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PERCEPTION OF NUTRITIONAL RISKS (malnutrition, obesity) BY VIETNAMESE MOTHERS.

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Abstract

Literature on risk perception shows that the gap between knowledge and behavior may not come from a knowledge deficit but be related to different rationalities between experts and laymen.

In this study we developed a psychometric questionnaire adapted to nutritional risks (malnutrition, obesity), which allows to identify socio-psychological characteristics influencing risk perception of Vietnamese mothers of school-aged children.

First results show differences between mothers in the perceived dimensions of both risks, which could explain various risk management logics. It thus appears necessary to give targeted information to the various clusters according to their risk perception instead of general communication.

INTRODUCTION OF THE PROBLEMATIC

During last decades, economics development, rising consumers' purchasing power, urbanization and concentration of the food supply chain modified the world food landscape and consumption models. Whereas the majority of nutritional deficiencies disappeared, challenges in nutrition and health fields have changed in nature (*FAO, 2004*). At the world scale, we notice today a high prevalence of chronically non-communicable diseases, such as some cancers, cardiovascular diseases, type 2-diabetes, allergies and osteoporosis (*WHO, FAO, 2003).* In the last decades, the cases of overweight and obesity drastically increased in the world among adults and children (*IOTF*[1]*, 2005*), so that WHO speaks about "world epidemic". In 2002, the prevalence of overweight and obesity[2] raised to 60% in US, 56% in UK, 39% in France, 30% in China, 42% in Tunisia (*OCDE Health data, 2004; WHO, 1997*). The prevalence of overweight and obesity reached 5,6% of adults in 2000 in Vietnam whereas it did not exist in 1997 (*Khoi, 2003; NIN, 2003*). High social and economic costs resulted. In 2001, chronic diseases accounted for 59% of the 56,5 million deaths in the world and 46% of the world load of morbidity (*WHO, FAO, 2003*). WHO (2004) estimates that the costs of obesity represent 7% of the direct[3] total health costs[4].

Food-related risks became public health priorities and nutritional risk management is made more complex. The developing world and economic transition countries, such as Vietnam, face the coexistence of both problems of malnutrition by deficiencies and by overweight, so these countries have to deal with a "double burden of malnutrition" (*FAO, 2004; WHO, FAO, 2003).* Moreover, various studies give evidence of a relationship between growth retardation during childhood and development of obesity and food-related chronically diseases at the adulthood (*Barker, 1994*).

In order to fight against nutritional problems and prevent food-related diseases, the authorities implement measures, either acting on food supply (promotion of nutritionally adapted and/or enriched products and diets, production increase, nutritional recommendations for diets in collective restaurants, etc), or on food demand (improvement of food safety, education and information, nutritional awareness campaigns, to influence people's food preferences and increase physical activity).

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[1] International Obesity Task Force

[2] Body Mass Index : (BMI) ≥ 25 kg/m²

[3] do not take into account the losses of productivity and income

[4] For example, the total costs ascribable to obesity amount to more than 70 billion US dollars a year in public health expenditures in US (*Colditz, 1999*) and to about 1,85 billion of euros in France (*Levy et al., 1995).*

Risk communication and public education play a central role in preventing risks. These interventions remain dominated by general psycho-sociological models (like the models of theory of reasoned action and of planned behavior proposed by *Fishbein & Ajzen in 1975; Ajzen, 1985*) or models applied to health behaviors such as the Health Belief Model (*Rosenstock, 1974; Becker, 1974*) or the Knowledge, Attitude, Beliefs, Practices (KABP) model promoted by WHO (*1989*). These implicit models of conventional nutritional education assume that bringing information upstream will make it possible to improve individual knowledge and choice abilities, in order to lead to a change of attitudes, which will result in improved food practices and therefore in a better nutritional status.

