act upon risk information and how substantial this risk information must be in order for it to be persuasive (McBride et al., 2010).

Cognitive uncertainties are, in many cases, strongly intertwined with moral uncertainties of nutrigenomics. For example, essential for the consumer is the question of how to deal with feelings of anxiety or uncertainty related to the effectiveness of changing a lifestyle (Hjorleifsson and Schei, 2006). This question is connected to the moral question of how much and in what way health professionals should provide people with information about their health status. Another example is the uncertainty surrounding the role of governments in the protection of people against genetic discrimination in the event that nutrigenomics would lead to genetic tests (Joh, 2011) or categorizations in dietary advice (Castle, 2009). Will the government allow insurance companies to use financial disincentives or incentives to partake in regular health checks or genetic testing (Cornel

et al., 2012)? Also, these moral uncertainties are connected to scientific questions; for example, the question of how common genetic risks are in the human population. How important are problems like genetic discrimination and stigmatisation if the majority of the population belongs to one or another genetic risk group? And finally, it remains to be seen if the industry is able and willing to use nutrigenomics to thoroughly investigate the effects of functional food products on health (Katan, 2004). This is connected to uncertainty surrounding the complexity of the relationships between the genome, diet, mRNA and metabolites.

Thus, there are many uncertainties that may influence the development of nutrigenomics from the laboratory to the actual application. These uncertainties are related to the scientific practices of nutrigenomics and the knowledge that these practices will provide. Moreover, they concern the way the applications of nutrigenomics will be shaped and the reactions and actions of social actors to these applications. All uncertainties are strongly intertwined. Cognitive uncertainties influence moral uncertainties, and vice versa.

Principalism, which is often used to deal with ethical problems in relation to food (Korthals, 2004), does not seem capable of dealing with this complexity. The concepts used in principalism assume a constant society with a clear and constant flow of information and clear lines of connection between science, stakeholders, and their social context. For example, for a discussion about “individual responsibility” (Cain and Smid, 2003), clear connections need to exist between persons, actions, the effects of these actions and the intentions behind these actions (Feinberg, 1964; Korthals, 2003). Since the information that nutrigenomics will bring is uncertain, and there are no stable and clear connections between actors, the concept of individual responsibility can only be of limited use when dealing with nutrigenomics (Chadwick, 2004).

Thus, to return to research question 1, “What is the state of art of nutrigenomics and how does this influence an ethical evaluation of nutrigenomics?”, it can be concluded that the state of art of nutrigenomics is uncertain, that moral and cognitive uncertainties are strongly entwined and that principalism is not able to deal with the uncertainties of nutrigenomics. The state of art of nutrigenomics calls for a different ethical approach. The “pragmatic ethical alternative” that Keulartz et al. (2004) propose, and which I have applied to the ideas of Dewey on ethical deliberation in Chapter 1, are better able to deal with the complexity of the intertwining between cognitive and moral uncertainties as well as the interaction between science and society during scientific developments (Chapter 1; Keulartz, et al., 2004; Korthals, 2004). The ultimate goal of the ethical deliberation, or “dramatic rehearsal” (Dewey and Tuft, 1908), is to explore a wide range of imagined actions, in this case, different strategies for implementing nutrigenomics, with social actors of nutrigenomics, and to evaluate which paths of action are moral. I have used norms underlying nutrigenomics practices and norms existing in everyday life as an input for this deliberation. Not only is insight into these norms important because they constitute a significant part of the negotiation process between society and nutrigenomics that, in

the end, will shape nutrigenomics applications (Williams–Jones and Graham, 2003), this insight is also necessary to enable an exploration of more than just the most obvious options for nutrigenomics (see Chapter 1). This has some advantages over the use of scenarios about futures in which merely one application of nutrigenomics is implemented. These advantages will be addressed later in this discussion.

I have used the notion of script, first introduced by Madeleine Akrich (1992), to explore norms that underlay nutrigenomics practices. This step enables a better comprehension of the complexity of the development of new sciences, such as nutrigenomics, and made it possible to analyse the possible influence of nutrigenomics on future norms. To uncover norms in everyday life, I have used the discourse analytic approach of Potter and Wetherell (1987).

Three assumptions of nutrigenomics and their ethical implications

In Chapter 3, research question 2, “What normative assumptions are embedded within one of the main scripts of nutrigenomics, and can these normative assumptions lead to ethical issues?”, was answered with the help of the notion of script (Akrich, 1992). The script is a tool widely used in STS and describes how developers of a new innovation envision what the network of their creation will look like in the future. These visions contain assumptions about the preferences, competences, norms and values of the end–users. The developmental process is, as seen from the perspective of the notion of the script, a negotiation between the creator’s envisioned characteristics of the end–user and the characteristics of the real end–user and his network. In Chapter 3, three main assumptions about the norms and values of the end–users and the ethical problems these entail were discussed.

A first observation made in the analysis is that nutrigenomics equate a healthy life with a life without disease. The equation of health with disease–free living and the role of the consumer, can be problematic because there are numerous diet–related diseases. This denotes that the lives of individuals are continuously endangered by eating. In other words, if one disease is prevented or delayed, another can appear or emerge again. Additionally, since food plays such an important role in our existence (Fischler, 1988; Chamberlain, 2004), trying to stay disease–free by eating healthily would become a major activity in everyday life.

A second assumption that was observed in the script of nutrigenomics is that health is quantified as risk minimisation. In the script of nutrigenomics, it is suggested that, by accurately measuring the effects of foods and by knowing the health risks, health can be controlled. Hence, staying healthy seems to be a problem which is solely technological. The methods to measure the effects of food in the body merely need to be improved to accomplish a completely healthy state. This assumption can also be problematic. Since there are multiple foodstuffs with contradictory health messages (Kaput, 2005), living a perfectly healthy life might be utterly complex and unachievable. In addition, describing

health solely in terms of measuring and controlling risks is a fairly narrow definition of health for, in most definitions, health encompasses the idea of wellness or fulfilling one's fullest potential (Hayden, 2001; Smith, 2006; Tischner and Malson, 2012). The focus on risks in nutrigenomics may decrease people's health risks but may, at the same time, raise feelings of anxiety and guilt while eating. (Chamberlain, 2004; Holm, 2003). Thus, while it minimizes risks, nutrigenomics may also decrease people's wellness. A final concern of the second assumption is a change in time regime that the focus on risks may entail. It is assumed that people want and need to deal with future problems in the current time (Radder, 2003).

The third assumption encompasses that risks are essentially personal. Supporters of nutrigenomics expect that consumers are and should be motivated by the risk information that nutrigenomics applications could provide. At the moment, people are willing to accept overall risks for the entire population but can easily deny the relevance for themselves. The assumption is that this escape route will disappear when people receive information about health risks that is tailored to their physical needs (Simons and Katrin Lensch, 2006). As Chapter 4 of this dissertation, as the studies of McBride et al. (2010) and Bouwman et al. (2008b) show, this presumption is rather questionable. One might wonder if people are open to personal risk information if it means that they have no choice but to act as is prescribed. In addition, personal risk information might be undesirable, especially when it concerns easily recognizable risk groups. The social environment may then attempt to exert pressure to obtain a personalized advice and acting upon such advice can easily become a social norm. Displaying behaviour that does not follow this norm might be punished by, for example, higher insurance rates. Instead of feelings of compassion for sick persons, people may blame the sick and perceive disease as a punishment for not having followed the lifestyle that fits with their personal physical needs.

In short, striving for health as it is defined within the script of nutrigenomics seems to be tremendously complex. Moreover, because it involves food, it is a goal that should be considered at every meal time and should be one of the most important activities in people's day-to-day business. This may increase the tendency within society to overestimate the significance of health as well as the tendency to strive for health. Health in the form of risk minimisation and disease prevention may become a social norm (Crawford, 2006). This exceptionally demanding social norm may stand in the way of priorities other than pursuing personal health. Consequently, the nutrigenomics script seems to presuppose that the healthy life is equated with the good life. This equalization, when seen from a philosophical viewpoint, is rather peculiar. For example, within deontology, working on one's health is only one of the duties (Kant, 1949) that one has. Likewise, within virtue ethics, health is merely a means to allow a person's virtues to flourish (Ree and Urnson, 2005). This shows that a script of nutrigenomics that promotes a balance between different responsibilities or different ends in order to lead a virtuous life is possibly more ethically desirable. What is more, when a healthy life is equated with a good life, health may not

only stand in the way of other priorities, but it may also be a goal that merely leads to dissatisfaction and disappointment. Some philosophers argue that striving for health is just a desire for a longer life; a desire that may never be fulfilled (Callahan, 1995; Achterhuis, 1988). This may lead to a society in which people have utopian expectations about the effects of food on health and the length of life which only leads to an overall dissatisfaction of how people feel (Barsky, 1988; Greenhalgh and Wessely, 2004).

How nutrigenomics will affect other norms related to food and health, and vice versa, is uncertain and unpredictable. History shows that applications can be accepted, rejected or reformed depending on the way its assumptions connect to “user contexts” (Akrich, 1992). Still, some of the complexity of technology development is captured in Chapter 3 by reflecting on the way a script or different scripts may be shaped by societal context (Williams–Jones and Graham, 2003; Keulartz et al., 2004). Answering the question, “What normative assumptions are embedded within one of the main scripts of nutrigenomics, and can these normative assumptions lead to ethical problems?”, provided the opportunity to explore how the script of nutrigenomics fits with norms in our society (Williams–Jones and Graham, 2003; Keulartz et al. 2004). Equally important, it gave insight into the taken–for–granted positions within food sciences and nutrigenomics which is necessary for a successful deliberation with social actors of nutrigenomics (see Chapter 1) and the ethical problems that these taken–for–granted positions can entail.

Matching or clashing depending on the interactional context: “Being conscious about health risks” and “Having to enjoy life”

In Chapter 4, more insight was given into the interactional norms within discussions about overweight. The results of Chapter 4 served the purpose of this thesis in two ways. First, some of the implicit interactional norms in discussions with citizen–consumers were exposed. As mentioned before, this was necessary for a fruitful ethical deliberation because it enabled social actors to become aware of current interactional norms as well as next to norms within the script of nutrigenomics. Secondly, this step enabled us to gain insight into the question if and in what form nutrigenomics applications may be accepted by their future users.

With respect to research question 3, “In what way do the assumptions embedded in nutrigenomics match or clash with the interactive goals of repertoires about genes and health risks in discussions about overweight with citizen–consumers?”, the following can be said. The presentation of healthful living in terms of personal risk management and disease prevention presupposed by nutrigenomics connects only partly to assumptions about health, risk, and genetic susceptibility in everyday life. The results reveal a tension between some of the participants’ notions of a “good life” (see also Komduur et al., 2009). This is specifically the case in regard to the importance of health–conscious behaviour and behavioural explanations for overweight, opposed to the importance of enjoying life and being accountable for being preoccupied with health risks.

First of all, the results of Chapter 4 suggest a normative orientation towards behavioural explanations for being overweight. This could be seen in the way people received accounts that literally contained the words “genes” or “genetic”, the “In the gene” repertoire. Although the “In the gene” repertoire was used reluctantly in the overweight groups to negotiate a diminished personal responsibility for being overweight, this did not work out well. Others in the overweight groups resisted these accounts and treated them as explanations that are merely used out of self-interest. Non-overweight groups treated the “In the gene repertoires” as a subjectively motivated explanation, that is, as solely used because it suits people to use it rather than a true explanation of being overweight. Other accounts that were used to negotiate issues of responsibility in regard to people being overweight, for example, the “Build” repertoire in which descriptions of differences in body size between children were given, were more easily accepted. However, it is questionable if this “Build” repertoire undermines the idea that people prefer behavioural explanations for being overweight. These descriptions were received as neutral and visible proof but merely *suggest* a genetic component. Moreover, the manner in which descriptions of the build of one’s children were used suggests that the normative orientation towards behavioural explanations is mainly applicable to being overweight. In the case of overweight children, the “Build” repertoire worked as a parent’s account for taking responsibility and to let them eat less. In the case of slim children, the “Build” repertoire was an account for allowing them to eat “anything” including unhealthy foods. Thus, a description of a “thin build” was used to present oneself as a responsible, but more relaxed, parent toward the dietary habits of one’s children. A similar observation could be made in the context of losing weight. In short, the orientation toward behavioural explanations was mainly found in the context of being overweight. In the context of parenting or losing weight, explanations containing stories about involuntary bodily processes were used and accepted.

Secondly, two assumptions about “good conduct” have been observed: being conscious about health risks and being able to enjoy life. People do not only account for unhealthy behaviour but also for being aware of health risks and acting accordingly. Although health is important, there is a normative orientation toward being relaxed about health risks. Making too much of a fuss about health was not accepted. Only when accounts were used regarding concrete risks like diseases in the family or concrete situations such as a health check, presenting oneself as being preoccupied with health risks was accepted. Otherwise, accounts about health risks were received as “being unable to enjoy life”.

Thus, there is, on the one hand, a normative orientation towards behavioural explanations and, on the other hand, a normative orientation towards being relaxed about health risks. These double standards reflect the idea that there is a tension between having control over one’s health and letting loose of this control (Crawford, 2006). In addition, a separate use of these repertoires can serve as explanations accounts not to take action against health risks, especially when healthy living demands overly complicated dietary actions such as

suggested in the nutrigenomics script. These results are confirmed by a study by Bouwman et al. (2009). In this study on everyday talk about people's dietary behaviour, it was shown that people see their own eating as uncomplicated and self-evidently healthy and, in those cases where they see it as unhealthy, easy to compensate for. Health professionals should, therefore, avoid an over-medicalization of food advice and pay attention to broader notions of health and looking at health problems from a wider perspective (Bouwman, 2009).

In short, this study on everyday talk gave evidence that the norms embedded in the script of nutrigenomics only partly connect to norms in everyday life. Although overall health is important, and people are held accountable for being overweight, being overly attentive toward health risks is undesirable and perceived as a failure to enjoy life. The visions about disease prevention and quantification of health and health risks within the script of nutrigenomics may conflict with this normative orientation toward being relaxed about health. By looking at current, everyday talk regarding health and genes, Chapter 4 showed that, at this moment, genetic information is not yet constructed as a reason for pro-active health behaviour, but instead, as a way to negotiate responsibility and blame for being overweight. For certain envisioned applications of nutrigenomics such as genetic tests or biomarker tests, this will mean the following. Accounts in which such tests are mentioned can be used to construct a health-conscious identity while also fully enjoying life. As seen in the use of descriptions of leanness in children and accounts for being responsible, but relaxed parents, descriptions of low risk test results might display health consciousness and, at the same time, a pleasurable life without worries. Genetic tests for obesity may be problematic for managing the tension between presenting oneself as relaxed about health risks and being health conscious. Narratives about doing a nutrigenomics test to reveal genetic susceptibilities for overweight and high-risk genetic test results could be treated as self-serving accounts. All suspiciousness is probably gone when the person concerned is not overweight. However, lean people do not have a direct reason to do a test, certainly not in a climate in which behavioural explanations predominate. Moreover, although information about health risks, such as family history and test results of medical check-ups, give people the possibility of accounting for more risk consciousness, this does not necessarily mean that it would lead to increased healthy behaviour. This is confirmed in studies on the effect of genetic testing on health behaviour when it concerns low risks. These studies show that low genetic risks did not affect health behaviour (Sanderson and Wardle, 2005; Lucke et al., 2008; Hilbert, Dierk et al., 2009; McBride, Koehly et al., 2010).

From the results in Chapter 4, it cannot be concluded that nutrigenomics tools may or may not work (Veen et al., 2011) since norms are fluid, and those now prevalent in everyday life or nutrigenomics may change (Keulartz et al., 2002b). Rather, evidence was given that the normative assumptions of nutrigenomics, as described in Chapter 3, are not as self-evident from an everyday perspective as they may seem. These observations were essential to make

social actors of nutrigenomics aware of different and, in many cases, contradictory norms that exist in nutrigenomics practices and in everyday life. This results in an improvement in the deliberation on ethical strategies for implementing nutrigenomics as described in Chapter 5.

Different strategies to manage a possible clash: communication, coercion and seduction

Possible ways of managing a mismatch between nutrigenomics' focus on health in terms of risk minimisation and the idea of being relaxed about health and enjoying life (Courtenay, 2006, Pajari et al., 2006; van Exel et al., 2006; Harrison, 2009; Bouwman, 2009; Chapter 4) were discussed with the following social actors: representatives from food sciences and nutrigenomics research, governmental organisations, the food industry, food communication and from social sciences studying nutrigenomics (see table 1, Chapter 5). With this deliberation, I have tried to answer research questions 4 and 5. First, question 4, "How can we manage a possible clash between everyday life and normative assumptions of nutrigenomics with different strategies of using nutrigenomics or reshaping its scientific paths according to social actors of nutrigenomics?", will be dealt with.

Consumers are constructed as individuals who are unable to use the information on health and nutrition, not interested in finding information about health and nutrition, or incapable of dealing with the tempting foods in their environment. The strategies that are put forward by the social actors entail changes at different levels of society and different ideas about the choices consumers should have but all had health improvement as a main goal. The first type of strategies focused on a change of the food environment, either by decreasing the number of choices for certain food products through coercion, by persuading the consumer to eat healthier or by steering unconscious behaviour of the consumer. Strategies that involved direct coercion included prohibition of the sale of certain food products or certain ingredients to prevent overconsumption. Moreover, social actors proposed to tax unhealthy foods. Other ways of changing the food environment involved creating more choices for more people by making healthy foods cheaper. Instead of penalizing the poor, as is the case by taxing foods, subsidizing fresh vegetables and fruits gives greater access to those that do not buy such products because they are too expensive. In all of these strategies, nutrigenomics is not providing new technological innovations but is providing the evidence to prohibit certain foods or ingredients or to tax or subsidize foods.

Other mentioned strategies that changed the food environment were oriented more toward the innovative capacity of nutrigenomics. Social actors proposed that nutrigenomics could help produce new types of food products to make it easier and more desirable to eat healthy. These new food products incorporate characteristics like taste, convenience and satiation and thus come closest to what is proposed in Chapter 3 of this dissertation. Thus, in these strategies, the outcome of nutrigenomics research is not solely used for risk minimization

and disease prevention. Instead, other characteristics of food play an important role. The goal of these new food products is to change a whole food pattern. First, improving the taste of foods that are seen as healthy, but of which most people do not eat enough, helps to enhance an entire food pattern. Secondly, food products that incorporate all elements that one needs steers unconscious dietary behaviour in such a way that people automatically consume all the elements needed for a healthy diet. Finally, making some foods more satiating steers physiological processes in the body in such a way that people are kept from eating too much of the foods they should not overeat.

In addition to changing the food environment, a second proposed strategy to manage the discrepancy between nutrigenomics and everyday life involved making information accessible for the consumer and educating consumers. First of all, social actors proposed that knowledge gained from nutrigenomics research should be translated to information that everyone can understand. Social actors proposed a simplification of the complex information that nutrigenomics may provide so that all consumers will be able to use it in an easy way. Secondly, it was suggested that healthy eating should be learned through education; in schools, children can be taught how fun it is to eat healthy. Finally, social actors proposed that tailored nutritional advice based on the outcome of genomics tests could be given to consumers with the help of a “lifestyle coach” and “the dietician as an expert of health”. Some of the social actors suggest that, in this way, people will get intensive support to use the nuanced and complex information that nutrigenomics provides.