PROBLEM STATEMENT

However, literature and experience show that attempts of nutritional education have little decisive impact on the evolution of food habits and appear mostly inefficient to solve nutritional problems in the developing countries (*Adrien & Beghin, 1993; NIN, UNICEF, 2001*). Several studies report that food behaviors are far from the nutritional recommendations, in spite of stronger consumers health concerns. Quantitative KABP type investigations as well as studies in health-nutrition (AIDS, tobacco, food) confirmed that an improvement of the knowledge level on prevention and control tools was not a sufficient condition to improve individual risks management behaviors *(Moatti & al, 1993; Calvez, 2004)*. In spite of their knowledge about risks, some individuals do not conform to the recommendations and continue to behave in a way which exposes them to the risks.

To explain the discrepancy between expected and actual practices, several arguments have been advanced : economical reasons, time constraints or a dysfunction of the communication system itself (*Adrien & Beghin, 1993; NIN, UNICEF, 2001*). One privileged explanation is the insufficiency of the approach derived from the subjective expected utility theory. In the standard risk analysis model, so-called "positivist", risk is appreciated by experts according to the microeconomic decision theory. Considering the choice as rational and based on probabilistic calculation, risk is assessed by the sum of the products of the severity and the probability of occurrence of the risk. Regarding individual risk perception as "subjective" and "irrational" compared to the "objective" risk defined by experts, the aim of risk communication is to reduce this distortion by leading the citizen to perceive the "real" risk (*Hansen, Holm, Frewer, Robinson & Sandoe, 2003*).

However, work in psychology and more specifically research based on the psychometric paradigm (*Slovic, Fischhoff & Lichtenstein, 1979)* showed the existence of a shift between

the way in which "experts" (agents in charge of risk analysis and risk communication) and consumers "laymen" perceive and evaluate risks (*Slovic, 1992; Fife-Schaw & Rowe, 1996; Peretti-Watel, 2001*). Indeed, the public have a multidimensional perception of the risks, more complex and qualitative than the experts. The psychological and social factors are especially recognized to be important determinants of the individual risk evaluation and of behaviors (*Kahneman & Tversky, 1979; Slovic & al, 1980; Tversky & Kahneman, 1981;*). The disposals set up by the citizens to face risks are compromises between objectives, know-how and concurrent risks (between health and self-image, etc).

The limits of the quantitative risk analysis model were shown by Peretti-Watel (*2000*). In a study analysing sexual behaviors among young people (ACSJ), the author shows that the combination rule between perceived severity and frequency of several health hazards is additive and rejects the assumption of independence between these variables. To explain the failure of the basic model in predicting perceived fear, the author assumes that people distinguish the risk for themselves (or their relatives) from the risk for the others, because they implement particular mechanisms of risk deny which enable them to believe that themselves are not, or little, exposed to a given risk. Several studies underline the important distinction between personal and general risks which brings to different judgements (*Drottz-Sjöberg, 1993*). This is matching with optimistic biases. Individuals seem to over-estimate certain risks, like the technological risks (ESB, GMO, food additives) and to underestimate others, like lifestyle related risks (harmfulness of tobacco, food risks, AIDS, road accidents) (*Frewer & al., 1994*). Thus, evaluation of food-related health hazards by the authorities and scientists appear far away from the concerns and requirements of the public.

A survey we implemented in Hanoi (Vietnam) among mothers of school-aged children in 2004 confirmed the insufficiency of the quantitative risk model. A Logit modeling made it possible to highlight that the perceived fear of malnutrition for the child was explained by the perceived gravity of this risk, whereas the perceived fear towards obesity was neither explained by gravity nor by the perceived frequency. There are thus other variables apart from perceived risk gravity and frequency which explain the perceived risk.

RESEARCH QUESTION

To go further the quantitative risk analysis model, which only considers the frequency and gravity of risk to explain individual risk-related behavior, we focus on a multidimensional analysis of citizens risk evaluation, aiming to highlight the psycho-sociological factors that form the public perception and that people incorporate in their set of knowledge and

practices. This analysis will help understanding the gap existing between expected and actual behaviors.

THEORETICAL AND CONCEPTUAL FRAMEWORK

The psychometric approach (*Slovic & al, 1979*) seems to be an interesting tool to identify the psycho-sociological determinant characteristics of perceived risks. In contrast with dominant models which evaluate risk perception globally, Slovic grid breaks up the perceived risks into various psycho-sociological attributes, which are gathered in three main dimensions : the « *dread* » and « *unknown* » factors and risk « *extend* » *(Slovic, 1987; 2002).*

The psychometric paradigm had a broad success because of the simplicity of the model, of its vision close to the "common sense" and the reproducibility of data (*Sjöberg & al, 2004*). Psychometric scales and multivariate analysis techniques make it possible to produce quantitative representations of attitudes towards risks (*Slovic & al., 1980*). This approach remains however scarcely used in consumer behavior research except in some studies in the field of health and safety (*Holtgrave & Weber, 1993).* Based on this paradigm, this research aims to understand the socio-psychological determinants of individual nutritional risks perception. It rests on the idea that "false beliefs" form part of the collective representations and that individuals develop responses which integrate the risk.

This article presents the first results of a study carried out in Hanoi (Vietnam) which aims to compare the perceived characteristics of two nutritional risks, risks of malnutrition (by deficiencies) and obesity, by mothers of school-aged children.

METHODOLOGY

This work has been implemented in partnership with CIRAD[5] and the vietnamese national institute of sociology (IOS).

Mothers have been sampled according to the nutritional status of their children in collaboration with the Women's Unions and school directors of Hanoi's districts. Thereby, 3 groups of children from 6 to 10 years old were constituted : one group of underweight[6] children (84), one group of children having a normal nutritional status (98) and one group of overweight and obese children (71). On the whole, 253 mothers were questioned during face to face interviews, on the basis of a quantitative and qualitative questionnaire.

[5] French Agricultural Research Centre for International Development
[6] According to WHO's and Centers for Disease Control and Prevention's criteria

The two targeted nutritional risks were declined into the perceived characteristics defined by *Slovic & al (1980; 1985), Sparks & Shepherd (1994), Fife-Shaw & Rowe (1996), Kirk & al (2002)* : severity, frequency, evolution, fear for the child (perceived vulnerability), possibility to act on the risk, control, auto-efficacy of the food practices, reversibility, risk "observability" (awareness), immediacy of the consequences, equitable nature, responsibility, mediatization, expert's uncertainty, personal knowledge of the causes, consequences and nutritional recommendations. Mothers had to quote each dimension on a 4 point scale.

Besides, we developed a general knowledge test on causes, consequences and recommendations with respect to malnutrition and obesity. A mothers' knowledge score was calculated on the basis of false (0) or right (1) answer to the test. The total score is 30 points. Mothers quoted their principal sources of information (in volume) and the confidence they had in these sources.

Anthropometrical measurements (weight and size) have been made in order to calculate the Body Mass Index (BMI) of the children and mothers. The BMI were calculated and classified according to WHO's criteria for adults (underweight : BMI $\leq$20; normal : BMI = 20–24.9 ; overweight : BMI = 25–29.9 ; obese : BMI $\geq$ 30) and the CDC's growth chart for children from 2 to 20 years old (a BMI-for-age percentile : $\leq 5^{th}$ percentile represents underweight children; $\geq 85^{th}$ percentile is for children at risk of overweight and $\geq 95^{th}$ percentile is for children overweight and obese) (*Cole & al., 2000*).

Socio-demographic information was finally collected : mothers and children's age, mothers' education level, household income by consumption unit.

Data were processed using SPSS 11.0 software. Mean scores for each item in the section of risk perception dimensions were first calculated and Chi-Square non-parametric test permitted to study statistical differences between the characteristics (with a 95 % confidence level).

From the data on perceived attributes of each risk taken separately and then together, a factor analysis with *oblimin* and *varimax* rotation was applied to extract the common factors. A hierarchical classification by Ward method permitted to classify the observations into classes. Finally, an ANOVA test was carried out in order to test the significance of the differences between means of each class for various socio-demographic variables, the knowledge score and nutritional status of mothers and children.