The social actors did not discuss strategies to implement nutrigenomics in which the relaxed hedonistic norms which already exist in everyday life predominate. For example, applications from nutrigenomics in which risk minimisation and disease prevention through foods does not play a role of any kind, were not proposed. In such hedonistic strategies to implement nutrigenomics the ultimate goal would be, for example, to make ultimately delicious foods that give fulfilment and are easy to prepare. Another option is that with the help of knowledge about the molecular mechanisms of taste, heavenly recipes can be created that give everlasting joy. That health remains important, however, is neither surprising nor ethically undesirable as I will show in the scope of the research.

Ethical reflection on alternative strategies: between paternalism and self-governance

To answer question 5: “What are the ethical issues regarding these alternative strategies of using or reshaping nutrigenomics and which of these might ethically be most preferable?”, I have conducted an ethical evaluation of the given strategies of managing the clash between nutrigenomics science and everyday life with the help of two perspectives: “paternalism” and “self-governance and the good life”. Given the importance of food for people’s identity, cultural lifestyles, and substantial meaning in day to day life (Rippe, 2000; Keulartz et al., 2002b; Korthals, 2008b), the assumption in this ethical reflection is

that the co-existence of different eating styles should be protected and that all eating styles, including the eating style directed at risk minimization, should be open for discussion. This is consistent with the ultimate aim of pragmatic ethics as is explained in Chapter 1, i.e., to achieve “peaceful” and “equal coexistence” between people with different views on the good life and fruitful cooperation (Keulartz et al., 2004). Thus, in pragmatic ethics, it is acknowledged that values about health and food are of a temporary nature and can be subject to reconsideration and, when needed, re-evaluation (Keulartz et al., 2004). When there are conflicting values about food and health within society, one view cannot be chosen automatically over the other. “Paternalism” and “self-governance and the good life” show how the freedom for choosing different eating styles and how norms in regard to food and health are affected by the proposed strategies.

Two extremities can be discovered in the proposed ways of using nutrigenomics that may endanger the possibility of having different lifestyles in our society. The first extreme, a change of the food environment through coercive measures, does not demand a change of norms in everyday life. These are paternalistic measures which ensure that people do not need to be pre-occupied with healthy eating. Here, the responsibility for health lies on a higher level because people simply can no longer choose certain products. The information obtained from nutrigenomics research, bears the burden of proof to pinpoint that certain products should just be kept from the shelves in order to protect people from unhealthy dietary choices. The second extreme, nutrigenomics as personalized dietary advice, promises freedom of choice but demands a change of norms within society in order for it to succeed.

In regard to the acceptability of coercive measures, John Stuart Mill argued that authorities should not force people into certain behaviours in order to protect them from the results of their actions, even if these authorities believe that they improve happiness and wellbeing or fulfil aspirations and needs of these people through this enforcement. He called this paternalism. According to Mill, this was unacceptable, first, because he expected that autonomous adult people know best what they want. Secondly, because he believed that forcing people, even for their own good, leads to suppression within society (Mill, 2011 [1859]). Mill makes this case with examples from history in which people were suppressed because others believed that it was for their own good. Only when people cause real harm to others, Mill argued, are authorities allowed to intervene. From a pragmatic ethical perspective, these arguments against paternalistic measures especially hold true when it concerns food. As is mentioned above, food forms a part of cultures and is strongly entrenched with people’s identity and worldview. Thus food is an expression of people’s way of life. When products would be prohibited, people would notice this on a day-to-day basis, and this would hinder them in choosing the lifestyle they want (Resnik, 2010; Rippe, 2002). Consequently, people may especially feel suppressed when authorities would interfere in their food choices. Arguments that claim that coercive measures are allowed because consuming certain food can cause cravings or because people that follow an

unhealthy lifestyle harm third parties do not hold. An exception is, perhaps, a prohibition of certain food ingredients. This measure seems to be similar to making it obligatory to wear seatbelts, a case which Dworkin used in a classical paper on how to ethically assess paternalistic measures (Dworkin, 1972). Dworkin argues that, when only a small change in behaviour is demanded, as is the case in using seat belts instead of not using them, and the consequences of certain behaviour are severe enough, as is the case when seatbelts are not used during an accident, certain coercive measures are allowed. Taking away ingredients without changing the taste is only a small intervention for the consumer and the possible consequences, for example, chronic kidney failure because of consuming too much salt, are serious enough to justify paternalistic measures. Above that, it is not likely that basic ingredients like salt or additives like trans fatty acids are important enough to be essential for someone's lifestyle.

At first glance, the second extreme for implementing nutrigenomics, the idea of delivering personalized dietary advice with the help of a lifestyle coach or dietician, seems preferable compared to the above mentioned paternalistic measures. It does not directly reduce people's choices for food and, therefore, it does not automatically make it more difficult to lead a certain lifestyle. However, in light of the pragmatic ethicist's goal of peaceful coexistence, this extreme also seems suboptimal and in need of a broad deliberation. Tailored information of a personal health coach or dietician will change society because this information specifically emphasizes the need to eat and live in terms of risk minimization and prevention of disease.

Although, in this strategy, the government or industry is not coercing the individual directly, it would be naïve to presume that people just have another choice. It may change the discourse on food and health to a discourse of self-governance, that is, a discourse in which it becomes the norm to discipline oneself through innovations and interventions provided by nutrigenomics in the hope for happiness and health (Clarke, 2001). When a discourse of self-governance becomes extremely dominant, it leads to social coercion in following complex personal dietary advices. If that will be the case, people use services like personal lifestyle recommendations or medical check-ups not because they want more information about their health status but because their social environment expects them to. A second step might be that people find it normal that those not using the available services pay a higher insurance rate.

Especially because of the fundamental changes in norms that the proposed strategy of giving personalized advice require, this social pressure can be problematic. Not only will the day-to-day business of eating become a medical matter, ideas of illness and health will also change since even a small disturbance of the bodily homeostasis will be marked as a pre-disease that requires action. It entails that the prevention of a multitude of diseases should be a continuing overall responsibility and risk minimization an important activity in life (see Chapter 3). Norms exposed in Chapter 4 such as "be relaxed about risks" and "be able to enjoy life", which are now prevalent in everyday life, may be lost. In

addition, the meaning of food may change. Food as a way to enjoy life, express your identity or to enjoy other people's company may be matters of the past if personal diets become mainstream. In short, then the norms as described in Chapter 3 that underlay nutrigenomics research will become dominant in everyday life. These disadvantages were mentioned during the deliberation. Governmental organizations as well as social scientists studying nutrigenomics mentioned effects like "a society of hypochondria" (see Chapter 5). Thus, in light of the pragmatist's goal of peaceful coexistence, both coercion as well as personalized dietary advice seem suboptimal and in need of a wider debate.

Other solutions that lay in between the extremities of paternalism and self-governance seem ethically more desirable. They show the "creative capacity" (Keulartz et al., 2002b) of nutrigenomics that is able to deal with the clash between the norms of nutrigenomics and norms existing in everyday life. These ideas for innovations or strategies to implement nutrigenomics have the possibility to incorporate norms and assumptions other than solely health. First of all, seducing people to change their food pattern with values other than health seems promising because it is not paternalistic, not too complex, and seems to manage differences between norms about food and health in the script of nutrigenomics and everyday life in an innovative way. Of course, generating access to such new products through low prices and information are important assets. When these products are not too expensive, many people can choose to consume them without having to be particularly preoccupied with risk minimization. Secondly, some of the proposed communication strategies give room for norms other than health or wider notions of health. In educational strategies, that is letting children experience different foods at school, norms such as fun, taste, and cultural aspects can also be implemented, while this is difficult to accomplish in communications strategies that are aimed at simplifying information. These two strategies seem less problematic from the perspective of the co-existence of different lifestyles. Above that, they allow for broader notions of health that are better suited to the realities of life; an important issue that is brought forth by more and more health professionals and philosophers (see Lezwijn et al., 2011; Mol, 2011).

These results show that a reflection on the discrepancy between norms within nutrigenomics and norms in everyday life helped to start a deliberation that explored a wide range of research tracks of nutrigenomics or strategies to make use of nutrigenomics. I have concluded that some of these strategies are more ethically desirable than others. Especially those proposed strategies that were able to exploit the creative capacity of nutrigenomics and enabled an incorporation of norms other than health seem especially ethically desirable because they enable a co-existence of different lifestyles and norms. When enough information is provided about new products; access for all is guaranteed; and when educational programs at school concerning food incorporate values of food other than health, these strategies become ethically desirable because they avoid strong paternalism and diminish the chances of social coercion. Moreover, these strategies can incorporate norms that fit best with the norms of everyday life (see chapter 4).

Instead of exploring different courses of actions with one possible application of nutrigenomics (see Stemerding et al., 2010), I have used the ideas behind the concept of dramatic rehearsal of Dewey (1908) to explore the possibility of different applications of nutrigenomics together with social actors which made an ethical reflection on these applications possible. In the scope of the research, I will elaborate the advantages and disadvantages of this approach.

Scope of the research

Evaluation of research methodology

Evaluation of overcoming technology blindness and the normative deficit

In this dissertation, the notion of script from STS (Akrich, 1992) and the discourse analytic perspective of Potter and Wetherell (1987) are used in a pragmatic ethical approach inspired by the ideas of John Dewey to overcome the technological blindness of other ethical approaches as well as the normative deficit of STS. The assumption was that this approach would involve the interaction between science and society which will, in the end, shape nutrigenomics, within the search for an ethical form of nutrigenomics. More specifically, this study meant to take notice of the fact that science and the role that it determines for the end user is a process of constant negotiation between visions about nutrigenomics that exist within scientific practices and ideas existing in daily life (Winner, 1986; Bijker and Law, 1993). The goal was to develop a pragmatic ethical approach that goes one step further than STS which solely describes the process of negotiation (Radder, 1992). I also wanted to assess ethical desirability of a change in norms in society.

The analysis in this dissertation solely concerns the negotiation process between norms within nutrigenomics research and norms in everyday life although, naturally, many factors including money and law influence the interaction between science and society (Akrich, 1992). The focus on norms is a simplification but also made the analysis more manageable, clear, and functional for an ethical deliberation. Moreover, these soft concerns from the social ethical arena of the public are essential for the appearance and use of scientific innovations (Swierstra and te Molder, 2012), along with hard concerns like risk perceptions and attitudes (for an analysis of hard concerns of nutrigenomics, for example, see Ronteltap, 2008). The aim was to explore and open up minds for different strategies of using nutrigenomics and to evaluate the ethical implications during an ethical deliberation about nutrigenomics together with social actors from food sciences, governmental institutes, food communication and social sciences studying nutrigenomics. Here, I will briefly evaluate to what extent using the notion of script and the discourse analytic approach of Potter and Wetherell within our pragmatic ethical approach succeeded in overcoming the technological blindness of other ethical approaches and the normative deficit of STS.

The steps that were taken in Chapters 3 and 4 made it possible to think about and ethically reflect upon how nutrigenomics may be used either when it would fit to norms now prevailing in nutrigenomics research (Chapter 3) or when it would fit to norms existing in everyday life (Chapter 4). In this way, the approach used in this dissertation did indeed make it possible to take into account how a negotiation process between the norms in everyday life and norms within nutrigenomics could take place. Moreover, Chapters 5 and 6 showed that, by involving the taken-for-granted assumptions of nutrigenomics and the interactive goals in conversations about being overweight in the deliberation of social actors, they were able to reflect on the interaction between different worldviews that may shape applications of nutrigenomics. Unfortunately, however, the social embedding of different uses of nutrigenomics that were proposed by the social actors played only a minor role in the discussion with social actors. The ethical implications of how our society would look like if norms within nutrigenomics became dominant in everyday life were only briefly discussed. For example, social actors did not deliberate extensively on the most ethical way to deliver biomarker or genetic tests for personal dietary advices. Moreover, although some critical statements were made on the idea of personalized dietary advice given by a dietician or a lifestyle coach, risk minimisation and health remained the main objective in the discussion. Thus, unlike the scenario studies of, for example, Swierstra (2010), the deliberation with social actors mainly focused on finding a strategy to use nutrigenomics in such a way that the clash between norms in nutrigenomics and in everyday life can be overcome without much deliberation about the wider ethical implications of these strategies. Possibly due to the limited time available for the deliberation, this step could not be made.

Nevertheless, the notion of script and the discourse analytic approach used provided the means for the entire project to present an ethical reflection on nutrigenomics while taking into account the negotiation process between nutrigenomics and the consumer. The reflection on the fit or clash of norms of nutrigenomics and norms in everyday life together with social actors gave an opportunity to imagine and ethically reflect on different ways of implementing nutrigenomics science if a more diverse spectrum of norms like culture, taste, satiation and convenience would be used in the normative framework of nutrigenomics. Instead of giving detailed information for policymakers about future controversies that may evolve because of the implementation of new technologies (see for example Swierstra et al., 2009), this study in total gave input to scientists working in the field of nutrigenomics to reflect on the research trajectories they are following. Still, a further deliberation with different social actors on the social ethical imbedding of the possible strategies for nutrigenomics would be desirable from a pragmatic ethical view point (Thompson, 2003). In “Steps for the future”, I will shortly reflect on how the results of the deliberation with social actors of food sciences can be used to explore the social ethical implications of different strategies of using nutrigenomics with a wider public.

Deliberation as a dramatic rehearsal.

As has been shown in the introduction, the approach used in this dissertation is based on the ideas of John Dewey on ethical deliberation as a process of dramatic rehearsal. Therefore, the second step in the evaluation of the approach used in this research is to assess to what rate our ethical deliberation fits with Dewey's ideas.

Let me first return briefly to my analysis in Chapter 1 on Dewey's ideas regarding ethical deliberation as a dramatic rehearsal. Dewey defined ethical deliberation as: "a process of active, suppressed, rehearsal, of imaginative dramatic performance of various deeds carrying to their appropriate issues the various tendencies which we feel stirring within us" (Dewey and Tuft, 1908, p322). Therefore, first of all, a good ethical deliberation is able to make people imagine as many actions as possible and not only those that fit best with their character. This process of imagining the widest range of actions can be reached by becoming aware of the tendencies and worldviews that are stirring within us, as well as in others, so no possible action is overlooked. Secondly, during the imaginative process of the dramatic rehearsal, emotions should not be excluded, but thought and emotion should be brought together. Thus, while imagining the possible actions and their consequences, one should be aware of emotions such as dissatisfaction, irritation or fulfilment and take these emotions into consideration. Thirdly, the ultimate judgment of which action is right or wrong lies in the intention as well as the consequences of the action. For example, one can have the intention to make people feel healthier and happier by making changes in the food supply, but it could lead to a position in which people feel worse because they feel suppressed when they are not able to follow the lifestyle that suits them. In that case, according to Dewey, the action of changing the food supply is immoral. The intention might be good, but the consequences are not fully thought out (Dewey and Tuft, 1908). In this project, these ideas are reinterpreted to shape an ethical deliberation about nutrigenomics. That is, I have tried to find all the possible actions stirring within the nutrigenomics practices by creating a deliberation in which social actors of nutrigenomics were conscious about the main norms embedded in nutrigenomics practices and could take into account and be empathic about prevalent norms existing outside the research practices of nutrigenomics in the everyday lives of consumer-citizens.

Did this, indeed, lead to a deliberation in which all of the possibilities of nutrigenomics were explored, and the consequences were fully thought out? As has been shown in the section "Evaluation of overcoming technology blindness and the normative deficit", the participants focused mostly on the "inner aspects" of the actions with nutrigenomics and did not fully think through the "outer aspects" (Chapter 1: p9), i.e., the participants did not deliberate extensively on the wider ethical implications of the proposed strategies for implementing nutrigenomics. Furthermore, the aim of the pragmatic ethical approach used to explore the widest possible range of strategies for implementing nutrigenomics is addressed in the discussion in Chapter 5 on page 96 where it is indicated that the deliberation with the stakeholders has led to a description of a wide range of strategies to

apply knowledge or tools from nutrigenomics in society. All of these tools varied in the roles and responsibilities they attributed to the consumer but, at first glance, the actions for nutrigenomics that were imagined appear to have the same underlying norms as the script of nutrigenomics. For example, strategies in which taste, satiation, culture and convenience were described always had health improvement of consumers as the ultimate goal. Paths for nutrigenomics in which a goal other than health, such as taste or fun, was the only goal that was aimed for, were not explored. Because the underlying idea of health improvement and risk minimization remained most important, it seemed as if the social actors mainly focused on finding ways to get their ideas about food with their own particular norms regarding health embedded within society while taking into account that the future user of nutrigenomics tools has other norms.

The question is, therefore, why health remained so important within the proposed strategies. That the abstract concept of health is important is confirmed in Chapters 3 and 4. The study on norms in everyday life in Chapter 4 revealed that health remains important along with being relaxed and enjoying life. Furthermore, also in the discussed philosophical ideas of the good life in Chapter 3, staying healthy is an important value. For example, deontologists claim that striving for health is an important duty that should be in balance with other duties such as taking care of others; in virtue ethics, health is needed to be able to let one's virtues bloom. Even to the old hedonists who pursue their own happiness and pleasure, health was important. Most people consider hedonism, as it is currently exploited within our society of consumerism, to be detrimental for long term health (Veenhoven, 2003). Epicurus (341–270 BC), however, who is considered by most to be the founder of hedonism, meant pleasure should be the absence of pain and health of the soul. He argued that people had the means to control their life to a great extent and that also meant that a smart person took care of his health by living and eating healthy. Therefore, also in his ideas, physical health stood next to pleasure and health of the soul. Hence, that health remains important in a deliberation about nutrigenomics was to be expected, at least when used as an abstract concept.

One could argue as, for example, Swierstra et al. 2009 who claim that health is a “cold” issue which means that, at the moment, there is no ethical discussion necessary about the idea of health improvement itself. Dewey showed, however, in his theory about deliberation that most concepts such as health that seem an end beyond discussion, in reality, are not undisputed. One of the concerns that Dewey had in regard to other ethical approaches like utilitarianism is that they tend to oversimplify a multitude of conflicting desires. He argued that ethicists tended to use fixed rules based on past customs that, only when presented in the abstract, would appeal to everybody. For example, concepts in the abstract such as health and social justice never give rise to much debate. Dewey demonstrated that, only when these concepts are explored in detail, conflicts and emotions arise (Dewey and Tufts, 1908). Thus, according to Dewey, most probably only the abstract meaning of concepts such as health are a “cold” issues, and underlying meanings of health and the way

to reach these meanings of health will surely emotionally arouse people and show that they have conflicting opinions (Dewey and Tuft, 1908). This is confirmed by Chapters 3 and 4. Both chapters show that striving for health should not be a too dominant activity, as is the case with striving for risk minimization and disease prevention. Furthermore, much broader notions of health are mainstream in everyday life than the notion of health underlying the nutrigenomics script.

In a follow up of this project, another step could make the deliberation even broader and make participants more ‘emotional’ about the proposed strategies of using nutrigenomics so that more strategies that solely focus on everyday aspects of food and health, such as the ‘hedonistic aspects’ of foods, are explored and the wider ethical implications of the proposed strategies of nutrigenomics are discussed. Besides making participants conscious about the norms embedded in nutrigenomics practices and the norms in everyday life, one could incorporate a process in which the participants are made conscious about their own norms surrounding food and health. In this step, participants could explore what, for them, health and its relationship with food exactly means. Moreover, the rather abstract concept of health should be studied further. That is, the underlying meaning of health within the proposed strategies for nutrigenomics could be further uncovered together with the social actors. For example, social actors could examine for themselves if health means mainly risk minimization or that broader notions of health like wellness and feeling good are important in their own life and what steps they are willing to take or they want others, like the industry, to take in order to stay healthy. This process of becoming self-conscious could reveal if different meanings of health and their relationship with food conflict or fit with the proposed strategies for nutrigenomics. Moreover, it will enable an ethical deliberation on strategies in which hedonistic values are dominant and risk minimization and disease prevention only play a subordinate role. The discursive action approach may be helpful in such a step. Swierstra and te Molder (2012) show, for example, how experts frame ‘soft concerns’ of consumers in such a way that they are able to avoid an in-depth exploration of these concerns. For example, experts pose the naturalness of foods as a private consumer matter, and they pose their own definition of naturalness as superior without further explicating this definition. These kinds of rhetoric strategies obstruct an in depth deliberation of the soft concerns of consumer-citizens. The discursive action model could help participants to reflect on abstract concepts such as health by making them aware of the social functions and effects of their arguments.