RESULTS

Mean scores results show some little differences in the way mothers globally perceive the dimensions between malnutrition and obesity. Chi-Square tests only show significant difference between the evolution of malnutrition et of obesity. Malnutrition is perceived as a decreasing risk ("there are less and less underweight 6-10 years old children in Vietnam") whereas obesity is considered to be increasing. The consequences of obesity are perceived as rapid (few weeks) whereas those of malnutrition are perceived “rather” in the long run (few months).

In spite of significant differences, some tendencies arise from these preliminary results. The consequences of these two risks are considered “rather” serious whereas mothers do not perceive any fear or low fear. It should be due to the high perceived control, which is “rather” important or total in both cases and mothers consider their food practices “rather” efficient or even totally efficient to fight against or prevent these two risks. This confirms Peretti-Watel’s results (2000) showing that risks when perceived as manageable are little feared.

Both risks are considered to be equitable (“all children are exposed in the same manner”) but more mothers consider obesity less equitable than malnutrition. According to conclusions of former studies on risk, it seems that malnutrition could be better accepted than obesity.

Maternal responsibility is considered to be more important in the case of malnutrition. It appears from the qualitative talks that the child is considered as one responsible of obesity.

Perceived mediatization of risks is "rather" important but is higher in the case of malnutrition, probably because obesity is a quite new problem in Vietnam. This also appears regarding perceived scientific uncertainty, which is weak for the two risks but more important for malnutrition ("scientists know perfectly the risk of malnutrition"). It may be possible to link these results with the high confidence in the official sources of information. The three main sources of information quoted according to their importance in volume are television, magazines/newspapers and health professionals for both risks. These sources are those which received the strongest scores of confidence respectively. Vietnamese thus seem to grant a great confidence with respect to official sources and experts in nutrition.

If we look at the first two factors proposed by Slovic (*1987, 1992*) (*cf. table 1*), it appears difficult to conclude about the level and knowledge of both nutritional risks. For example, both risks seem to be perceived globally in the same way for some attributes, as they are both judged for example as controllable, not dread, easily reduced. In contrast they are assessed differently for other characteristics; for example, malnutrition is perceived more equitable

than obesity, and an old risk *versus* new risk for obesity. Then, it should exist individual variation in the perceived attributes, that we propose to study by a factor analysis and an attempt to make a typology of mothers.

Table 1 : Main risk factors following Slovic (*1987, 2002*)

LOW RISK	*FACTOR 1 : « DREAD »*	**HIGH RISK**
Controllable		Uncontrollable
Not Dread		Dread
Not Global Catastrophic		Global Catastrophic
Consequences Not Fatal		Consequences Fatal
Equitable		Not equitable
Individual		Collective
Low Risk to Future Generations		High Risk to Future Generations
Easily Reduced		Not Easily Reduced
Risk decreasing		Risk increasing
Voluntary		Involuntary
KNOWN RISK	*FACTOR 2: « UNKNOWN »*	**UNKNOWN RISK**
Observable		Not observable
Known to those Exposed		Risk Unknown to those Exposed
Effect Immediate		Effect Delayed
Old Risk		New Risk
Risks Known to Science		Risk Unknown to Science

Factor analysis on the perceived dimensions of the risk of malnutrition

The principal component analysis from the perceived dimensions of malnutrition shows three main factors, with loadings greater than 1, explaining 65,111% of the total variance (244 valid responses). These factors were labeled as : factor 1 “unknown” (Eigen value : 2,721, explaining 30,233% of the variance), factor 2 “dread” (EV : 1,977; variance : 21,966%) and factor 3 “observability” (EV : 1,162; variance : 12,912%).