Steps for the future

Implications for nutrigenomics

This research enabled us to lay bare some of the ethical dilemmas that society is facing when norms underlying nutrigenomics practices would become mainstream. First of all, seeing food in the light of the prevention of a multitude of diseases, and seeing health as an object in terms of measurable and calculable risks that can be minimized by obtaining

the optimal health equilibrium imply that the consumer should, on a daily basis, be careful with food from childhood to the grave. Moreover, this view on food implies that the consumer should have a peculiar view on what a good life entails, specifically, the good life is the healthy life in terms of risk minimization (Chapter 3). The norms of nutrigenomics only partly connect to norms existing in everyday life about health, food, and risks. Although accounts about healthy eating and personal responsibility for being overweight are self-evident, they are just as indisputable as accounts about the importance of being relaxed about health risks and being able to enjoy life without worrying about health risks (Chapter 4). Thus, within nutrigenomics practices and everyday life, different norms exist. How this will work out in the future is uncertain since norms are fluid. If more and more tools become available that measure health risks and health status, in the end, almost everyone is at risk and a preoccupation with these risks can become the norm. On the other hand, a relaxed attitude towards the possibility to measure health risks may also prevail (Chapter 4). All the same, the interaction between the norms found in Chapters 3 and 4 will probably help steer the development of nutrigenomics.

The ethical concerns of a change in the discourse on health and food in everyday life toward the norms embedded in nutrigenomics include a fear for health and the body; a society that holds individuals overall responsible for their diseases and future diseases; an increasing dissatisfaction with the body and health because of high expectations about health; and a society in which people become more self-centred because of the tremendously time consuming and complex character of living healthy. Furthermore, the presumption that the good life is the healthy life in terms of risk minimization could make our society more individualistic and less tolerant to the weakest in our society, as well as endanger the plurality of lifestyles and eating styles that now exist (Chapter 3).

The deliberation with social actors resulted in a wide range of solutions that manage the mismatch between norms existing in everyday life and in nutrigenomics. Some of these strategies, such as the lifestyle coach and simplifying nutrigenomics knowledge for public health campaigns, demand a change of norms in everyday life. In that case, discourses of self-governance are reinforced that equalize the good life with pursuing risk minimization and disease prevention (Clarke et al., 2003). Other strategies take coercion as a starting point; they force people to take up certain dietary habits through a change in the food supply. In this case, issues like freedom of choice and the right to interfere in the lifestyle choices of the consumer by the government are at stake (Verbeke, 2005; Resnik, 2010). Again, others propose to give more opportunity for choice by giving access to a greater diversity of food products to a larger population. Lastly, some stretch the script of nutrigenomics by incorporating norms other than health like taste and ease in preparation, into the research goals of food sciences and nutrigenomics, in particular, which can lead to innovative products and inventive educational strategies informed by nutrigenomics. In Chapter 5, it was concluded that this incorporation of norms other than health is preferable compared to the other proposed strategies. I argue that incorporating other

norms is ethically most desirable because it gives room for a co-existence of different lifestyles. Moreover, it seems to better manage the mismatch between everyday life and nutrigenomics because it gives room for broader notions of health. Still, in the end, the consumer needs to accept these strategies; there is always uncertainty whether new products are able to survive the market.

The strategies for matching nutrigenomics with everyday life mainly focus on the scientific trajectories of nutrigenomics or making complex information from nutrigenomics available for the consumer and, therefore, are especially interesting for nutrigenomics scientists and food communicators. A broader debate is needed on how these strategies should be socially embedded to protect different lifestyles and to prevent ethical issues. In the following section, I will discuss some lessons that can be learned from this research for a further deliberation on nutrigenomics.

Implications for further ethical research on nutrigenomics and food sciences

The ethical deliberation with social actors in this dissertation showed that health remains the main goal of nutrigenomics. A debate with a wider public is needed to discuss this goal, or rather, goals. Although health is normally seen as a goal beyond discussion (Swierstra et al., 2009), it should be asked how “big” health, in terms of risk minimization, should become in people’s lives and if other notions of health should play a role within nutrigenomics. Is, in fact, the danger of less time for other aspects in life indeed a legitimate argument not to change the discourse on healthy living? And is a plurality of lifestyles a legitimate argument not to use hard paternalistic measures in regard to food? Is a soft paternalistic attitude of the industry or government unacceptable, or do we accept that nudging towards healthy diets should be the way forward just as we accept the prohibition of hazardous food products? In what way are more innovative products really the solution, and how do these influence health disparities within society, the environment, and the economy? Or should people just make lifestyle changes with the simple products in life?

Many ideas exist on what participation in discussions on the wider societal impacts of science exactly entails and the impact these discussions should have on technological decision making. Collins and Evans (2002) propose that technological decision making should be left to the experts active in doing research. Others propose that a narrow collaboration between ethicists and scientists would be sufficient (McGregor and Wetmore, 2009) while, for example, Macalay et al. (1999) and Burby (2003) suggest to include stakeholders and people with special information from the “backyard”, for example, patients in medical research or, in case of sciences that could endanger the environment in a certain area, people with knowledge about the local nature. Again, others claim that, in the past, NGO’s have been merely involved in participatory processes and that public participation should be taken to another level in which the totality of the public has an important role to play (Ravetz, 2002; Ravetz, 2004; Tait, 2009). But what exactly are the ideas about participation in pragmatic ethics?

In relation to its view on participation in ethical deliberation, the pragmatic ethical approach is inspired by the communicative ethical approach of Jurgen Habermas which presumes that what is a right or wrong action should be decided by a community. Thomson (2003) shows that this is necessary because the main problem of technological changes is that, during these changes, conflicts emerge between different cultural groups in society. The pragmatist's solution is to let all parties participate in a debate without any constraint of time and money. The main goal of this deliberation is peaceful cohabitation and collaboration between different groups in society. The pragmatic ethicist facilitates the deliberation and tries to elaborate the main ethical issues that are concerned. He, thereby, tries to solve conflicts by searching for common grounds and compromises (Keulartz et al., 2002b). This, however, does not mean that the ethical deliberation should lead to regulations and laws. When a deliberation can accomplish more understanding between different parties within society, it is already successful (Korthals 2011). Understanding in this context means that one should not remain indifferent towards varying conflicting values but really recognize and respect them and inquire which practical conflicts competing values may give (see Chapter 1). An ideal situation would be that the general public would be recruited randomly and brought together with different stakeholders representing science, public health institutions, and governmental institutions.

It would be interesting to use the results of this dissertation for a larger debate, although the discussion on being overweight included the possible "future user" of nutrigenomics, and scientists and stakeholders have participated in this research. In such a debate, ideally, all future stakeholders as well as the general public should be involved while taking into account the pitfalls that would obstruct an equal deliberation (see, for example, Felt et al., 2009; Wynne, 2006 and Rowe and Frewer, 2004).

There are some challenges that need to be overcome in the event a debate would be organized in a set up that is ideal to pragmatic ethics in a follow-up study. In addition to time, money and workforce availability for the organization of such a debate, it is vital to raise interest among the general public and stakeholders. Different studies show that people are often not interested in participation in debates on societal issues of sciences (te Molder and Gutteling, 2003; Dijkstra et al., 2012), especially when it concerns sciences that are still in their infancy. Similarly, during the research described in this dissertation, some relevant social actors were said to not want to spend time on nutrigenomics and its ethical concerns because they thought that the subject was neither urgent nor relevant. Only the stakeholders that were extremely interested in the scientific developments within food sciences or who were working in the field of nutrigenomics wanted to participate. This is consistent with the results of a wide-scale research of Dijkstra et al. (2012). In their study, the researchers showed that experts working in the field of genomics were most likely to participate in a public consultation project and that the general public was less inclined to participate. Interest groups such as patient groups were not as interested as experts but showed more interest than the general public. They also showed that prior

interest, education and a socially engaged attitude were important. Attitude and education is, of course, difficult to influence, but the framing of the subject can be influenced in such a way that more people have prior interest in the discussion. Possibly, more people have prior interest in a deliberation on the wider trends in regard to health and food of which nutrigenomics is only one example. The proposed strategies of the participants to apply nutrigenomics tools or knowledge such as allowing the government to decide what is in the shops or nudges from the industry to eat healthier would then be examples that should be able to trigger enough interest in such a debate. The subject should arouse emotion such as dissatisfaction, irritation, or fulfilment (Dewey and Tuft, 1908; Swierstra, 2009) but should also be rooted in the reality of science and society. This is perhaps perceived as being more relevant than futuristic scenarios about uncertain technologies (Stenne et al., 2012) and, therefore, may raise more interest from the public. Moreover, it prevents that scientists and health professionals respond evasively, due to all of the uncertainties or the unlikeliness of certain scenarios about distant applications of nutrigenomics (see for example Bouwman et al., 2008).

Other challenges clearly came up in the evaluation of the research approach used in this project. First, in a broader debate, the goal is not only to find an ethical strategy to use nutrigenomics but also to discuss the social–ethical imbedding of possible strategies to use nutrigenomics. Beforehand, the strategies for using nutrigenomics or for reforming its pathways can be categorized and further explored to make a debate on the social–ethical imbedding possible. Also, different meanings of food such as taste and health or wellness and joy could be further explored in the proposed strategies. Finally, not only should the participants have knowledge about the norms embedded in nutrigenomics practices and the norms in everyday life, but a process should also be incorporated during which the participants are made conscious about their own norms surrounding food and health (Dewey and Tuft, 1908; Fesmire, 2003). The Discursive Action Method could help this process of becoming aware of the soft issues of food and health and the way social actors deal with these issues during a deliberation, for example, by reflecting on the interactive goals of how social actors frame health and the consumer and confronting the social actors with these interactive goals (Lamerichs and te Molder, 2011; Swierstra and te Molder, 2012). I expect that these steps would make the deliberation in a follow–up study even more inclusive.

The outcome of this research within a deliberation about the broader context of health and food can help frame a debate that meet the requirements mentioned above, i.e., raising enough interest; not only involving the innovative capacities of food science, but also the soft social ethical impacts; and exploring and making people more conscious about what, to them, the meaning of food and health is. That is not to say that, in this broader debate, nutrigenomics should not play a role. Chapter 5, in which the strategies of using nutrigenomics and the way they fit everyday norms about food and health are evaluated, illustrate that prevalent normative trends in regard to health and food existing within the

nutrigenomics script are also important outside the laboratory. In the end, these normative assumptions will help shape our future, therefore, nutrigenomics has a role to play in a further debate. The proposed strategies of using nutrigenomics are illustrations that can be used for a broader discussion with a greater public. Moreover, the analysis of the deliberation with social actors in Chapter 5 and the analysis described in Chapters 3 and 4 shows that the following three dimensions are important to include in a further deliberation. First of all, deliberation is needed on the possibility of paternalistic measures versus measures that enforce norms of self-governance with biomedical screening methods (Chapters 3 and 5). That is, the desirability of measures involving narrowing down food choices and nudging people toward certain dietary behaviour and the desirability of putting people under social pressure to minimize health risks with the help of biomedical screening methods should play a role in this dimension. Secondly, the legitimacy of protecting a plurality of lifestyles versus the importance of diminishing health risks should be included in the deliberation. This involves a discussion on the desirability of a focus on biomedical notions of health and food versus broader notions of health and food in which enjoying life and being relaxed about health risks play a role. Moreover, an exploration should be included of what effect different meanings of health may have on a plurality of ideas of the good life within society (Chapters 3 and 4). Thirdly, issues of blame and personal responsibility in relation to being overweight and in relation to lifestyle-related diseases need to be discussed (Chapters 3 and 4).

This dissertation tried to find an ethical form of nutrigenomics by analysing and creating a deliberation about nutrigenomics. It has provided insight into the social ethical issues surrounding nutrigenomics and food sciences, in general, as well as challenges on how to create a debate on sciences in their infancy. Moreover, it opened up for discussion some of the soft social ethical aspects of issues surrounding policy making in relation to health and food. It seems that the main assumption of nutrigenomics, as well as of the social actors who have participated in this research, is that health and risk minimisation is the way forward. Since this is not so self-evident as presumed, a broader debate on this topic is necessary with the help of the outcome of this research.

I

References

- Achterhuis, H. (1988). *Het goede leven of overleven*. In Jacobs, F. and van der Wal, G. *Medische Schaarste en het Menselijke Tekort*. Baarn, The Netherlands, Ambo.
- Afinan, L. and Müller, M. (2006). "Nutrigenomics: From molecular nutrition to prevention of disease." *Journal of the American Dietetic Association* 106: 569–576.
- Aggett, P.J., Antoine, J.-M., Asp, N.-G., Bellisle, F., Contor, L., Cummings, J.H., . . . Verhagen, H. (2005). "PASSCLAIM, Process for the Assessment of Scientific Support for Claims on Foods." *European Journal of Nutrition* 44(0): i1–i2.
- Akrich, M. (1992). The de-scription of technical objects. In Bijker, W.E. and Law, J. *Shaping Technology/ Building Society*. Cambridge, MA: MIT Press: 205–224.
- Akrich, M. and Latour, B. (1992). A summary of a convenient vocabulary for semiotics of human and nonhuman assemblies. In Bijker, W.E. and Law, J. *Shaping Technology/ Building Society: Studies in Sociotechnical Change*. Cambridge, Massachusetts, London, MIT Press: 259–264.
- Amendola, A. (2002). "Recent paradigms for risk informed decision making." *Safety Science* 40(1–4): 17–30.
- Arab, L. (2004). "Individualized nutritional recommendations: do we have the measures needed to assess risk and make dietary recommendations?" *Proceedings of the Nutrition Society* 63: 167–172.
- Avena, N.M., Rada, P. and Hoebel, B.G. (2001). "Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake." *Neuroscience and Biobehavioral Reviews* 32(1): 20–39.
- Bago d'Uva, T., Jones, A.M. and van Doorslaer, E. (2009). "Measurement of horizontal inequity in health care utilization using European panel data." *Journal of Health Economics* 28: 280–289.
- Barnes, B., Palmary, I. and Durrheim, K. (2001). "The denial of racism: The role of humor, personal experience, and self-censorship." *Journal of Language and Social Psychology* 20(3): 321–338.
- Barroso, I. (2005a). "Complex disease: Pleiotropic gene effects in obesity and type 2 diabetes." *European Journal of Human Genetics* 13(12): 1243–1244.
- Barsky, A.J. (1988). "The paradox of health." *The New England Journal of Medicine* 318(7): 414–418.
- Bauman, Z. (1995). *Life in fragments: Essays in Postmodern reality*. Oxford, Blackwell Publishing.
- BBC-News. (2005, 17 July, 2005). "DNA test for diabetes and obesity " *BBC health* Retrieved 7 November, 2005.
- Beadle, G.W. and Tatum, E.L. (1941). "Genetic control of biochemical reactions in neurospora." *Proceedings of the National Academy of Sciences of the United States of America* 27(11): 499–506.
- Beck, U. (1990). *Risk Society*. London, Sage.

- Bell, C.G., Walley, A.J. and Froguel, P. (2005). "The genetics of human obesity." *Nature Reviews Genetics* 6(3): 221–234.
- Bijker, W.E. and Law, J. (1993). General introduction. In Bijker, W.E. and Law, J. *Shaping Technology/ Building Society: Studies in Sociotechnical Change*. Cambridge, Massachusetts, London, The MIT Press: 1–17.
- Bouwman, L., te Molder, H. and Hiddink, G. (2008a). "Patients, evidence and genes: an exploration of GPs' perspectives on gene-based personalized nutrition advice." *Fam. Pract.*: cmn067.
- Bouwman, L.I., Hiddink, G.J., Koelen, M.A., Korthals, M., van't Veer, P. and van Woerkum, C. (2005). "Personalized nutrition communication through ICT application: how to overcome the gap between potential effectiveness and reality." *European Journal of Clinical Nutrition* 59(S1): S108–S116.
- Bouwman, L.I., Koelen, M.A. and Hiddink, G.J. (2008b). The personal factor in nutrition communication. In Bouwman, L.I., Kok, F. and Desiere, F. *Personalized Nutrition: Principles and Applications*. London, CRC press: 169–185.
- Bouwman, L.I., te Molder, H., Koelen, M.M. and van Woerkum, C.M.J. (2009). "I eat healthfully but I am not a freak. Consumers' everyday life perspective on healthful eating." *Appetite* 53(3): 390–398.
- Bouwman, L.I. and te Molder, H.F.M. (2008). "About evidence based and beyond: a discourse-analytic study of stakeholders' talk on involvement in the early development of personalized nutrition." *Health Education Research* 24 (2), 253–269.
- Brezis, M. and Wiist, W.H. (2011). "Vulnerability of health to market forces." *Medical Care* 47(3): 232–239.
- Brown, N. and Michael, M. (2003). "A sociology of expectations: retrospectively prospecting and prospecting retrospects." *Technology Analysis & Strategic Management* 15(1): 3–18.
- Bryson, B. (2003). *A Short History of Nearly Everything*. London, Black Swan. Chapter 7, 10
- Buchanan, D.R. (2008). "Autonomy, paternalism and justice: ethical priorities in public health." *American Journal of Public Health*, 998(1), 15–21.
- Burby, R.J. (2003). "Making plans that matter: Citizen involvement and government action." *Journal of the American Planning Association* 69(1): 33–49.
- Burgess, M.M. (2007). "Proposing modesty for informed consent." *Social Science & Medicine* 65(11): 2284–2295.
- Cain, M. and Smid, G. (2003). *From Nutrigenomic Science to Personalized Nutrition: The Market in 2010 [SR-793]*, Institute for the Future.
- Callahan, D. (1995). *What Kind of Life: The Limits of Medical Process*. New York, Georgetown University Press.
- Castle, D. (2003). "Clinical challenges posed by new biotechnology: The case of nutrigenomics." *Post-Graduate Medical Journal* 79: 65–66.

- Castle, D. (2009). The personal and the public in nutrigenomics. In Castle and Ries *Nutrition and Genomics*. San Diego, Academic Press: 245–262.
- Castle, D., Cline, C., Daar, A., Tsamis, C. and Singer, P., Eds. (2007). *Science, Society and the Supermarket: The Opportunities and Challenges of Nutrigenomics*. Hoboken, John Wiley & Sons Inc.
- Castle, D. and Ries, N. (2009). *Nutrition and Genomics*. Amsterdam, Academic Press
- Chadwick, R. (1990). *Encyclopedia of Applied Ethics*. New York, Academic Press
- Chadwick, R. (2004). “Nutrigenomics, individualism and public health.” *The Proceedings of the Nutrition Society* 63(1): 161–166.
- Chamberlain, K. (2004). “Food and health: Expanding the agenda for health psychology.” *Journal of Health Psychology* 9(4): 467–481.
- Clarke, A.E., Shim, J.K., Marno, L., Fosket, J.R. and Fishman, J.R. (2003). “Biomedicalization: Technoscientific transformations of health, illness, and U.S. biomedicine.” *American Sociological Review* 68(2): 161–194.
- Collier, J. (2006). “The art of moral imagination: Ethics in the practice of architecture.” *Journal of Business Ethics* 66(2): 307–317.
- Collins, H.M. and Evans, R. (2002). “The third wave of science studies.” *Social Studies of Science* 32(2): 235–296.
- Cornel, M., van El, C. and Dondorp, W. (2012). “The promises of genomic screening: Building a governance infrastructure. Special issue: genetics and democracy.” *Journal of Community Genetics* 3(2): 73–77.
- Corthésy–Theulaz, I., den Dunnen, J.T. and Ferré, P. (2005). “Nutrigenomics: The impact of biomics technology on nutrition research.” *Annals of Nutrition and Metabolism* 49: 355–365.
- Courtenay, W.H. (2000). “Constructions of masculinity and their influence on men’s well-being: a theory of gender and health.” *Social Science and Medicine* 50: 1385–1401.
- Crawford, R. (2006). “Health as a meaningful social practice.” *Health* 10(4): 401–420.
- Crocker, D. and Linden, T. (1998). *Ethics of Consumption: The Good Life, Justice and Global Stewardship*, Rowman & Copperfield.
- Crossley, M.L. (2002). “Could you please pass one of those health leaflets along?: Exploring health, morality and resistance through focus groups.” *Social Science & Medicine* 55(8): 1471–1483.
- Crossley, M.L. (2003). “‘Would you consider yourself a healthy person?’: Using focus groups to explore health as a moral phenomenon.” *Journal of Health Psychology* 8(5): 501–514.
- Darnton–Hill, I., Margetts, B. and Deckelbaum, R. (2004). “Public health nutrition and genetics: implications for nutrition policy and promotion “ *Proceedings of the Nutrition Society* 63(1): 173–185(113)

- Davis, C.D. and Milner, J. (2004). "Frontiers in nutrigenomics, proteomics, metabolomics and cancer prevention." *Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis* 551(1–2): 51–64.
- de Roos, B. and Romagnolo, D.F. (2012). "Proteomic approaches to predict bioavailability of fatty acids and their influence on cancer and chronic disease prevention." *The Journal of Nutrition* 142(7): 1370S–1376S.
- Dembinska-Kiec, A. (2008). Nutrigenomics and angiogenesis in obesity. In: *Personalized Nutrition: Principles and Applications*. London, CRC Press: 23–32.
- Desai, A.C. (2011). "Libertarian paternalism, externalities and the 'spirit of liberty': How Thaler and Sunstein are nudging us toward an "overlapping consensus"." *Law and Social Inquiry* 36(1): 263–295.
- Devcich, D.A., Pedersen, I.K. and Petrie, K.J. (2007). "You eat what you are: Modern health worries and the acceptance of natural and synthetic additives in functional foods." *Appetite* 48: 333–337.
- Dewey, J. (1960). *Quest for Certainty*. New York, Putnam
- Dewey, J. and Tufts, J. (1908). *Ethics*. New York, Henry Holt and Company
- Dietz, W.H. and Hunter, A.S. (2009). "Legal preparedness for obesity prevention and control: The public health framework for action." *Journal of Law, Medicine and Ethics* 37(s1): 9–14.
- Dijkstra, A.M., Gutteling, J.M., Swart, J.A.A., Wieringa, N.F., van der Windt, H.J. and Seydel, E.R. (2012). "Public participation in genomics research in the Netherlands: Validating a measurement scale." *Public Understanding of Science* 21(4): 465–477.
- Douglas, M. (2001). "Dealing with uncertainty." *Ethical Perspectives* 8(3): 145–155.
- Driessen, C. and Korthals, M. (2012). "Pig towers and in-vitro meat: Disclosing moral worlds by design." *Social Studies of Science*.
- Dworkin, G. (1972). "Paternalism." *The Monist* 56: 64–84.
- Dwyer, J. (2006). "Starting down the right path: Nutrition connections with chronic diseases of later life." *The American Journal of Clinical Nutrition* 83 (suppl): 415S–420S.
- Easton, D.F., Deffenbaugh, A.M., Pruss, D., Frye, C., Wenstrup, R.J., Allen-Brady, K., . . . Goldgar, D.E. (2007). "A systematic genetic assessment of 1,433 sequence variants of unknown clinical significance in the BRCA1 and BRCA2 breast cancer-predisposition genes." *The American Journal of Human Genetics* 81(5): 873–883.
- Edley, N. (2001). Analysing masculinity: Interpretative repertoires, ideological dilemmas and subject positions. In Wetherell, M., Taylor, S. and Yates, S.J. *Discourse as Data: A Guide for Analysis*. London, Sage Publications Ltd: 189–224.
- Einsiedel, E.F. and Geransar, R. (2009). "Framing genetic risk: trust and credibility markers in online direct-to-consumer advertising for genetic testing." *New Genetics and Society* 28(4): 339–362.

- Emslie, C., Hunt, K. and Watt, G. (2003). "A chip off the old block? Lay understandings of inheritance among men and women in mid-life." *Public Understanding of Science* 12(1): 47–65.
- Falas, T., Papadopoulos, G. and Stafylopatis, A. (2003). "A review of decision support systems in telecare." *Journal of Medical Systems* 27(4): 347–356.
- Feinberg, J. (1964). Action and responsibility. In Black, M. *Philosophy in America*, George Allen & Unwin Ltd: p134–p160.
- Felt, U., Fochler, M., Müller, A. and Strassnig, M. (2009). "Unruly ethics: on the difficulties of a bottom-up approach to ethics in the field of genomics." *Public Understanding of Science* 18(3): 354–371.
- Fenech, M., El-Sohemy, A., Cahill, L., Ferguson, L.R., French, T.A.C., Tai, E.S., . . . Head, R. (2011). "Nutrigenetics and nutrigenomics: Viewpoints on the current status and applications in nutrition research and practice." *Journal of Nutrigenetics and Nutrigenomics* 4(2): 69–89.
- Fesmire, S.A. (2003). *John Dewey and Moral Imagination*, Indiana University Press. 167
- Fischler, C. (1988). "Food, self and identity." *Social Science Information* 27(2): 275–292.
- FoodEthicsCouncil (2005). *Getting Personal: Shifting Responsibilities for Dietary Health*. Brighton, Food Ethics Council: 38.
- Foucault, M. (1998). *History of Sexuality*. London, Penguin
- Frewer, L., Lassen, J., Kettlitz, B., Scholderer, J., Beekman, V. and Berdal, K.G. (2004). "Societal aspects of genetically modified foods." *Food and Chemical Toxicology* 42: 1181–1193.
- Frich, J.C., Malterud, K. and Fugelli, P. (2007). "Experiences of guilt and shame in patients with familial hypercholesterolemia: A qualitative interview study." *Patient Education and Counseling* 69(1–3): 108–113.
- Friedman, J.F. (2004). "Modern science versus the stigma of obesity." *Nature Medicine* 10(6): 563–569.
- Frosch, D.L., Mello, P. and Lerman, C. (2005). "Behavioral consequences of testing for obesity risk." *Cancer Epidemiology, Biomarkers & Prevention* 14(6): 1485–1489.
- Fukuyama, F. (2002). *Our Posthuman Future: Consequences of the Biotechnology Revolution*. New York, Farrar, Straus and Giroux.
- Funtowicz, S.O. and Ravetz, J.R. (1993). "Science for the post-normal age." *Futures*: 739–755.
- Gabriel, Y. and Lang, T. (2008). "New faces and masks of today's consumer." *Journal of Consumer Culture* 8(3): 321–340.
- German, J.B. and Watzke, H.J. (2004). "Personalizing foods for health and delight." *Comprehensive Reviews in Food Science and Food Safety* 3: 145–151.
- Gollust, S.E., Wilfond, B.S. and Hull, S.C. (2003). "Direct-to-consumer sales of genetic services on the Internet." *Genetics in Medicine* 5(4): 332–337.

- Gottweis, H. (2005). "Governing genomics in the 21st century: between risk and uncertainty." *New Genetics and Society* 24(2): 175–194.
- Graham, G. (1990). *Living the Good life: An Introduction to Moral Philosophy*. New York, Paragon Press.
- Green, R. (2010). "The ethics of sin taxes." *Public Health Nursing* 28(1): 68–77.
- Greenhalgh, T. and Wessely, S. (2004). "'Health for me': a sociocultural analysis of healthism in the middle classes." *British Medical Bulletin* 69(1): 197–213.
- Gregori, D., Foltran, F., Verduci, E., Ballali, S., Franchin, L., Ghidina, M., . . . Giovannini, M. (2011). "A genetic perspective on nutritional profiles: Do we still need them?" *Journal of Nutrigenetics and Nutrigenomics* 4(1): 25–35.
- Gruber, J.H. and Mullainathan, S. (2005). "Do cigarette taxes make smokers happier?" *Advances in Economic Analysis & Policy* 5(1): article 4.
- Guston, D.H. and Sarewitz, D. (2002). "Real-time technology assessment." *Technology in Society* 24(1–2): 93–109.
- Hacking, I. (1983). *Representing and Intervening*. Cambridge, Cambridge University Press.
- Harbers, H. (2006). Genomics and justice— DNA and prescription: finality in justice. In Beintema, N. *The Power of Reciprocity: How Genomics and Society can Strengthen One Another.*, MCG programme: 59–60.
- Harrison, M. and Jackson, L.A. (2009). "Meanings that youth associate with healthy and unhealthy food." *Canadian Journal of Dietetic Practice and Research* 70(1): 6–12.
- Harvey–Berino, J., Gold, E.C., West, D.S., Shuldiner, A.R., Walston, J., Starling, R.D., . . . Poehlman, E.T. (2001). "Does genetic testing for obesity influence confidence in the ability to lose weight? A pilot investigation." *Journal of the American Dietetic Association* 101(11): 1351–1353.
- Harvey, A. (2009). "From genetic risk to post-genomic uncertainties: nutrigenomics and the birth of the "genetic entrepreneur"." *New Genetics and Society* 28(2): 119–137.
- Hayden, J., Macdonald, J. and Fraser, D. (2001). "Health promotion, social determinants and the role of the early childhood setting." *Bedrock* 2: 8–11.
- Hepburn, A. and Wiggins, S. (2005). "Size matters: constructing accountable bodies in NSPCC helpline interaction." *Discourse Society* 16(5): 625–645.
- Herald News Services (2011). "Hungary mulls 'hamburger tax'." *The Calgary Herald* March 12.
- Higgs, E., Light, A. and Strong, D. (2000). *Technology and the good Life*. Chicago & London, The University of Chicago Press.
- Hilbert, A., Dierk, J.–M., Conradt, M., Schlumberger, P., Hinney, A., Hebebrand, J. and Rief, W. (2009). "Causal attributions of obese men and women in genetic testing: Implications of genetic/biological attributions." *Psychology & Health* 24(7): 749–761.

- Hjorleifsson, S. and Schei, E. (2006). "Scientific rationality, uncertainty and the governance of human genetics: an interview study with researchers at deCODE genetics." *European Journal of Human Genetics* 14(7): 802–808.
- Hodgetts, D., Bolam, B. and Stephens, C. (2005). "Mediation and the construction of contemporary understandings of health and lifestyle." *Journal of Health Psychology* 10(1): 123–136.
- Holm, L. (2003). "Food health policies and ethics: Lay perspectives on functional foods." *Journal of Agricultural and Environmental ethics* 16(6): 531–544.
- Hospers, J. (1953). *An Introduction to Philosophical Analysis*. London, Prentice–Hall
- House of Lords (2011). *Behaviour Change*, HL paper 179. Committee, S.a.T.S. London, The Stationery Office Limited.
- Hyde, R. (2008). "Europe battles with obesity." *The Lancet* 371(2160–2161).
- Jaffe, A.S., Babuin, L. and Apple, F.S. (2006). "Biomarkers in acute cardiac disease: The present and the future." *Journal of the American College of Cardiology* 48(1): 1–11.
- James, W. (1897). *The Will to Believe, and other Essays in Popular Philosophy*. New York Cosimo
- Jasanoff, S. (2004). *States of Knowledge: The Co–production of Science and the Social Order*. London, Routledge.
- Jasanoff, S. (2005). "In the democracies of DNA: Ontological uncertainty and political order in three states." *New Genetics and Society* 24(2): 139–156.
- Joh, E.E. (2011). "Ethics watch– DNA theft: your genetic information at risk." *Nature Reviews Genetics* 12(12): 808–808.
- Johnson, R.L. and Williams, S.M. (2006). "Genomics, nutrition, obesity and diabetes." *Journal of Nursing Scholarship* 38(1): 11–18.
- Joly, Y., Braker, M. and Le Huynh, M. (2010). "Genetic discrimination in private insurance: Global perspectives." *New Genetics and Society* 29(4): 351–368.
- Jones, P.J.H., Asp, N–G., Silva, P. (2008). "Evidence for health claims on foods: how much is enough? Introduction and general remarks." *The Journal of Nutrition* 138: 1189S–1191S.
- Junghans, C., Feder, G., Hemingway, H., Timmis, A. and Jones, M. (2005). "Recruiting patients to medical research: Double blind randomized trial of "opt–in" versus "opt–out" strategies." *BMJ*
- Just, D.R. and Payne, C.R. (2009). "Obesity: can behavioral economics help?" *Annals of Behavioral Medicine* 38(1): S47–S55.
- Kahn, R., Robertson, R.M., Smith, R. and Eddy, D. (2008). "The impact of prevention on reducing the burden of cardiovascular disease." *Circulation Journal of the American Heart Association*
- Kant, I. (1949). *The Philosophy of Kant: Immanuel Kant's Moral and Political Writings*, Random House inc.

- Kant, I. (1777). Von der Macht des Gemüts, durch den blossen Vorsatz seiner krankhaften Gefühle meister zu sein. In Weischedel, W. Schriften zur Anthropologie, Geschichtsphilosophy, Politik und Pädagogik 1. Germany, Suhrkamp.
- Kaput, J. (2005). “Decoding the pyramid: A systems–biological approach to nutrigenomics.” *Annals of the New York Academy of Sciences* 1055(1): 64–79.
- Kaput, J., Evelo, C., Perozzi, G., van Ommen, B. and Cotton, R. (2010). “Connecting the Human Variome Project to nutrigenomics.” *Genes & Nutrition* 5(4): 275–283.
- Kaput, J., Ordovas, J.M., van Ommen, B., Rodriguez, R., Allen, L., Ames, B., . . . Zucker, J. (2005). “The case for strategic international alliances to harness nutritional genomics for public and personal health.” *British Journal of Nutrition* 94: 623–632.
- Katan, M.B. (2004). “Health claims for functional foods.” *BMJ* 328(7433): 180–181.
- Katan, M.B. (2006). “Regulation of trans fats: The gap, the polder, and McDonald’s french fries.” *Atherosclerosis* 7: 63–66.
- Keulartz, J., Korthals, M., Schermer, M. and Swierstra, T. (2002a). *Pragmatist Ethics for a Technological Culture*. Dordrecht, Kluwer Academic Publishers.
- Keulartz, J., Korthals, M., Schermer, M. and Swierstra, T. (2002b). Pragmatism in action (Chapt 20). In Keulartz, J., Korthals, M., Schermer, M. and Swierstra, T., *Pragmatist ethics for a technological culture*. Springer Netherlands. 3: 247–264.
- Keulartz, J., Schermer, M., Korthals, M. and Swierstra, T. (2004). “Ethics in technological culture: A programmatic proposal for a pragmatist approach.” *Science, Technology, & Human Values* 29(1): 3–29.
- Knoppers, B.M. and Chadwick, R. (2005). “Human genetic research: emerging trends in ethics “ *Nature Reviews Genetics* 6(1): 75–79.
- Kokkonen, R. (2009). “The fat child—a sign of ‘bad’ motherhood? An analysis of explanations for children’s fatness on a Finnish website.” *Journal of Community & Applied Social Psychology* 19(5): 336–347.
- Komduur, R. and TeMolder H. (2013). “The role of genes in discussions about overweight: An analysis of talk on genetics, overweight and health risks.” *Public Understanding of Science*. 10.1177/0963662512472159
- Komduur, R.H., Korthals, M. and te Molder, H.F.M. (2009). “The good life: living for health and a life without risks? On a prominent script of nutrigenomics.” *British Journal of Nutrition*, 101(3):307–316
- Korthals, M. (2003). “Do we need Berlin walls or Chinese walls between research, public consultation, and advice? New public responsibilities for life scientists.” *Journal of Academic Ethics* 1(4): 385–395.
- Korthals, M. (2004). *Before Dinner: Philosophy and Ethics of Food*. Dordrecht, Springer.

- Korthals, M. (2007). Ethics of personalized nutrition (Chap.12). In Kok, F., Bouwman, L. and Desiere, F. *Personalized Nutrition: Principles and Applications*. London, Taylor and Francis: 221–235.
- Korthals, M. (2008a). “Ethical Rooms for Maneuver and Their Prospects vis-à-vis the current ethical Food Policies in Europe.” *Journal of Agricultural and Environmental ethics* 21(3): 249–273.
- Korthals, M. (2008b). “Ethics and politics of food: Toward a deliberative perspective.” *Journal of Social Philosophy* 39(3): 445–463.
- Korthals, M. (2011). *Genomics, obesity and the struggle over responsibilities*, The international Library of Environmental, Agricultural and Food Ethics.
- Kuhn, T.H. (1962). *The Structure of Scientific Revolutions*. Chicago, The University of Chicago Press
- Kutz, G. (2006). *Nutrigenetic testing: Testimony before the special committee on aging* (GAO–06–977T). Washington D.C., Governmental Accountability Office.
- Lamerichs, J. and te Molder, H. (2011). Reflecting on your own talk: The Discursive Action Method at work. In Antaki, C. *Applied Conversation Analysis: Intervention and Change in Institutional Talk*. Basingstoke, Palgrave Macmillan: pp.184–206.
- Lang, T. and Rayner, G. (2007). “Overcoming policy cacophony on obesity: an ecological public health framework for policymaker.” *Obesity Reviews* 8(1): 165–181.
- Lawes, R. (1999). “Marriage: An analysis of discourse.” *British Journal of Social Psychology* 38: 1–20.
- Lee, D. (1987). “The semantics of just.” *Journal of Pragmatics* 11(3): 377–398.
- Lévesque, L., Ozdemir, V., Gremmen, B. and Godard, B. (2008). “Integrating anticipated nutrigenomics bioscience applications with ethical aspects.” *OMICS: A Journal of Integrative Biology* 12(1): 1–16.
- Lezwijn, J., Vaandrager, L., Naaldenberg, J., Wagemakers, A., Koelen, M. and C., v.W. (2011). “Healthy ageing in a salutogenic way: building the HP 2.0 framework.” *Health and Social Care in the Community* 19(1): 43–51.
- Lind, E.A. and Tyler, T.R. (1988). *The Social Psychology of Procedural Justice*. Berlin, Springer
- Lock, M., Freeman, J., Sharples, R. and Lloyd, S. (2006). “When it runs in the family: Putting susceptibility genes in perspective.” *Public Understanding of Science* 15(3): 277–300.
- Loewenstein, G., Brennan, T. and Volpp, K.G. (2007). “Asymmetric paternalism to improve health behaviors.” *The Journal of the American Medical Association* 298(20): 2415–2417.
- Lucke, J., Hall, W., Ryan, B. and Owen, N. (2008). “The implications of genetic susceptibility for the prevention of colorectal cancer: A qualitative study of older adults’ Understanding.” *Community Genetics* 11(5): 283.