Table 2 : Components matrix for malnutrition after varimax rotation (Kaiser normalization)

	Factor 1	**Factor 2**	**Factor 3**
Knowledge of the causes	**0,920**		
Knowledge of consequences	**0,915**		
Knowledge of the recommendations	**0,704**		
Personal control on malnutrition	0,164	**0,859**	
Efficacy of the food practices		**0,845**	
Fear for the child	0,195	**-0,686**	
Reversibility of malnutrition	0,206	**0,533**	0,460
Observability of malnutrition	0,176	0,112	**-0,756**
Knowledge of the specialists	0,276	0,178	**-0,581**

Kaiser-Meyer-Olkin : 0,655; Barlett : 797,764 - sig : 0,000; NB : same structure with oblimin rotation

We notice that we find the same first two “unknown” and “dread” components defined by Slovic and al. When we force the factor analysis to two components, the variables on the third factor are attached to the factor “unknown” (52,199% of the explained variance), in conformity with what is expected from the psychometric paradigm.

The hierarchical classification from these factors reveals four main groups of mothers.

Their projection on the two factors “unknown” and “dread” shows that groups 1 (60 mothers) and 4 (37) assess their knowledge on malnutrition as good and very good, in opposition with groups 2 (75) and 3 (72) perceiving to know little about this risk.

On the component “dread”, groups 1 and 2 differentiate themselves from the two other groups. They gather mothers fearing the most the risk of malnutrition, feeling to lack of control on it and to have inefficient or rather not efficient food practices to control malnutrition. In contrast, groups 3 and 4 have the lowest levels of perceived fear with high levels of control and auto-efficacy. These latter judge malnutrition as reversible, whereas the former assess it as irreversible.

From these results, we observe a strong link between perceived control and auto-efficacy and the level of fear of the mothers. In terms of personal and scientific knowledge, there is no univocal link with the fear for the child. As an example, it is not because mothers perceive a low scientific uncertainty or a high personal knowledge, that they fear less malnutrition. In the same way, there is no clear relationship with the observability of the risk.

Factor analysis on the perceived dimensions of the risk of obesity

When we perform a factor analysis from the perceived dimensions of obesity, we obtain three main factors, explaining 60,405% of the total variance (245 valid responses). These factors were labeled as : factor 1 “unknown” (EV : 2,768, variance : 27,678%), factor 2 “dread” (EV : 2,085; Variance : 20,845%) and factor 3 “behavior” (EV : 1,188; variance : 11,882%).

Table 3 : Components matrix for obesity after varimax rotation (Kaiser normalization)

	Factor 1	Factor 2	Factor 3
Knowledge of the consequences	**0, 897**		
Knowledge of causes	**0,880**	-0,109	
Knowledge of the recommendations	**0,778**	-0,105	
Mediatization on obesity	**0,546**	0,167	0,134
Efficacy of the food practices		**0,840**	0,191
Personal control on obesity		**0,837**	0,179
Fear for the child	0,295	**-0,607**	0,171
Effects of the consequences in time	0,194	**0,487**	
Reversibility of obesity		-0,100	**0,786**
Possibility to act on obesity		0,179	**0,751**

Kaiser-Meyer-Olkin : 0,686; Barlett : 770,191 - sig : 0,000; NB : same structure with oblimin rotation

The first two factors correspond to the factors “unknown” and “dread” from Slovic grid. The third factor “behavior” refers to the possibility to act on the risk and to influence the course of the risk by a behavioral change. Indeed, qualitative interviews with mothers revealed that mothers think it is possible to reduce, prevent or remove malnutrition : decreasing some nutrients in food (55% of the responses); practicing exercise and sport (43%); reducing the consumption of “snacks” (25%); balancing the diet (24%); restraining eating, following a diet

(23%). When we force the factor analysis to two components, the variable "possibility to act" is attached to the factor "dread" (48,523% of variance), as expected.

The hierarchical classification from the three factors reveals four main groups of mothers. On the "unknown" and "dread" we see an opposition between groups 2 (40 mothers) /3 (48) and groups 1 (93) / 4 (64). The former classes represent mothers which consider to know few or nothing about obesity, whereas the latter perceive to have a good or perfect knowledge.

On the component "dread", the groups 1 and 2 of mothers are different from the two others in terms of perceived fear and control. The fear for the child is higher when mothers perceive a low control and auto-efficacy (the former groups) and lower when mothers have the feeling to control obesity (the latter groups).