- Lupton, D. and Chapman, S. (1995). "A healthy lifestyle might be the death of you": Discourses on diet, cholesterol and heart disease in the press and among the lay public." *Sociology of Health and Illness* 17: 477–494.
- Macaulay, A.C., Commanda, L.E., Freeman, W.L., Gibson, N., McCabe, M.L., Robbins, C.M. and Twohig, P.L. (1999). "Participatory research maximises community and lay involvement." *British Medical Journal* 319(7212): 774–778.
- MacKenzie, D. and Wajcman, J. (1999). Introductory essay: The social shaping of technology. In MacKenzie, D. and Wajcman, J. *The Social Shaping of Technology*. Trowbridge, Redwood Books: 3–27.
- Marteau, T., Ashcroft, R. and Oliver, A. (2009). "Using financial incentives to achieve healthy behaviour." *British Medical Journal* 338: 983–985.
- Mathers, J.C. (2003). "Symposium on 'How and why measure individual variability' –Chairman's introduction: What can we expect from genomics? ." *Proceedings of the Nutrition Society* 63: 1–4.
- McBride, C.M., Koehly, L.M., Sanderson, S.C. and Kaphingst, K.A. (2010). "The behavioral response to personalized genetic information: Will genetic risk profiles motivate individuals and families to choose more healthful behaviors?" *Annual Review of Public Health* 31(1): 89–103.
- McGregor, J. and Wetmore, J. (2009). "Researching and teaching the ethics and social implications of emerging technologies in the laboratory." *NanoEthics* 3(1): 17–30.
- McVea, J. (2007). "Constructing good decisions in ethically charged situations: The role of dramatic rehearsal." *Journal of Business Ethics* 70(4): 375–390.
- Medina, J. (2004). "In defense of pragmatic contextualism: Wittgenstein and Dewey on meaning and agreement." *The Philosophical Forum* 35(3): 341–369.
- Meijboom, F.L.B., Verweij, M.F. and Brom, F.W.A. (2003). "You eat what you are: moral dimensions of diets tailored to one's genes." *Journal of Agricultural and Environmental Ethics* 16: 557–568.
- Meijer, G. (2005). *Pharma–food: Are tailor–made, individual; diets relevant for problems of public health?* Eurosafe News. Utrecht. 7.
- Merton, R.K. (1968). *Science and the social order* In Merton, R.K. *Social Theory and Social Structure*. New York, The Free Press.
- Meyre, D., Bouatia-Naji, N., Tounian, A., Samson, C., Lecoeur, C., Vatin, V., . . . Froguel, P. (2005). "Variants of ENPP1 are associated with childhood and adult obesity and increase the risk of glucose intolerance and type 2 diabetes." *Nature Genetics* 37(8): 863–867.
- Mill, J.S. (2011[1859]). *On liberty*, Simon & Brown
- Mol, A. (2011). *De tragiek van de kilocalorie. Over wetenschap in de publieke ruimte*. In Dijstelbloem, H. and Hagendijk, R. *Onzekerheid troef. Het betwiste gezag van de wetenschap*. Amsterdam, van Genneep: 137–156.

- Moskowitz, H.R., German, J.B. and Saguy, I.S. (2005). "Unveiling health attitudes and creating good-for-you foods: The genomics metaphor, consumer innovative web-based technologies." *Critical Reviews in Food Sciences and Nutrition* 45: 165–191.
- Müller, M. (2002). *Over Genen en Genieten: Rede uitgesproken bij de aanvaarding van het ambt van hoogleraar in de Voeding, Metabolisme en Genomics bij het departement Agrotechnologie en Voeding van Wageningen Universiteit, Wageningen.*
- Müller, M. and Kersten, S. (2003). "Nutrigenomics: goals and strategies." *Nature Reviews Genetics* 4: 315–322.
- Mutch, D.M., Wahli, W. and Williamson, G. (2005). "Nutrigenomics and nutrigenetics: the emerging faces of nutrition." *The Journal of the Federation of American Societies for Experimental Biology* 19(12): 1602–1616.
- Nerlich, B., Dingwall, R. and Clarke, D.D. (2002). "The book of life: How the completion of the human genome project was revealed to the public." *Health*: 6(4): 445–469.
- Nestle, M. (2003). "The ironic politics of obesity." *Science* 299: 781.
- Ng, P.C., Murray, S.S., Levy, S. and Venter, J.C. (2009). "An agenda for personalized medicine." *Nature* 461(7265): 724–726.
- Nussbaum, M.C. (2001). *The Fragility of Goodness*. Cambridge, Cambridge University Press
- Obuchowski, N.A., Holden, D., Modic, M.T., Cheah, G., Fu, A.Z., Brant-Zawadzki, M., . . . Mohammed, T.-L. (2007). "Total-body screening: Preliminary results of a pilot randomized controlled trial." *Journal of the American College of Radiology* 4(9): 604–611.
- O'Connor, A. (2011). "Nutrition and health claims—where are we with the health claims assessment process." *Nutrition Bulletin* 36:242–247.
- O'Key, V. and Hugh-Jones, S. (2010). "I don't need anybody to tell me what I should be doing'. A discursive analysis of maternal accounts of (mis)trust of healthy eating information." *Appetite* 54: 524–532.
- Oliver, D. (2005). *The future of nutrigenomics— from the lab to the dining room* (No. SR–889)
- O'Neil, J.M., and Egan, J. (1992). Men's and women's gender role journeys: Metaphors for healing, transition, and transformation. In Wainrip, B.R. *Gender issues across the life cycle*. New York, Springer: 107–123
- Ordovas, J.M. and Corella, D. (2004). "Nutritional genomics." *Annual Review of Genomics and Human Genetics* 5: 71–118.
- Ordovas, J.M. and Mooser, V. (2004). "Nutrigenomics and nutrigenetics." *Current Opinion in Lipidology* 15: 101–108.
- Oudshoorn, N., Rommes, E. and Stienstra, M. (2004). "Configuring the user as everybody: Gender and design cultures in information and communication technologies." *Science Technology Human Values* 29(1): 30–63.

- Pajari, P.M., Jallinoja, P. and Absetz, P. (2006). "Negotiation over self-control and activity: An analysis of balancing in the repertoires of Finnish healthy lifestyles." *Social Science & Medicine* 62(10): 2601–2611.
- Panagiotou, G. and Nielsen, J. (2009). "Nutritional systems biology: Definitions and approaches." *Annual Review of Nutrition* 29(1): 329–339.
- Parrish, P. (2006). "Design as storytelling." *TechTrends* 50(4): 72–82.
- Pearson, H. (2006). "Genetics: What is a gene?" *Nature* 441(7092): 398–401.
- Penders, B., Horstman, K., Saris, W.H.M. and Vos, R. (2007). "From individuals to groups: a review of the meaning of 'personalized' in nutrigenomics." *Trends in Food Science & Technology* 18(6): 333–338.
- Peterson, G.D., Cumming, G.S. and Carpenter, S.R. (2003). "Scenario planning: a tool for conservation in an uncertain world/ Planificación de un Escenario: una Herramienta para la Conservación en un Mundo Incierto." *Conservation Biology* 17(2): 358–366.
- Piatigorsky, J. (2007). *Gene sharing and evolution: The diversity of Protein Functions*. USA, Harvard University Press.
- Pinch, T. (2000). "The golem: Uncertainty and communicating science." *Science and Engineering Ethics* 6(4): 511–523.
- Popper, K.R. (1998). *The world of Parmenides: Essays on the Presocratic Enlightenment*. London and New York Routledge.
- Potter, J. (2001). Wittgenstein and Austin. In Wetherell, M., Taylor, S. and Yates, S. *Discourse Theory and Practice: A Reader*. London, Sage Publications: 39–46.
- Potter, J. and Wetherell, M. (1987). *Discourse and Social Psychology: Beyond Attitudes and Behaviour*. London, Sage Publications.
- Putman, H. (1995). *Pragmatism: An open question*. Oxford, Blackwell.
- Radder, H. (1992). "Normative reflexions on constructivist approaches to science and technology." *Social Studies of Science* 22(1): 141–173.
- Radder, H. (2003). *The philosophy of experimentation*. Dordrecht, Springer.
- Rauch-Kallat, M. (2006). Reflection on the future of health care. In Europe, H.f. 2050 A health Odyssey: Thought-Provoking Ideas for Policymaking, Health first Europe: 4–7.
- Ravetz, J. (2002). "Food safety, quality, and ethics—a post-normal perspective." *Journal of Agricultural and Environmental Ethics* 15: 255–265.
- Ravetz, J. (2004). "The post-normal science of precaution." *Futures* 36: 347–357.
- Ree, E. and Urmson, J.O. (2005). *The Concise Encyclopedia of Western Philosophy*. London, Routledge.
- Reich, W.T. (1995). *Encyclopedia of Bioethics*. New York, Simon & Schuster
- Resnik, D. (2010). "Trans fat bans and human freedom." *The American Journal of Bioethics* 10(3): 27–32.

- Rich, E. and Evans, J. (2010). "Fat ethics: The obesity discourse and body politics." *Social Theory and Health* 4(4): 341–358.
- Rief, W., Conradt, M., Dierk, J.-M., Rauh, E., Schlumberger, P., Hinney, A. and Hebebrand, J. (2007). "Is information on genetic determinants of obesity helpful or harmful for obese people?—A randomized clinical trial." *Journal of General Internal Medicine* 22(11): 1553.
- Rip, A., Misa, T.J. and Schot, J. (1995). Constructive technology assessment: A new paradigm for managing technology in society. In Rip, A., Misa, T.J. and Schot, J. *Managing Technology in Society*. London, Pinter Publishers: 1–17.
- Rippe, K.P. (2000). "Novel foods and consumer rights: concerning food policy in a liberal state." *Journal of Agricultural and Environmental Ethics* 12: 71–80.
- Rolls, B.J., Morris, E.L. and Roe, L.S. (2002). "Portion size of food affects energy intake in normal-weight and overweight men and women." *American Journal of Clinical Nutrition* 76(6): 1207–1213.
- Ronteltap, A. (2008). Public acceptance of nutrigenomics-based personalized nutrition: Exploring the future with experts and consumers, PhD thesis Wageningen University
- Ronteltap, A., van Trijp, J.C.M., Renes, R.J. and Frewer, L.J. (2007). "Consumer acceptance of technology-based food innovations: Lessons for the future of nutrigenomics." *Appetite* 49(1): 1–17.
- Rose, G. (2001). "Sick individuals and sick populations." *International Journal of Epidemiology* 30(3): 427–432.
- Rose, N. (2007). Biopolitics in the twenty-first century. In Rose, N. *The Politics of life itself: biomedicine, power, and subjectivity in the twenty-first century* (pp. 9–41). Oxfordshire, Princeton University Press.
- Roth, J., Qiang, X., Marbán, S.L., Redelt, H. and Lowell, B.C. (2004). "The Obesity Pandemic: Where have we been and where are we going?" *Obesity Research* 12(Suppl): 88S–100S.
- Rowe, G. and Frewer, L.J. (2004). "Evaluating public-participation exercises: a research agenda." *Science, Society and Human Values* 29(4): 512–556.
- Rutten, F.H., Cramer, M.-J.M., Grobbee, D.E., Sachs, A.P.E., Kirkels, J.H., Lammers, J.-W.J. and Hoes, A.W. (2005). "Unrecognized heart failure in elderly patients with stable chronic obstructive pulmonary disease." *European Heart Journal* 26(18): 1887–1894.
- Saguy, A.C. and Gruys, K. (2010). "Morality and health: News media constructions of overweight and eating disorders." *Social Problems* 57(2): 231–250.
- Sanderson, S. and Michie, S. (2007). "Genetic testing for heart disease susceptibility: potential impact on motivation to quit smoking." *Clinical Genetics* 71(6): 501–510.
- Sanderson, S.C., Humphries, S.E., Hubbard, C., Hughes, E., Jarvis, M.J. and Wardle, J. (2008). "Psychological and behavioural impact of genetic testing smokers for lung cancer risk: A phase II exploratory trial." *Journal of Health Psychology* 13(4): 481–494.

- Sanderson, S.C. and Wardle, J. (2005). "Will genetic testing for complex diseases increase motivation to quit smoking? Anticipated reactions in a survey of smokers." *Health Education & Behavior* 32(5): 640–653.
- Saris, W.H.M. (2005). "DiOGenes: an integrated multidisciplinary approach to the obesity problem in Europe." *Nutrition Bulletin* 30(2): 188–193.
- Saukko, P.M., Reed, M., Britten, N. and Hogarth, S. (2010). "Negotiating the boundary between medicine and consumer culture: Online marketing of nutrigenetic tests." *Social Science & Medicine* 70(5): 744–753.
- Saukko, P.M., Richards, S.H., Shepherd, M.H. and Campbell, J.L. (2006). "Are genetic tests exceptional? Lessons from a qualitative study on thrombophilia." *Social Science & Medicine* 63(7): 1947–1959.
- Schot, J. and Rip, A. (1997). "The past and future of constructive technology assessment." *Technological forecasting and social change* 54: 251–268.
- Schroeder, D. (2007). "Public health, ethics, and functional foods." *Journal of Agricultural and Environmental Ethics* 20: 247–259.
- Segal, M., Polansky, M. and Sankar, P. (2007). "Predictors of uptake of obesity genetic testing among affected adults." *Human Genetics* 120(5): 641–652.
- Sibbel, A. (2007). "The sustainability of functional foods." *Social Science and Medicine* 64(554–561).
- Silverstone, R. and Hirsch, E. (1992). *Consuming Technologies. Media and Information in Domestic Spaces*. London, Routledge.
- Simons, J. and Katrin Lensch, A. (2006). "How to encourage individual contributions to reduce food borne risks." *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 7(1): art 15, <http://nbn-resolving.de/urn:nbn:de:0114-fqs0601153>.
- Sinha, G. (2005, 29 June 2005). "News Feature: Designer diets." *Nature medicine* Retrieved 9–3–2006, 2006.
- Smith, A.D., Kim, Y.-I. and Refsum, H. (2008). "Is folic acid good for everyone?" *The American Journal of Clinical Nutrition* 87(3): 517–533.
- Smith, B.J., Tang, K.C. and Nutbeam, D. (2006). "WHO health promotion Glossary: new terms." *Health Promotion International*, Vol 21 No.4 21(4): 340–345.
- Smith, G. (2005). *The Genomic Age—How DNA Technology is Transforming the Way We Live and Who We are*. New York, Amacom.
- Sneijder, P. and te Molder, H. (2004). "Health should not have to be a problem: talking health and accountability in an internet forum on veganism." *Journal of Health Psychology* 9: 599–616.
- Sriram, G., Martinez, J.A., McCabe, E.R.B., Liao, J.C. and Dipple, K.M. (2005). "Single-gene disorders: What role could moonlighting enzymes play?" *The American Journal of Human Genetics* 76(6): 911–924.

- Stemerding, D., Swierstra, T. and Boenink, M. (2010). "Exploring the interaction between technology and morality in the field of genetic susceptibility testing: A scenario study." *Futures* 42(10): 1133–1145.
- Stenne, R., Hurlimann, T. and Godard, B. (2012). "Are research papers reporting results from nutrigenetics clinical research a potential source of biohype?" *Accountability in Research* 19(5): 285–307.
- Stephenson, F. (2008). *DNA: How the Biotech Revolution is Changing the Way We Fight Disease*. New York, Prometheus Books.
- Swierstra, T., Korthals, M. and Keulartz, J. (2001). "You only live twice: ethical deficiencies in dealing with genomics." *Essays van Themadag: De Maatschappelijk Component van het Genomics—onderzoek*. Retrieved januari 2002.
- Swierstra, T., Stemerding, D. and Boenink, M. (2009). Exploring techno—moral change: The case of the obesitypill. In Sollie, P. and Düwell, M. *Evaluating New Technologies*, Springer Netherlands. 3: 119–138.
- Swierstra, T. and te Molder, H. (2012). Risk and soft impacts. In Roeser, S., Hillerbrand, R., Peterson, M. and Sandin, P. *Handbook of Risk Theory*. Dordrecht, Springer: 1050–1066.
- Tait, J. (2009). "Upstream engagement and the governance of science." *EMBO Reports* 10(S1): S18–S22.
- te Molder, H.F.M. (2012). Discourse communities as catalysts for science and technology communication. In Phillips, L., Carvalho, A. and Doyle, J. *Citizen Voices. Performing Public Participation in Science and Environment Communication*. Bristol UK/Chicago USA, Intellect/The University of Chicago Press.: 97–118.
- te Molder, H.F.M. and Potter, J (Eds) (2005). *Conversation and Cognition*. Cambridge Cambridge University Press.
- te Molder, H.F.M and Gutteling, J. (2003). The issue of food genomics: about reluctant citizens and united experts In Est, R.V., Hanssen, L. and Crapels, O. *Genes for Your Food: Food for Your Genes: Societal Issues and Dilemmas in Food Genomics* The Hague: Rathenau institute: 117–131.
- ten Have, M., de Beaufort, I.D., Teixeira, P.J., Mackenbach, J.P. and van der Heide, A. (2011). "Ethics and prevention of overweight and obesity: An inventory." *Obesity Reviews* 12(9): 669–679.
- Thaler, R.H. and Sunstein, C.R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press.
- Thompson, P.B. (2003). Pragmatism, discourse ethics and occasional philosophy. In Keulartz, J., Korthals, M., Schermer, M. and Swierstra, T. *Pragmatist Ethics for A Technological Culture*, Springer Netherlands. 3: 199–216.
- Tischner, I. and Malson, H. (2012). "Deconstructing health and the un/healthy fat woman." *Journal of Community & Applied Social Psychology* 22(1): 50–62.

- Tompa, P., Szász, C. and Buday, L. (2005). "Structural disorder throws new light on moonlighting." *Trends in Biochemical Sciences* 30(9): 484–489.
- van Baak, M. (2004). "Adaptive thermogenesis during over- and underfeeding in man." *British Journal of Nutrition* 91(3): 329–330.
- van den Oever, M.C., Spijker, S., Li, K.W., Jimenez, C.R., Koya, E., van der Schors, R.C., . . . Smit, A.B. (2006). "A proteomics approach to identify long-term molecular changes in rat medial prefrontal cortex resulting from sucrose self-administration." *Journal of Proteome Research* 5: 147–154.
- van der Weijden, W.J. and Hin, K.J. (2004). Definities en aspecten van voedselveiligheid. In Scheepmaker, M.P.C. *Nederland, Justitiële Verkenningen Voedselveiligheid*, 30(2): 19–30. Den Haag: Boom Juridische Uitgevers.
- van Exel, N.J.A., de Graaf, G. and Brouwer, W.B.F. (2006). "'Everyone dies, so you might as well have fun!' Attitudes of Dutch youths about their health lifestyle." *Social Science & Medicine* 63(10): 2628.
- van Ommen, B., Keijer, J., Heil, S.G. and Kaput, J. (2009). "Challenging homeostasis to define biomarkers for nutrition related health." *Molecular Nutrition & Food Research* 53(7): 795–804.
- van Ommen, B., Keijer, J., Kleemann, R., Elliott, R., Drevon, C., McArdle, H., . . . Müller, M. (2008). "The challenges for molecular nutrition research 2: quantification of the nutritional phenotype." *Genes & Nutrition* 3(2): 51–59.
- van Roost, M. (2005). "The metabolic syndrome: a ticking time bomb: Will nutrigenomics turn the tide?" *Food Engineering and Ingredients*. 30(2): 5–7.
- Veen, M., Gremmen, B., te Molder, H. and van Woerkum, C. (2011). "Emergent technologies against the background of everyday life: Discursive psychology as a technology assessment tool." *Public Understanding of Science* 20(6): 810–825.
- Veenhoven, R. (2003). "Hedonism and happiness." *Journal of Happiness Studies* 4(4): 437–457.
- Verbeek, P.-P. (2006). "Materializing morality: Design ethics and technological mediation." *Science Technology Human Values* 31(3): 361–380.
- Verbeke, W. (2005). "Agriculture and the food industry in the information age." *European Review of Agricultural Economics*.
- Verkuyten, M. (2003). "Discourses about ethnic group (de-)essentialism: Oppressive and progressive aspects." *British Journal of Social Psychology* 42: 371–391.
- Vernooij, M.W., van der Lugt, A., Ikram, M.A., Wielopolski, P.A., Niessen, W.J., Hofman, A., . . . Breteler, M.M.B. (2008). "Prevalence and risk factors of cerebral microbleeds." *Neurology* 70(14): 1208–1214.
- Wallace, H. (2006). *Your diet tailored to your genes: Preventing diseases or misleading marketing*. Buxton, Genewatch UK.

- Walley, A.J., Asher, J.E. and Froguel, P. (2009). "The genetic contribution to non-syndromic human obesity." *Nature Reviews Genetics* 10(7): 431–442.
- Wang, S.S., Brownell, K.D. and Wadden, T.A. (2004). "The influence of the stigma of obesity on overweight individuals." *International Journal of Obesity* 28(10): 1333–1337.
- Wetherell, M. and Potter, J. (1988). Discourse analysis and the identification of interpretive repertoires. In Antaki, C. *Analysing Everyday Explanation: A Casebook of Methods*. Newbury Park, CA Sage: 168–183.
- Williams-Jones, B. and Graham, J.E. (2003). "Actor–Network Theory: A tool to support ethical analysis of commercial genetic testing." *New Genetics and Society* 22: 271.
- Winner, L. (1986). *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. Chicago and London, The University of Chicago Press
- Wittgenstein, L. (1969). *On Certainty*. Anscombe, G.E.M. and von Wright, G.H. Oxford, Basil Blackwell
- Wynne, B. (2006). "Public engagement as a means of restoring public trust in science -- Hitting the notes, but missing the music?" *Community Genetics* 9(3): 211–220.
- Young, L.R. and Nestle, M. (2002). "The contribution of expanding portion sizes to the US obesity epidemic." *American Journal of Public Health* 92(2): 246–249.

II

Summary

The latest nutritional research, nutrigenomics, tries to unravel the molecular interaction between nutrients, cells and genes. An important objective of this research is the measurement and quantification of small health changes caused by diet and lifestyle, and calculating health risks of food and dietary habits. Nutrigenomics can dramatically change our view on eating and the role of food in our daily life. Therefore, the objective of the research described in this thesis is to expose the possible ethical problems of the way nutrigenomics might affect our life at an early stage of its development as a science and to find an ethical form of nutrigenomics. This is done by reflecting on the norms embedded in the script of nutrigenomics, by reflecting on norms of health, food and genes in everyday life, and by an ethical deliberation with important social actors of nutrigenomics.

One major challenge in trying to anticipate the possible ethical problems of nutrigenomics is that nutrigenomics is still in its infancy. Accordingly, it is still a mystery how the knowledge gained from nutrigenomics research will be used. Traditionally, ethical approaches are not well adapted to deal with this uncertainty. Therefore, in Chapter 1, an ethical approach is introduced that provides tools to deal with the uncertainty surrounding new sciences, i.e., the pragmatic ethical approach inspired by the ideas of John Dewey on ethical deliberation. Pragmatism tries to bring people together within an ethical deliberation to create a mutual understanding of the different values they have and to find ways to deal with the practical consequences of existing conflicts. Thus, unlike ethical approaches that aim for the most happiness for everybody or use fixed duties to make ethical decisions, pragmatism uses peaceful coexistence and fruitful cooperation between groups of people with diverse and conflicting worldviews as guidance for ethical decision making.

The pragmatic ethical approach described in Chapter 1 provides tools to deal with the following two aspects that may complicate an ethical deliberation on nutrigenomics. To begin with, it tries to take into account the complexity of the development of novel sciences. This means that the development of a science is seen as a negotiation process between visions existing within nutrigenomics research and ideas existing in everyday life. Therefore, as an input for deliberation, norms underlying the habits and worldviews within nutrigenomics research and norms within everyday life are brought together. By bringing these norms together and using them as an input for an ethical deliberation about nutrigenomics with social actors of nutrigenomics and food science, the project takes into account features of the complex interactions between society and science in its ethical reflection on nutrigenomics, as well as stimulates an interaction between nutrigenomics and society. The second aspect concerns the characteristics that Dewey has described as being essential for a fruitful ethical deliberation. Dewey showed that empathy for and consciousness of other people's worldviews is essential for a fruitful deliberation. Moreover, he demonstrated that there is always a danger that an ethical deliberation is solely steered by the first inclinations that a group of people may have because of their background

and character. Consequently, in that case, not all the possible actions are thought of. By exposing the norms underlying habits and worldviews within nutrigenomics (Chapter 3) and the conflicts these may have with ideas in everyday life (Chapter 4), the broadest possible ethical deliberation about nutrigenomics can be created (Chapter 5).

But, first of all, in order to get a grip on the state of art of nutrigenomics, in Chapter 2, some of the major uncertainties of nutrigenomics have been linked to possible ethical dilemmas that may arise with nutrigenomics. The analysis shows cognitive uncertainties, e.g., uncertainties in the scientific practice of nutrigenomics and uncertainties within social sciences that study dietary habits and health-related behaviour and moral uncertainties, e.g., uncertainty that people encounter when they try to determine what action would be moral in a certain situation in relation to nutrigenomics. We show how these cognitive uncertainties are interwoven with moral uncertainties. Cognitive uncertainties influence moral uncertainties and vice versa.

We demonstrate that many ethical approaches are less capable of dealing with the entanglement between moral uncertainties and cognitive uncertainties. For example, we show this with principlism which is often used for dealing with ethical problems related to food. Ethical concepts used in principlism, such as 'individual responsibility, rely on stable conditions and an enduring and constant society with constant norms. The state of art of nutrigenomics does not give a reason for taking such stable situations as a starting point for ethical evaluation, and taking the process of co-evolution between science and society into account complicates an analysis of these concepts even further. Conclusively, we show how consumers can deal with the uncertainties in relation to nutrigenomics and how to deal with the state of art of nutrigenomics in ethics with the pragmatic ethical approach.

In Chapter 3, visions that underlie nutrigenomics research practices have been studied with the notion of the script developed by Madeleine Akkrich. The notion of the script takes, as a starting point, that research plans and scientific publications of nutrigenomics contain ideas on how the results of nutrigenomics can be used, who the end users of these applications are and how these applications can be implemented within society. By analysing the script, the co-evolution between society and scientific development can be explained and ethically evaluated. In chapter 3 we have focussed on an analysis and ethical evaluation of the normative assumptions that underlie the script of nutrigenomics, that is norms about how future consumers should live with the help of applications of nutrigenomics.

Three major normative assumptions have been exposed after analysing scientific applications of nutrigenomics. First, values around food are exclusively explained in terms of health. In this explanation, health is defined very specifically, that is as the prevention of a sum of diseases. A second assumption is that, when health and health risks can be measured accurately, health and disease can be controlled. Thirdly, it is assumed that,

when people know the risks of food and know what their personal risks are, they will act accordingly and change their lifestyle. Thus, we demonstrate that the visions within nutrigenomics contain the promise of control of diseases by adapting food to information that is revealed by measuring health and by calculating risks. This can lead to a massive amount of complex information about nutrition that people are supposed to apply to their dietary habits. Together, the above assumptions presume that healthy living in terms of preventing diseases and controlling health risks should be an important activity in everyday life. Healthy living becomes an unremitting responsibility for disease prevention through foods, and healthy living should become one of the main tasks in everyday life. In short, we show that, in the script of nutrigenomics, the healthy life equals the good life.

An ethical reflection on these normative assumptions shows that the script of nutrigenomics has some problematic characteristics. First of all, other meanings of food, besides its meaning for health, may be lost which raises issues of free choice since food is traditionally part of people's identity and culture. Secondly, it may entail a constant dissatisfaction and even fear for the body and for one's health, for example, because the script of nutrigenomics entails the promise of everlasting health and happiness by measuring health and health risks. This can degrade the overall perception of health and decrease the feeling of wellbeing. Thirdly, the script may lead to increased social pressure to adhere to dietary advice whether or not personal or based on belonging to a certain risk group. This implies that the individual is viewed as being solely accountable for his dietary behaviour, while the influence of the food environment is denied. Moreover, it can be seen as an unwanted intrusion into the private life of the individual and can decrease the freedom of choice for a certain lifestyle. Finally, when the good life is increasingly equated to the healthy life, in terms of a constant personal effort for risk minimisation and disease prevention, people may become more individualistic and self-centred. People may become less tolerant of the weakest within society.

In Chapter 4, the normative assumptions embedded in the script of nutrigenomics have been compared with norms in everyday life by using the discourse analytic perspective developed by Potter and Wetherell. This perspective treats talk as a social practice in which expressions of people are used to accomplish certain social actions such as accusing, defending or constructing a certain expertise. We use the discourse analytic perspective to expose problems that are, at first sight, not technology related but can cause conflicts when new technologies and knowledge from nutrigenomics are applied. The goals for which people construct arguments and stories about health and health risks and the role of accounts about genes and predisposition in relation to being overweight have been studied. The goal was to find out which interactional norms exist in relation to health, predisposition and genes as a cause of being overweight, and health risks and lifestyle. To accomplish this, six group discussions on obesity, nutrition and health were organized.

The analysis shows that, in everyday life, behavioural explanations for obesity are preferred. The 'In the gene repertoire', e.g. explicit gene talk to explain overweight, is treated as being solely used out of self-interest rather than a true explanation for obesity. Behavioural explanations for being overweight, for example, repertoires about a busy hectic life in which there is less time for healthy eating, are preferred. At the same time, in the context of thinness, accounts in which predisposition played a role were accepted. Repertoires about a thin build are used to account for unhealthy eating habits of slim children. Thin children can do as they want because they will never become overweight and are healthy anyway. So accounts in which predisposition plays a role is only suspicious in the context of overweight.

Furthermore, it appears that two conflicting norms are accepted. People need to account for an unhealthy lifestyle as well as for being too preoccupied with health, health risks, and the prevention of diseases. Stories of being overly concerned about the adverse effects of foods are treated as being unable to enjoy life and to have fun. Only in repertoires in which concrete risks and complaints are mentioned, repertoires about being healthy and risk-conscious are accepted. Repertoires in which people construct an explicit awareness of health risks without relating this to complaints are resisted.

In short, Chapter 4 shows evidence that the norms embedded in the script of nutrigenomics only partly connect to norms in everyday life. In everyday life, it is not so self-evident that people will give main priority to healthy living and disease prevention. Collecting information about food and health with the help of nutrigenomics in order to prevent diseases and to minimize risks is inconsistent with the idea of being relaxed about health risks and not being preoccupied with health. Moreover, Chapter 4 shows that information about predisposition and risks can be used in unforeseen ways. As shown by the use of repertoires about thin children, accounts of health tests that reveal no particular predisposition or health risk may enable people to display that they are health-conscious and, at the same time, have a pleasant life without health worries. Furthermore, though information about health risks give people the opportunity to account for healthy behaviour, it does not necessarily have to lead to actual lifestyle changes. It remains to be seen whether negative test results will present the opportunity to account for dietary behaviour that is aimed at the prevention of diseases or will merely be used to negotiate blame and responsibility for lifestyle-related diseases or conditions such as obesity.

In a meeting with representatives from governmental organizations and food industry, dieticians, food scientists, nutrigenomics researchers, and social scientists studying nutrigenomics, the mismatch between norms in everyday life and norms in the script of nutrigenomics was discussed. Chapter 5 shows the strategies to make nutrigenomics suitable for everyday life as proposed by these social actors of nutrigenomics. First of all, some strategies are aimed at changing the environment by using coercive measures or measures that should tempt the consumer to healthy choices by making these choices easier or tastier. The social actors propose legislative measures to take away risky ingredients

without changing the taste of the products, to put taxes on certain food products, to totally prohibit the selling of certain products or selling at certain locations. Other measures included subsidizing products such as fruit and vegetables, creating new products by making healthy products tastier, producing products that quickly cause a feeling of satiety, or products that contain all the elements of a balanced diet. Furthermore, some strategies are aimed at giving information to the consumer. The participating social actors propose to simplify complex information on health and diet, to coach people to lead a healthy lifestyle with the help of a lifestyle coach or dietician, or to bring children in contact with different types of healthy food in schools so that they can learn about healthy eating and how one can enjoy healthy eating. A striking feature of the deliberation was that participating social actors recognize the mismatch between norms in the nutrigenomics script and norms in everyday life but reformulate it as a shortcoming of the consumer. They construct consumers as being unable to use the information on health and nutrition, uninterested in finding and using information about health and nutrition, or being incapable of dealing with the tempting foods in their environment. Accordingly, in the suggested strategies, there is little attention paid toward using nutrigenomics for goals other than health.

In light of the purpose of the pragmatic ethical approach used in this thesis, i.e., peaceful coexistence between different groups of people with different values, the suggested strategies were analysed with the help of the notion of paternalism and self-governance. These notions consider from different angles as to what rate the proposed strategies give room for the existence of different lifestyles and various norms and values about health and nutrition. Seen from these two perspectives, two extremities can be seen in the strategies proposed by the social actors. First, it is argued that, though the strategies that are aimed at changing the food environment prevent a situation in which people have to comprehend an abundance of complex information, strategies in which too much coercion is used, like taxes on certain food types and keeping certain products from the shelves, are ethically undesirable. These are strong paternalistic measures, e.g., people are forced to specific behaviour while their original conscious behaviour did not harm others. Chapter 5 shows that, although eating can cause cravings toward certain foods caused by the way some foods work on the brain, there is not enough reason for strong coercion. In addition, unhealthy eating is not harming third parties, like some claim.

Secondly, strategies that change the behaviour of consumers by means of information, by simplifying nutrigenomics information, or by personal coaching by a lifestyle coach or a dietician can be problematic when seen from the perspective of self-governance. In these cases, it is assumed that people will be able to choose freely if they will use the available information or these kinds of services. However, it would be too easy to think that, within a future society, this choice is indeed free. Self-governance is a concept used by Foucault and later applied to the process of bio-medicalization by Clark to indicate that people use innovations and interventions to discipline themselves with hope for happiness and health. Self-governance is not driven by direct coercion but by discourses that are

guided by scientific experts that promote the pursuit of health and happiness, for example, by knowledge about the risks of certain diets. When these discourses become extremely dominant, other ideas about a good life and happiness can be threatened. The power of social pressure that can be caused by creating a dominant discourse on health risks and food and the right kind of behaviour should not be underestimated. Chapter 5 shows that, given the complexity of gene food interaction and the daily character of eating, striving for health could even put free choice for different ideas of the good life under pressure.

Chapter 5 concludes with the idea that tempting people to change their eating habits by making new products that incorporate values other than health, such as taste, convenience and fulfilment, and educational strategies in which enjoying food and culture are incorporated, seem to manage the discrepancy between norms in everyday life and in the nutrigenomics script very well, as well as protect a plurality of eating styles.

In chapter 6, I discuss the main findings of Chapters 2 through 5 with the help of the research questions and return to the objectives of this thesis. First of all, the aim was to find an ethical form of nutrigenomics by creating and analysing an ethical deliberation about nutrigenomics. The results of the deliberation show that the strategies that use nutrigenomics to create new products that include values other than health and use knowledge from nutrigenomics for education in which the experience of food is mainly important are ethically most desirable. In addition, I conclude that the steps taken in this research give insight into the social ethical issues of nutrigenomics and make these available for further deliberation. Moreover, it is concluded that the analysis shows that health in terms of risk minimization is not as self-evident as it seems as a goal for nutrigenomics.

Chapter 6 also shows that the questions and considerations revealed in Chapters 3, 4 and 5 give reason for a deliberation with a more diverse public. I propose the following dimensions that could guide this deliberative process: paternalism versus self-governance with the help of biomedical techniques; guilt and blame and the responsibility for health and disease; biomedical notions of health versus broader notions of health in which pleasure and a relaxed attitude towards health risks are important; and the role of the good life. These dimensions, together with strategies that the social actors propose for implementing nutrigenomics, can guide a further deliberation on nutrigenomics as one of the trends within the wider debate on food and health.

Secondly, Chapter 6 shows an evaluation of the steps taken in this research and gives recommendations for further research. Exposing norms with the notion of the script and the discourse analytic approach made social ethical issues in relation to nutrigenomics available for discussion. Moreover, the steps enabled to take into account some of the interaction between society and nutrigenomics practices in the ethical evaluation for the research in total. However, the deliberation with social actors remained limited. The consequences were not sufficiently addressed. That is the ethical desirability of the proposed strategies and steering of the proposed strategies by for example laws were only briefly discussed.

Moreover, in the proposed strategies to implement nutrigenomics, health remained the most important end. Instead of acknowledging and working with broader notions of health existing in everyday life, consumers were constructed as persons who are not interested, capable or willing to use information or tools generated by nutrigenomics. This could obstruct a further deliberation on food and nutrigenomics in which every day norms are addressed more constructively. It could be possibly due to the lack of time available for the deliberation that the social ethical implications of the proposed strategies were not addressed. However, some of the problems can also be explained with the help of the theories of John Dewey and some recent findings in discourse analytical studies on expert debates. These show that the concept of health may not have raised emotions and further discussion in the deliberation with social actors because it is often only used in the abstract. The following steps could help. First of all, social actors could be made more conscious about their ideas and definitions of health and ideas on what the proposed strategies would do to themselves as citizen-consumers. Secondly, an analysis and reflection together with the social actors on the discursive strategies used in relation to the concept of health or in relation to consumers could help the deliberation further. These steps can be taken in a follow-up study.

III

Summary in Dutch (Samenvatting)

Het overwegen van verschillende routes voor nutrigenomics: een pragmatisch ethische benadering

Het nieuwste voedingsonderzoek, nutrigenomics, richt zich op moleculaire interacties tussen voedingsstoffen, cellen en genen. Daarbij spelen het meten en kwantificeren van kleine gezondheidsveranderingen die worden veroorzaakt door voeding en leefstijl, en het berekenen van gezondheidsrisico's van voeding een grote rol. Nutrigenomics kan onze kijk op eten en voeding ingrijpend veranderen. Dit project heeft dan ook tot doel om in een vroeg stadium van de ontwikkeling van nutrigenomics als wetenschap, mogelijke ethische problemen ter discussie te stellen en een ethische vorm van nutrigenomics te vinden. Dit wordt gedaan door het script van nutrigenomics te analyseren, door normen rond voeding, gezondheid en genen in het dagelijks leven bloot te leggen, en deze resultaten te gebruiken in een ethische deliberatie met maatschappelijke actoren van nutrigenomics. Tot slot wordt deze combinatie van stappen geëvalueerd.

Een belangrijke uitdaging bij het in kaart brengen en mogelijk anticiperen op ethische problemen rond nutrigenomics, is dat dit type onderzoek nog in de kinderschoenen staat. We weten niet hoe de kennis die voortkomt uit nutrigenomics onderzoek gebruikt kan gaan worden. Veel ethische benaderingen lijken niet in staat om technologieën die nog zo vroeg in hun ontwikkeling zijn te hanteren. Hoofdstuk 1 introduceert daarom een ethische benadering, de pragmatische ethiek, die geïnspireerd is door de ideeën van John Dewey over ethische deliberatie. Deze benadering geeft handvaten voor het hanteren van onzekerheden rond nieuwe wetenschappen. De pragmatische ethiek neemt, in plaats van bijvoorbeeld het grootste geluk voor iedereen of vaststaande plichten, vreedzame samenleving en goede samenwerking tussen mensen met verschillende wereldbeelden als leidraad voor ethische besluitvorming. De pragmatische ethiek die gebruikt is in dit proefschrift, beoogt deze vreedzame co-existentie te bevorderen door een ethische deliberatie in gang te zetten tussen verschillende groepen in de maatschappij. Het pragmatisme probeert door middel van deliberatie een wederzijds begrip tussen mensen te bewerkstelligen en manieren te vinden om met de praktische consequenties van bestaande conflicten om te gaan.