Thus, these results confirm the reverse link between perceived control and the level of fear of the mothers and the diffuse relationship between fear and personal knowledge. We can underline that there is also no direct bond between mediatization of the risk and perceived fear. A strong attention paid by the media to obesity can lead to a high (group 1) *versus* low fear (group 3) of obesity for the children.

Concerning the factor 3 related to the "behavior", we notice that the mothers who judge more possible to act on obesity and consider it as reversible have a greater fear of the risk (group 1), whereas those who assess obesity as irreducible and irreversible have a little fear of it. Thus, it seems that the feeling to be able to do something against obesity is anxiogenous.

Factor analysis taking into account together perceived dimensions of malnutrition and obesity

The final factor analysis conducted together for malnutrition and obesity highlights that the selected variables are summarized in 4 main components, explaining 69,204% of the total variance (245 valid responses).

Table 3 : Components matrix for malnutrition and obesity after varimax rotation

	Factor 1	Factor 2	Factor 3	Factor 4
Efficacy of food practices on malnutrition	**0,856**		0,107	-
Personal control on malnutrition	**0,830**	0,135	0,111	-0,180
Fear of malnutrition for the child	**-0,604**	0,246	-0,178	0,146
Reversibility of the consequences of malnutrition	**0,579**	0,157	0,204	
Knowledge on the causes of malnutrition		**0,884**	0,238	
Knowledge on the consequences of malnutrition		**0,880**	0,262	
Knowledge on the recommendations on malnutrition	0,109	**0,720**		
Knowledge on the consequences of obesity	0,194	0,139	**0,910**	
Knowledge on the causes of obesity	0,166	0,172	**0,893**	
Knowledge on the recommendations on obesity	0,262	0,304	**0,639**	-0,124
Personal control on obesity				**0,886**
Efficacy of food practices on obesity				**0,883**
Fear of obesity for the child	0,286		0,124	**-0,595**

Kaiser-Meyer-Olkin : 0,730; Barlett : 1526,354 - sig : 0,000; NB : same structure with oblimin rotation

It is interesting to observe that we find the factors “dread” and “unknown” related to the two nutritional risks : the factor 1 represents the factor “dread malnutrition” (accounting for 31,010% of the total variance; EV : 4,031), the factor 2 is the “unknown malnutrition” (18,188 %; EV : 2,364), the factor 3 “unknown obesity” (11,408 %; EV : 1,483) and the last component is the factor “dread for obesity” (8,598 %; EV : 1,118).

The Ward Method classification differentiate 4 classes. The first (65 mothers) and second (55) groups gather mothers who fear a lot malnutrition and perceive a low control and auto-efficacy on this risk but do feel little concern with obesity (and they feel to strongly control the risk of obesity). The more mothers judge malnutrition as a reversible risk, the more they feel they can control it. Groups 4 (71) and 3 (54) represent the mothers who fear the most obesity and perceive their control and auto-efficacy on this risk very weak, but in contrast do not feel concerned with malnutrition.

Mothers who fear the most malnutrition are those who fear the less obesity and conversely. Mothers fearing malnutrition have low feeling of control and auto-efficacy on malnutrition and have conversely a high perceived control and auto-efficacy on obesity, fearing little this latter risk.

There is a relationship between the concern of mothers and the nutritional status of the children. The mothers fearing obesity have the children with highest BMI, ie children potentially affected by overweight or obesity. And mothers having children vulnerable to malnutrition with the lowest BMI, feel a lot of concern on malnutrition. In conclusion, mothers perceive the vulnerability of their children to the nutritional risk. Moreover, we note the tendency for mothers to over-estimate risks in a reverse way. Indeed, qualitative interviews show that mothers whose children are overweight are more likely to over-estimate child weight, whereas mothers of underweight children are more likely to judge their child thinner than they really are. This suggests that mothers whose children suffer nutritional problem perceive the risk and even amplify it. Thus, even the problem is perceived, it is not obvious that mothers will implement strategies to reduce it, as can be judged by children nutritional status.