Hoofdstuk 1 laat zien dat er twee belangrijke obstakels zijn die een ethische deliberatie in de weg kunnen staan en geeft handvaten om met deze obstakels om te gaan. Ten eerste wordt er rekening gehouden met het complexe karakter van wetenschappelijke ontwikkelingen. Dit betekent dat de ontwikkeling van nutrigenomics benaderd wordt als een onderhandelingsproces tussen visies die bestaan binnen de wetenschap en ideeën die mensen hebben in het dagelijks leven. Daarom worden normen binnen het nutrigenomics onderzoek die ten grondslag liggen aan bepaalde assumpties over de maatschappij en normen in het dagelijks leven vergeleken. Door deze normen samen te brengen in een ethische deliberatie over nutrigenomics met maatschappelijke actoren van nutrigenomics, beoogt het project niet alleen de interactie tussen maatschappij en nutrigenomics te stimuleren, maar ook kenmerken van de complexe interactie tussen maatschappij en wetenschap

mee te nemen. Een tweede aspect waar rekening mee gehouden moet worden, zijn een aantal van de door John Dewey beschreven eigenschappen van een succesvolle ethische deliberatie. Zo liet Dewey zien dat empathie voor en bewustzijn van de wereldvisies van anderen essentieel zijn voor een goede ethische deliberatie. Daarnaast beschreef hij, dat er altijd een gevaar is dat een ethische deliberatie alleen gestuurd wordt door de impulsen die een groep mensen heeft vanwege hun achtergrond en karakter. Hierdoor worden niet alle mogelijkheden voor actie onderzocht. Door de normen binnen het nutrigenomics onderzoek bloot te leggen (hoofdstuk 3) en de discrepantie die deze hebben met ideeën in het dagelijks leven in kaart te brengen (hoofdstuk 4), kan een zo breed mogelijke ethische deliberatie over nutrigenomics gestimuleerd worden (hoofdstuk 5).

Echter allereerst wordt getracht vat te krijgen op de onzekerheden rond nutrigenomics. In hoofdstuk 2 zijn een aantal van de belangrijkste onzekerheden van nutrigenomics in verband gebracht met mogelijk ethische dilemma's die hierbij een rol spelen. De analyse laat zien hoe cognitieve onzekerheden, dus onzekerheden binnen de wetenschappelijke praktijk en onzekerheden binnen de sociale wetenschappen die zich bezig houden met eetgewoonten en gezondheid, en morele onzekerheden, dus onzekerheden die mensen tegenkomen wanneer zij proberen te bepalen wat een morele actie is in een bepaalde situatie, met elkaar verweven zijn. Cognitieve onzekerheden beïnvloeden morele onzekerheden en vice versa.

We laten zien dat veel ethische benaderingen niet in staat zijn om onzekerheden van nieuwe wetenschappen te hanteren. We demonstreren dit bijvoorbeeld met behulp van de principebenadering die veelvuldig wordt gebruikt in de ethiek van voeding. Ethische concepten die worden gebruikt in de principebenadering, zoals "individuele verantwoordelijkheid", zijn gebaseerd op stabiele condities en een constante maatschappij met constante normen en waarden. Er is echter geen sprake van een dergelijke stabiele situatie gegeven de staat waar nutrigenomics zich in bevindt, en aangezien de normen en ethische zorgen van mensen in de samenleving de ontwikkeling van toepassingen en nieuwe kennis uit de wetenschap beïnvloeden en vice versa. Tot slot laten we zien met behulp van de pragmatische ethiek, hoe met de onzekerheden betreffende nutrigenomics om gegaan kan worden door consumenten en binnen een ethische evaluatie van nutrigenomics.

In hoofdstuk 3 zijn visies die ten grondslag liggen aan het nutrigenomics onderzoek beschreven door deze te ontvouwen met behulp van de notie van het script die is ontwikkeld door Madeleine Akkrich. Met behulp van de notie van het script kan worden aangetoond dat onderzoeksplannen en publicaties ideeën bevatten over hoe resultaten kunnen worden toegepast, wie de gebruikers van deze toepassingen zijn, en hoe deze toepassingen in de maatschappij geïmplementeerd kunnen worden. Door het script te bestuderen kan de co-evolutie tussen maatschappij en technologieontwikkeling verklaard

worden en wordt een betere ethische reflectie mogelijk gemaakt. Daarbij ligt de nadruk op normatieve vooronderstellingen die ten grondslag liggen aan het script, of in andere woorden, normen over hoe het leven van de toekomstige consument zou moeten worden ingericht met behulp van nieuwe toepassingen van nutrigenomics.

Na analyse van wetenschappelijke publicaties met betrekking tot nutrigenomics zijn drie belangrijke normatieve assumpties ontvouwd. Ten eerste worden waarden rond voeding uitsluitend in termen van gezondheid uitgelegd en wordt gezondheid daarbij op een hele specifieke manier ingevuld, namelijk ter voorkoming van een som aan ziekten. Ten tweede wordt verondersteld dat wanneer gezondheid en gezondheidsrisico's zo goed mogelijk gemeten kunnen worden, men deze kan beheersen. Een derde vooronderstelling is dat als mensen de risico's van voeding kennen en weten welke risico's ze persoonlijk lopen, zij daar naar zullen handelen door hun leefstijl aan te passen. Dus we laten zien dat de visies binnen nutrigenomics de belofte inhouden van controle over ziekten door de voeding aan te passen aan informatie uit metingen aan de gezondheidstoestand van mensen en het berekenen van risico's. Dit kan leiden tot een veelheid aan complexe informatie over voeding die mensen zouden moeten gebruiken om gezond te leven. De bovengenoemde assumpties veronderstellen dan ook samen dat gezond leven in termen van het meten en beheersen van gezondheidsrisico's, een belangrijke bezigheid moet zijn in het alledaagse leven. Gezond leven wordt een constante verantwoordelijkheid en één van de belangrijkste taken in het dagelijks leven. Kortom we laten zien dat binnen het script van nutrigenomics wordt verondersteld, dat het gezonde leven gelijk is aan het goede leven.

Een reflectie op deze vooronderstellingen laat zien dat het script van nutrigenomics een aantal problematische eigenschappen heeft. Andere betekenissen van eten naast gezondheid kunnen verloren gaan. Dit kan het idee van vrije keuze in gevaar brengen wat nu in onze maatschappij leeft, helemaal omdat voeding traditioneel gezien onderdeel is van de identiteit en cultuur van mensen. Ten tweede is het denkbaar dat mensen een toenemende ontevredenheid en zelfs angst over het lichaam en hun gezondheid gaan ervaren, bijvoorbeeld doordat er te hoge verwachtingen over gezondheid worden gecreëerd door een discours van een utopisch eeuwigdurende gezondheid en geluk. Hierdoor kan de perceptie van gezondheid en een gevoel van welzijn verminderd worden. Ten derde kan er een steeds grotere sociale druk ontstaan die mensen ertoe beweegt zich aan bepaalde voedingsadviezen te houden, dan wel omdat men persoonlijke risico's kent voor leefstijl-gerelateerde ziekten, dan wel omdat men tot een bepaalde risicogroep behoort. Dit impliceert niet alleen dat louter het individu verantwoordelijk wordt gehouden voor wat hij eet en dus de invloed van voedselomgeving wordt ontkend, het kan ook gezien worden als een ongewilde inbreuk in het privé leven van het individu en de vrijheid ondermijnen om een bepaalde leefstijl te kiezen. Tot slot zouden mensen individualistischer kunnen

worden, wanneer het goede leven in toenemende mate gelijk gesteld wordt aan het gezonde leven in termen van een constant persoonlijk streven tot risico minimalisering en ziekte preventie. Er zou een verminderde tolerantie kunnen ontstaan voor de zwaksten in de samenleving.

Bovengenoemde normatieve assumpties zijn in hoofdstuk 4 vergeleken met bestaande normen in het alledaagse leven door gebruik te maken van de discourse analytische benadering die is ontwikkeld door Potter en Wetherell (1987). Deze methode bekijkt taal als een sociale praktijk waarin de uitspraken van mensen sociale acties zijn, zoals beschuldigen, verdedigen of het construeren van een bepaalde deskundigheid. In hoofdstuk 4 laten wij zien hoe deze benadering ingezet kan worden om problemen bloot te leggen die in eerst instantie niet technologie gerelateerd zijn, maar die wel in de toekomst mogelijke conflicten opleveren bij de toepassing van nieuwe technologieën en kennis. Er is gekeken voor welke doelen mensen argumenten en verhalen over gezondheid en gezondheidsrisico's naar voren brengen en in hoeverre formuleringen over genen en aanleg met betrekking tot overgewicht hierbij een rol spelen. Daarbij is gekeken of er in gesprekken over overgewicht interactionele dilemma's zijn die iets zeggen over normen over gezondheid, over aanleg als oorzaak voor overgewicht en over leefstijl en gezondheidsrisico's. Hiertoe zijn groepsdiscussies gehouden over overgewicht, voeding en gezondheid.

Uit de analyse komt naar voren dat men de voorkeur geeft aan verhalen over gedrag om overgewicht te verklaren. Hoewel verklaringen waarin genen expliciet worden aangewend om overgewicht uit te leggen wel worden gebruikt, worden deze niet behandeld als een ware verklaring voor overgewicht. Eerder worden verklaringen over genen behandeld als een uitleg die gebruikt wordt omdat het op dat moment goed uitkomt om zichzelf op deze manier te verdedigen. Daarentegen worden repertoires over een bepaalde moderne leefstijl, bijvoorbeeld een druk hectisch leven waarbij gezond eten achterwege blijft, als verklaring voor overgewicht geaccepteerd. In de context van slankheid worden wel verklaringen geaccepteerd waarin aanleg een rol speelt. Zo worden bijvoorbeeld repertoires over slankheid ingezet om ongezond eetgedrag van slanke kinderen te verantwoorden. Slanke kinderen kunnen alles maken, worden nooit dik (zit immers in de aanleg) en zijn dus per definitie gezond. Dus het gebruik van verklaringen met aanleg is alleen verdacht in de context van overgewicht.

Daarnaast blijkt dat er in het dagelijks leven twee normen worden nagestreefd. Enerzijds moeten mensen zich verantwoorden als ze ongezond leven, anderzijds moeten zij zich juist verantwoorden als ze te veel bezig zijn met gezondheidsrisico's. Het veel bezig zijn met de nadelige effecten van voedingsmiddelen lijkt behandeld te worden als iets dat genieten en plezier in het leven in de weg staat. Pas als men verhalen vertelt over bestaande gezondheidsklachten, worden repertoires over gezondheidsbewustzijn en het letten op risico's van voeding geaccepteerd. Verhalen over een nadrukkelijk bewustzijn van gezondheidsrisico's zonder deze in verband te brengen met klachten worden minder gemakkelijk geaccepteerd.

Kortom, hoofdstuk 4 laat zien dat de normatieve assumpties van het script van nutrigenomics slechts ten dele aansluiten bij normen in het dagelijks leven. Het idee dat mensen prioriteit geven aan gezond leven in termen van ziekte preventie lijkt nog ver van het dagelijks leven af te staan. Het verzamelen van informatie over eten en gezondheid dat moet leiden tot ziekte preventie lijkt op gespannen voet te staan met het idee van ‘niet te moeilijk doen over gezondheid’ en genieten. Verder blijkt uit het voorbeeld van het gebruik van repertoires over slankheid dat informatie over aanleg of risico’s op een onverwachtse manier kan worden ingezet: juist als middel om ongezond leven of genieten te verantwoorden terwijl men zich wel een gezondheidsbewuste identiteit aanmeet. Daarnaast blijkt uit de analyse dat repertoires over testresultaten louter gebruikt zouden kunnen worden om over kwesties van schuld en verantwoordelijkheid te onderhandelen. Het is dus niet ondenkbaar dat testresultaten niet zozeer helpen om gedrag gericht op de preventie van ziekten te legitimeren, maar vooral ook gebruikt zullen worden om te onderhandelen over schuld en verantwoordelijkheid voor leefstijl–gerelateerde ziekten of condities zoals obesitas.

De discrepantie tussen normatieve assumpties in het script van nutrigenomics en normen in het alledaagse leven is ter discussie gesteld in een bijeenkomst met nutrigenomics onderzoekers, diëtisten, beleidsmakers, sociologen, voedingsvoorlichters en voedingswetenschappers. Hoofdstuk 5 laat zien dat er verschillende strategieën worden aangedragen om nutrigenomics toe te passen. Ten eerste zijn deze strategieën gericht op het veranderen van de omgeving van de consument door middel van dwingende maatregelen of verleiding tot gezonde keuzes door deze keuzes makkelijker of lekkerder te maken. De maatschappelijke actoren stellen voor om producten te veranderen door ingrediënten die gezondheidsproblemen kunnen veroorzaken bij overconsumptie te verwijderen zonder de smaak van de producten te veranderen, om de belasting te verhogen, om producten te verbieden op sommige locaties zoals scholen of door het aanbod in de schappen van winkels door wettelijke maatregelen te sturen. Andere maatregelen waarbij consumenten meer keuze hebben, zijn het subsidiëren van producten zoals groente en fruit of het maken van nieuwe producten die gezonder zijn. Nieuwe gezondere producten zouden smaakvoller gemaakt kunnen worden, ongezonder producten zouden zo gemaakt kunnen worden dat ze eerder een gevoel van verzadiging geven, en producten zouden zo samengesteld kunnen worden dat zij alle elementen van een gebalanceerd dieet bevatten en op deze manier gezond eten gemakkelijker maken. Ten tweede worden er strategieën voorgesteld die gericht zijn op het overdragen van kennis of informatie. De participerende maatschappelijke actoren stellen een simplificatie voor van de complexe informatie over de relatie tussen voeding en gezondheid, een model waarin consumenten persoonlijk begeleid worden door een leefstijl coach of een diëtist, en educatie waarbij kinderen op school in aanraking worden gebracht met verschillende soorten gezonde voeding, zodat zij van jongs af aan leren wat gezond eetgedrag is en dat ze van gezonde voeding kunnen genieten. Aan de deliberatie valt op dat de participerende maatschappelijke actoren de discrepantie herkennen tussen nutrigenomics en normen in

het dagelijks leven, maar dit herformuleren als een tekortkoming van de consument. In de deliberatie is dan ook weinig aandacht voor strategieën waar gezondheid helemaal geen rol speelt. De consument gezonder maken, staat altijd centraal. Daarnaast is er weinig aandacht voor de sociaal ethische inbedding van de aangedragen strategieën.

Met het oog op het doel van het ethisch pragmatisme, vreedzame co-existentie tussen verschillende groepen mensen met verschillende normen en waarden, zijn de aangedragen strategieën geanalyseerd met behulp van de noties van paternalisme en zelfbestuur. Deze noties bekijken vanuit verschillende invalshoeken in hoeverre er ruimte is voor het bestaan van verschillende leefstijlen naast elkaar, als wel het bestaan van verschillende normen en waarden rond gezondheid en voeding. Wanneer wordt gekeken vanuit deze twee perspectieven, kunnen twee extremen onderscheiden worden.

Ten eerste zorgen strategieën die de omgeving van mensen veranderen er voor dat mensen zich geen complexe informatie over de relatie tussen voeding en gezondheidsrisico's en ziekten eigen hoeven te maken. Echter hoofdstuk 5 laat zien dat de strategieën waarin te veel dwang gebruikt wordt, zoals het beperken van het aanbod op de schappen en belastingen op bepaalde producten, niet wenselijk zijn. Daarbij wordt gesteld dat dit harde paternalistische maatregelen zijn, dat wil zeggen maatregelen die mensen dwingen tot bepaald gedrag, terwijl hun oorspronkelijke bewuste gedrag niet schadelijk is voor anderen. Hoofdstuk 5 laat zien dat, ook al kan het eten van bepaalde producten hunkeren naar meer veroorzaken doordat voeding op een bepaalde manier op beloningssystemen in onze hersenen werkt, dit niet genoeg reden is voor dwang. Daarnaast wordt uitgelegd dat ongezond eten derden niet schaadt, zoals sommigen beweren.

Ten tweede wordt in hoofdstuk 5 beargumenteerd waarom strategieën problematisch zijn die gericht zijn op het veranderen van gedrag door middel van het simplificeren van nutrigenomics informatie of begeleiding door een coach of diëtist. Vooral de persoonlijke leefstijl coach die persoonlijk dieet advies geeft, zou mensen moeten bewegen om door middel van voeding gezondheidsrisico's te verkleinen en ziekten te voorkomen. Daarbij wordt er vanuit gegaan dat mensen volledig vrij zullen zijn om voor deze voorzieningen te kiezen. Echter hoofdstuk 5 laat met de notie van zelfbestuur zien dat het naïef is om te denken dat hierbij alleen maar sprake zou zijn van meer keuzes voor de consument-burger. De notie van 'zelfbestuur' is een foucaultiaans begrip wat wordt toegepast bij discussies over bio-medicalisering. Het duidt een situatie aan waarin mensen bij hun streven naar gezondheid en geluk zichzelf disciplineren met behulp van innovaties en interventies. Deze disciplinerende wordt niet ingegeven door dwang, maar door discoursen (meestal geleid door wetenschappelijke experts) waarin het streven naar gezondheid en geluk gepromoot wordt, bijvoorbeeld met discoursen over de risico's van voeding en lifestyle. Wanneer deze discoursen zo dominant worden, dat zij andere ideeën over het goede leven met daarbij mogelijke andere leefstijlen bedreigen, brengt dit ethische conflicten met zich mee.

Daarbij moet de kracht van sociale druk niet onderschat worden. Bovendien kan, gezien het complexe karakter van de kennis over voeding en gezondheid die uit nutrigenomics voortkomt, het streven naar gezondheid zelfs vrije keuze voor andere ideeën over het goede leven in de verdrukking laten komen.

Tot slot wordt geconcludeerd dat strategieën die verleiding centraal stellen met voedingsproducten waarbij naast gezondheid andere waarden, zoals smaak, gemak en verzadiging een belangrijke rol spelen, en strategieën waarbij kinderen op school met verschillende eetstijlen in aanraking komen, de discrepantie tussen normen in het dagelijks leven en normen in het nutrigenomics script goed lijken te managen. Bovendien wordt bij deze strategieën de pluraliteit van eetstijlen niet in gevaar gebracht.

In hoofdstuk 6 worden de belangrijkste conclusies van hoofdstuk 2 tot en met hoofdstuk 5 besproken aan de hand van de onderzoeksvragen die gesteld zijn in de introductie. Verder wordt teruggekoppeld naar de doelstellingen van dit proefschrift. In dit proefschrift is ten eerste getracht om een ethische vorm te vinden van nutrigenomics door het creëren en analyseren van een deliberatie over nutrigenomics. Het blijkt dat nieuwe producten die meer waarden incorporeren dan enkel en alleen gezondheid, en onderwijs waarin de beleving van voeding de belangrijkste rol speelt, de ethisch meest wenselijke vormen van het gebruik van nutrigenomics zijn. Daarnaast wordt geconcludeerd dat de stappen die genomen zijn, inzicht geven in de sociaal-ethische kwesties die een rol spelen bij nutrigenomics en deze bespreekbaar maken voor verdere deliberatie. Daarbij blijkt dat gezondheid gezien als risicominimalisering door middel van voeding als belangrijkste doel van nutrigenomics niet zo vanzelfsprekend is als het lijkt.

Hoofdstuk 6 laat verder zien dat er een aantal kwesties zijn die in een deliberatie met een breder publiek kunnen worden besproken. Uit de vragen die de discussie met de maatschappelijke actoren, de notie van het script en de analyse van normen in het dagelijks leven oproepen, volgen een aantal dimensies die als leidraad kunnen dienen voor een verdere deliberatie. De volgende dimensies kunnen in een dergelijke discussie een rol spelen: paternalisme versus zelfbestuur met behulp van biomedische technieken; schuld en verantwoordelijkheid voor ziekte en gezondheid; biomedische noties van gezondheid versus bredere noties van gezondheid, waarbij de relatie die deze noties hebben met ideeën over het goede leven en alledaagse normen als genieten en ontspannen zijn over risico's een rol speelt. Deze dimensies kunnen, samen met de door de stakeholders voorgestelde strategieën voor het implementeren van nutrigenomics, verder ter discussie stellen of voeding een middel moet en kan zijn wat vooral wordt gebruikt om gezondheidsrisico's te minimaliseren, zoals dit gesteld wordt in het nutrigenomics script en door maatschappelijke actoren binnen de voedingswereld. Deze dimensies gaan veel verder dan alleen nutrigenomics en de daarbij behorende ideeën over persoonlijke dieetadviezen. Dit neemt echter niet weg dat in een dergelijk debat nutrigenomics als voorbeeld kan dienen als één van de trends binnen de wereld van voeding.

Ten tweede wordt in hoofdstuk 6 de aanpak van dit onderzoek geëvalueerd en worden er lessen weergegeven die meegenomen kunnen worden in een vervolgonderzoek. De stappen, de notie van het script en de discursive analytische benadering, beoogden inzicht te geven in hoe de wisselwerking tussen normen in het dagelijks leven en normen in het nutrigenomics script plaats kan vinden en trachten een optimale deliberatie met maatschappelijke actoren te organiseren. Voor het onderzoek in het geheel gaf deze aanpak de mogelijkheid om gevoeligheden rond nutrigenomics bloot te leggen en bespreekbaar te maken, en de wisselwerking tussen maatschappij en wetenschap in de ethische evaluatie mee te nemen. Echter de deliberatie met maatschappelijke actoren bleef beperkt. Zo kwamen de consequenties, dat wil zeggen een reflectie over de ethische wenselijkheid van verschillende strategieën, en mogelijkheden voor sturing door bijvoorbeeld wetgeving, minder aan de orde. Daarnaast bleef gezondheidsoptimalisatie de belangrijkste doelstelling in de voorgestelde strategieën voor het gebruik van nutrigenomics, en werden consumenten geconstrueerd als personen die tegen zichzelf beschermd moeten worden of als personen die gezond gaan leven als nutrigenomics kennis makkelijker toepasbaar wordt. Deze constructies van gezondheid en consumenten kunnen een verdere deliberatie over het gebruik van nutrigenomics in de weg staan, omdat bepaalde alledaagse normen als “genieten”, het idee dat te veel bezig zijn met gezondheidsrisico’s bizar is, en ideeën over plezier hebben aan ongezond eten slecht doorgang vinden in de discussie. Mogelijk wordt een verdere stap in de deliberatie niet gemaakt vanwege gebrek aan tijd. Daarnaast kunnen de theorieën van John Dewey ondersteund door recent onderzoek uit discursive analytische studies hier een verklaring voor geven. Deze geven aanwijzingen dat gezondheid minder emoties en discussie kan hebben oproepen in de deliberatie met maatschappelijke actoren, omdat het vaak als een abstract begrip gebruikt wordt. Een stap van verdere bewustwording van de concepten van gezondheid en voeding, als ook een verdere uitdieping en reflectie op wat de verschillende strategieën zouden betekenen voor het leven van de deelnemers aan de deliberatie als burger–consument, zou de deliberatie verder kunnen helpen. Ook zou een analyse van de discursieve strategieën die maatschappelijke actoren gebruiken bij het concept van gezondheid of beschrijvingen van consumenten, kunnen helpen om het debat verder te brengen. De resultaten van een dergelijke analyse kunnen worden teruggekoppeld aan de maatschappelijke actoren om hen zo bewust te laten worden van hun discursieve strategieën. Deze lessen kunnen worden meegenomen naar een vervolgonderzoek.

IV

Acknowledgements (Dankwoord)

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Bedankt ook vrienden en familie. Friso en Hedzer bedankt voor jullie steun als paranimf. Papa en mama bedankt voor de fantastische basis en de steun die jullie aan mij hebben gegeven. Daarnaast wil ik jullie en Ad en Marijke speciaal bedanken voor de ruimte die jullie hebben gecreëerd als oppas opa’s en oma’s van Marijgje om net die ene laatste creatieve spurt te kunnen maken. Marijke bedankt voor je kritisch oog op mijn stukken en de tijd die je daar altijd voor vrij wilde maken. Lieve Gertjan, bedankt voor je geweldige ondersteuning en je geduld tijdens al onze vrije tijd die ik aan dit proefschrift heb moeten besteden. We hebben de laatste jaren fantastische avonturen beleefd met ons trouwen, de geboorte van Marijgje en Thijs en ons verblijf in Colombia. Ik heb veel zin in de nieuwe avonturen die ons leven samen gaat brengen. Marijgje voor jou is het ook even een hele turbulente tijd geweest met mama die een proefschrift afrond met een kindje in de buik. Thijs jij bent een extra motivatie geweest om voor eens en voor altijd een punt te zetten achter dit proefschrift.

V

Curriculum Vitae

Rixt Herma Komduur was born on September 7, 1979 in Heerenveen in the Netherlands. After primary school, she attended VWO at OSG Sevenwolden in Heerenveen which she graduated in 1997. Subsequently she started her study in Biology, with a specialization in animal physiology at Wageningen University. After this she decided to take part in the MSc program Societal Biology at the University of Amsterdam, during which she did a research on accountability issues in relation to the trustworthiness and safety of health claims on functional food products. After her graduation in 2004 she had several jobs on the side. A PhD project on the communicative and ethical issues around nutrigenomics was a perfect opportunity to combine her interest in biology and societal issues around life sciences. She started this project in 2005.

During the project she presented work on several international conferences, stayed two month at the University of Ottawa and the University of British Colombia in Canada, was a member of the PhD education committee of Mansholt Graduate school and member of the animal experimental committee of Wageningen University.

After her contract ended in 2009, she started working on a post doc project at the National Knowledge Centre on Alternatives to Animal Use at the University of Utrecht in which she studied current and future trends in animal experimentation and 3R alternatives for the Dutch Ministry of Health, Welfare and Sports. During this project she supervised several master and bachelor students in biology and animal sciences in their practical work and thesis projects. In 2011 she moved with her husband and her baby daughter to Cali, Colombia. Where she and her husband worked at International Centre for Tropical Agriculture (CIAT). After returning to the Netherlands she picked up her PhD project again and worked as an ethicist on the animal experimental committee at VU University and Medical Center Amsterdam. Momentarily she still works at the animal experimental committee at VU University, is taking care of daughter, her new born son and is looking for a new challenging job.

VI

Completed Training and Supervision Plan (TSP)

Completed Training and Supervision Plan

Rixt Komduur

PhD candidate, Wageningen School of Social Sciences (WASS)

Completed Training and Supervision Plan



Wageningen School
of Social Sciences

Name of the course	Department/Institute	Year	Ects
General part			
Project and Time Management Course	WGS	2008	1.5
Scientific Writing	WGS	2007	1.5
Mansholt-specific part			
Mansholt Introductory Course	MG3S	2005	1,5
Mansholt PhD Day	MG3S	2008	1
‘Ethical implications of different levels of uncertainty for the application of nutrigenomics’	CSG/CESAGEN, Genomics and Society: Towards a robust science?, Amsterdam	2006	1
‘Ethical impact of uncertainties of nutrigenomics’	10th Int. Conference on Agricultural Biotechnology: Facts Analysis and Policies, ICABR, Ravello	2006	1
‘Creating a basis for deliberation’	CESAGEN/CSG, Genetics and Society: Retrospects and prospects, London	2007	1
‘The good life, living for health and life without risks: On the present script of nutrigenomics’ (poster)	ESRC Genomics Network Conference Genomics and Society– Today’s answers, tomorrows questions, London	2007	1
‘The role of genes in discussions about overweight’	Corsage workshop: Contingencies of genomics– finding roads into the future, Utrecht	2007	1
‘The good live with nutrigenomics’	Genomics Researchers Event , The Hague	2007	1

Name of the course	Department/Institute	Year	Ects
'Prevention and nutrigenomics: An analysis of talk on genetics, overweight and health risks'	Int. conference CSG & UK Economic and Social Research Councils Genomics Network Amsterdam	2008	1
'Engagement with applied science: nutrition, health, quality standards, Europe— Prevention and nutrigenomics'	4S–EASST conference	2008	1
Discipline-specific part			
1st International Advanced Course: The Future Genomics Society	MG3S/ VLAG	2005	4
Fourth PhD Workshop of the Dutch–Flemish Network for Philosophy of Science and Technology	NFWT	2005	2
Communication Strategies in Everyday Life	Communication Science	2005	6
Fundamental Ethics Course: Discussion Group	Applied philosophy	2005 / 08	6
Masterclass: Nutrition Communication: Challenges and Opportunities	VLAG/ MG3S	2005	1
Qualitative Methodology Course	MG3S	2006	3
CSG Onderzoeksdagen		2006 / 08	–
Member Animal Experimental Committee	WUR	2005 / 08	3
Study Tour Canada (NWO travelgrant)			–
Teaching and supervising activities			
Food Ethics		2005 / 08	1
Ethics and Social Science		2007 / 09	1
Lecture Laboratory Animal Science: 'DEC's en de beoordeling van de ethische toelaatbaarheid van dierproeven'	UU	2009	–
Member Education Committee		2006/08	–
Total			40.5

★ One ECTS on average is equivalent to 28 hours of course work

VII

Appendix: Original Dutch fragments of Chapter 4

Extract 1

Rose: Bij sommige mensen zit het ook in de genen gewoon. Ja, ik bedoel de aan mijn moeders kant van de familie is iede is iedereen te zwaar. Ik wou dat ik mijn vaders genen had gekregen. Aan mijn vaderskan zijn ze allemaal heel smal.

Interv: hm

Rose: Maar ja, ik heb mijn moeders gen(lachend) Dus ja neeeuh ja. Da dat is dus gewoon inderdaad. Ja ik ja op een gegeven ogenblik ben jeuh. Ik ben heel vaak op lijn lijnen geweest ja dat jojo euh effect dan.

Interv: Ja

Rose: Ja.(.)

John: [t is dus ge]

Rose: [t is gewoon] van t eten=

John: t is van het eten en t kan ook aanleg zijn.

Rose: t is ook aanleg=

John: =t kan ook aanleg zijn

Extract 2

Ellen: Nou ik ben het eigenlijk met met hun met hun wel eens. Maar het zit bij ons ook wel een beetje in de genen. Mijn moeder is ook. Die is vijfentachtig geworden maar die is net nog als ik. De— Ik ben zo grof. En nou ja de rest is natuurlijk ook wel spek hoor.

Interv: Lacht (meer gelach)

Ellen: Dat mag je best wel weten hoor

Ralf: Vandaar dat je je [onduidelijk]

Ellen: [Het is gewoon] helemaal grof. Grof gebouwd.

Interv: Ja.

Ellen: Zwaar ook. Gewoon zwaar.

Interv: Ja. (.) Dus aanleg.

Ellen: Aanleg. Ja.

Jorien: Ja maar ik denk ook als je kinderen hebt gehad.

(Eight lines omitted)

Ralf: Spychisch [zeggen ze dan]

Ellen: [Nee Ik heb het] eigenlijk altijd gehad. Ben altijd. Ik zeg wel eens maat zesendertig heb ik gewoon overgeslagen.

Extract 3

Anneke: Er wordt wel snel achter geschild van, (1)

Johan: Ja

Anneke: ik heb er aanleg voor. Maar er zijn natuurlijk mensen, maar die zijn meestal, (1) die hebben euh ergens last van. (2)

(Three lines omitted)

Anneke: Maar ja, het is natuurlijk gauw (1) te zeggen van, (1) ik heb er euh (2)daar aanleg voor.

Extract 4

Paula: Ik kan het soms binnen gezinnen geweldig zien dat euh de één, één van de kinderen wordt monsterlijk dik

Jan: [Jajaja

Paula: en de ander blijft [gewoon] keurig,

Bea: [Ja

Jan: Ja

Paula: en dan weet je het niet, maar dan mag je ervan uitgaan dat er toch redelijk vergelijkbare manier van

Jan: [Ja]

Paula: hoe gaan we met eten om binnen dit gezin

Extract 5

Ewald: Euh ik euhh. Ik euh heb drie euh meiden heb ik al gezegd.

Interv: hmhm

Ewald: Euh Waarbij de oudste en de jongste (.) zijn super slank. Supereuh dun. Die oudste eet de hele dag door. (2) Die komt geen gram aan die blijft gewoon op haar (1) En die middelste motten we echt reduceren. Want die kan dat. Die die groeit gewoon dicht.

(Four lines omitted)

Ewald: Dan zie je heel duidelijk het verschil (1) tussen het ene kind en het andere kind

Interv: Ja

Merel: Ja heel herkenbaar

Extract 6

Ewald: Want die oudste die stopt de hele dag maar door. Die die kan eten. Zakken euh euh gaan er leeg. Chips maakt niet uit.

Interv: hm

Ewald: Die komt geen gram aan.

Extract 7

Ellen: Effen een pizzaatje, of effen een frietje of effen een dingetje

Peter: Ja

Ellen: En dat is ook dat [Dat is ook een grote oorzaak hoor]

Peter: [Dat proberen wij t] Dat proberen wij zoveel mogelijk te beperken We doen het wel eens

(10 lines omitted)

Peter: Nee maar dat euh. (2) Ze hebben die bouw ook helemaal niet. (2)

Ellen: Nee nee

Extract 8

Johan: Maar ja goed, wat is onder controle houden?

(Iedereen praat door elkaar)

Tessa: Nou, zodra je nog heel veel invloed hebt als [als moeder]

Johan: [Ja maar] ja goed je hebt wat invloed op euh=

Tessa: =Maar (.) maar op op die van dingen dat zou ook niet goed zijn als je die nog [helemaal onder controle hebt. (lacht)]

Johan: [En ik bedoel, ze zien er goed uit] alle twee, en ook dus daar heb ik geen moeite mee als ze dan een euh 's avonds wat chips of pakken.

Annie: Nee natuurlijk.

Extract 9

Jelle: Dus die dame die net weg liep.(.) Dat is mijn vrouw. (.) En die heeft precies het tegenovergestelde. Als die wat stress heeft of onregelmatig gaat leven, dan zakt zij de verkeerde kant in en dan (van Baak), zoals ze nu is, soms 57 kilo. Ze is één meter tachtig. (2) Ik ben één meter vierennegentig. Ik zit op honderdtien kilo. (3) Precies andersom.

interv: Hele verschillende reacties. Euh

Jelle: Ja

Extract 10

Peter: De een hebt die juist van de stress die afvallen

Ellen: Ja

Peter: en de ander [die komt weer aan]

Jose: [die wordt di] ik ga juist eten

Ellen: Ja

Extract 11

Jasper: Elk pondje gaat door het mondje zeggen ze dan he?=
 Karijn: =Dan doen ze het stiekem gewoon

Interv: dus eten

Titia: Ma [maar je kan ook bijna niet]

Jasper: [Ja, maar als je ge- gefrustreerd] bent, (.) of nerveus of wat dan ook dan lijkt mij juist, (1) die binnenvetter (1), die komt niet aan denk ik. (.) Lijkt mij (2)

Karijn: Nou (.) [Ik denk het wel]

Jasper: [Je kunt, je] kunt er ook van afvallen.

Karijn: Ja, dat kan ook, van de zenuwen of zo. (2) Ja. (.) Er zijn mensen die kunnen van stress afvallen ja.

Jasper: Ja

Karijn: Maar mensen die stresseters zijn, die worden er ook heel dik van. (2) Kijk ik even naar mij zelf. (lacht)

Extract 12

Walter: Gewoon 3, 4 hele intensieve jaren gehad op mijn werk. Nou, prima allemaal. Maar euh, je betaalt wel een tol. En op een gegeven moment ga je wat meer bewegen, en dan denk je (.) goh (.) krijg ik daardoor veel meer energie. Dus dan voer je die discussie met mensen bij wie je dat ook ziet komen (.) of bij wie het al verder (.) en dan zijn er ook mensen die zeggen van (.) 'Ja(.) ja, dat weet ik wel (.) Dat realiseer ik me wel. Ja, ik vind dit prima zo,' en die drinken weer een biertje.

Extract 13

Joris: Ik ben nog geen dertig ik ga toch niet aan gezondheidsrisico's denken
 (Two lines omitted)

Ik euh als ik naar mijn vader kijk inderdaad die is nou wel (.) meer naar de niet niet overdreven dik of zo

Interv: Hm

Joris: Maar goed dat is dan gediagnosticeerd met suikerziekte. En ja (1) dan is het zo dat bijna alles wat ie eet of doet(.) Toch even nadenken en ik bedoel dat ie een keer (1) weet je dat hoor je dan en je schrikt een keer van goh ja hoe komt dat dan. Nou ja dat je er een keer over na gaat denken. Ja ik heb dat niet.

(Five lines omitted)

Joris: Neu (.) ik denk dat mijn problemen met mijn gewicht meer zijn als ik s ochtend een keer wakker wordt, of als ik een stoel zit met een wit shirt aan dat ik denk van (.) Nou dat vind ik erger dan die gezondheidsrisico's

Extract 14

Interv: Denken jullie wel eens over die risico's na? (van Baak)Die gezondheidsrisico's, [en wanneer].

Karin: [Zekers]

Interv: Ja, wanneer?

Karin: Als ik me laat keuren, ik laat me regelmatig keuren. (1) Euhm, als ik mijn hart voel kloppen. Da-da-dat ik denk, hé mijn hart klopt me helemaal in mijn keel, weet je wel? Of ik kan niet meer praten als ik de trap heb gelopen.

Interv: Hm

Karin: Dan denk ik van euh ja, ik moet gewoon of veel beter bewegen, of gewoon beter eten. (2)Gewoon meer groente, meer fruit

Interv: Wel een reden om je leefstijl aan te passen dus?

Karin: Ja. (2) Want ik vind, ik hou heel veel van mezelf. En ik hou heel veel van het leven.

Interv: Ja

Extract 15

Maja: Ik heb euh twee zusjes met suikerziekte. En mijn vader heeft dan euh ouderdomsdiabetes. En euh ik heb dan wel zo van oh euh het zit erg heel erg in de familie. En ik denk van ja met overgewicht (1) zat ik ook niet goed. En dat is ook de reden, wat ik al zei, dat ik elk half jaar naar de dokter ga. En elke keer denk ik van nou, Maja, nou is het mis. Nou krijg je het te horen.

(Four Lines omitted)

Maja: Hoe kun je nou zo stom zijn. Want er is wel aanleg voor in de familie en dan w-w-werk je ook nog overgewicht in de hand.

(Five lines omitted)

Maja: Als ik dan weer zo'n uitslag krijg, van alles is goed en je bent kerngezond, (1) dan druk ik dat ook weer heel makkelijk weg, he?

Others: Ja

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