We notice a strong relationship between the nutritional status of children and mothers and the income level of the household. We find the children with the lowest BMI in the households with the lowest income per consumption unit; conversely, the children with highest BMI live in families with highest income.

In terms of objective knowledge, mothers with children with low BMI have the lowest knowledge score, whereas mothers with overweight or obese children have the better

knowledge. This comes to the conclusion that knowledge is not determinant of the nutritional status of the children. Even mothers having a good knowledge have children presenting nutritional problems.

DISCUSSION AND CONCLUSIONS

Many papers highlighted that public has its own way of apprehending uncertainty and has a more complex and qualitative risk perception than experts. The shifts observed between individual knowledge on nutrition and health and food behaviors may not come from a deficit of knowledge but would be related to a difference of rationality from the different actors (specialists, citizens). Results from this study confirm that knowledge is not a strong determinant of the nutritional status of children. Although mothers have a good or very good knowledge on risks, their child can present nutritional problems, especially overweight.

This research make evidence that the psychometric paradigm can be a good methodological tool to characterize various socio-psychological characteristics influencing individual risk perception. Results underline that there are some differences in risk perception, according to the type of risk and to the individuals. We find a differentiation between the way mothers perceive the different characteristics of the nutritional risks.

Perceived control and auto-efficacy are two central variables in risk perception, which are negatively correlated with the perceived fear of the risk. Mothers who fear the risk consider that they have low control on it and that their food practices are not sufficient enough to manage the risk.

It is necessary to go further and link risk perception with effective potential practices implemented by mothers to face the risks. This will make it possible to highlight some optimism bias, current in food domain (*Miles & Scaife, 2003)*. These optimism bias refer to the fact that people consider themselves less likely to experiment negative events and more likely to experiment positive events, compared to the others (*Weinstein, 1980*). Weinstein (*1989*) showed that individuals considered themselves systematically less exposed to the risk than the others. In the health domain, optimistic biases imply that individuals are less likely to adopt self-protection behaviors (*Dejoy, 1996).* The more one thinks he/she knows or controls the risk, the more he/she thinks to be able to protect himself/herself (*Weinstein, 1998*). Data from this work show that some mothers under-estimate their knowledge on nutrition while others over-estimate their knowledge; it happens that these latter mothers have children have high BMI. One other factor contributing to optimistic biases is the degree of

perceived control. The illusion of control is linked to the belief to have control on a situation more than one really has.

It would be interesting to compare these results with Rimal's ones (*2001*), who attempted to understand the links between risk perception of heart diseases, perceived auto-efficacy, health information research and use. He distinguishes 4 attitudinal groups according to risk perception level and perceived auto-efficacy. « Responsive » attitudes (high perceived risk and high auto-efficacy) correspond to subjects aware of their risk status and believing that they have required tools to manage the risk or threat; they will actively look for health information. People with « avoidance » attitudes (high perceived risk and low auto-efficacy) do not believe in their capacity to control the risk; they are supposed to avoid information making more salient their risk status. Individuals with « proactive » attitudes (low perceived risk and high auto-efficacy) will actively search information to avoid the disease; they are not motivated by their risk status since they do not perceive them as vulnerable, but rather by the wish to stay unharmed from these diseases. « Indifference » attitudes (low perceived risk and low auto-efficacy) characterize subjects who have less motivation to search information because they do not consider them as vulnerable or do not believe in their auto-efficacy to face risks.

In terms of risk communication and risk management, these results have several implications. Since it is possible to clearly distinguish mothers according to the perceived dimensions of the risks, the type of risk and their knowledge, risk communication should not be general for all mothers but specific for targeted groups. The literature highlights that people will deny the information when general because they do not feel affected. The segmentation of the populations according to their risk perception seems to be a useful tool to define more direct and personalized interventions. This work maybe useful for nutritional risk management policies to understand the individual and collective representations as profane knowledge guiding behaviors. The integration of the risk into individuals' responses must bring to consider the individual as a subject and not simply as a target of the interventions.

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